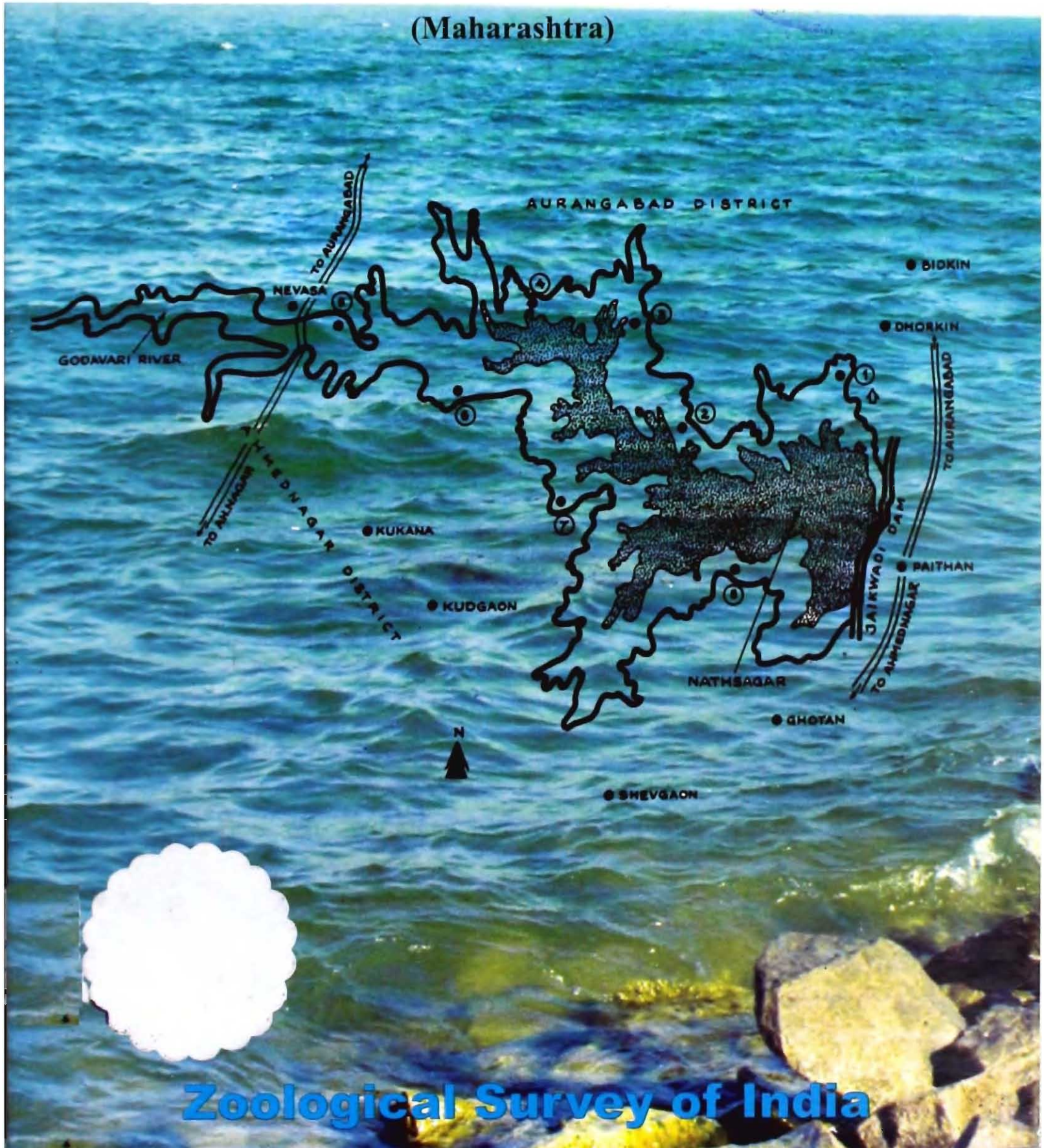


Fauna of Nathsagar Wetland and Jaikwadi Bird Sanctuary

(Maharashtra)



Wetland Ecosystem Series 7

**FAUNA OF NATHSAGAR WETLAND AND
JAIKWADI BIRD SANCTUARY
(MAHARASHTRA)**

Edited by the Director, Zoological Survey of India, Kolkata



सत्यमेव जयते

**Zoological Survey of India
Kolkata**

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NATHSAGAR WETLAND AND JAIKWADI BIRD SANCTUARY — AN OVERVIEW

ANIL MAHABAL

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INTRODUCTION

Natural and man-made large wetlands have significant impact on human life in their vicinity. Post independence years have seen erection of man made wetlands on ever increasing scale. In Maharashtra slopes on both the sides of Western Ghats were favorite sites for dams as the valleys could trap huge amount of water with its minimum spread. However, in Central part of Maharashtra State, most of the plateau is plain and few large rivers traverse it. Godavari is the largest river in this area, originating from Trimbakeshwar in Nasik, traveling through Ahmednagar, it has its course through Aurangabad and Nanded Districts of Maharashtra.

A dam on River Godavari at Jaikwadi village in Paithan Taluka of Aurangabad District was erected in 1976. It has an earthen wall of 10.2 kms. Due to this dam large water body with submergence of 35,000 hectare is created. Paithan is a religious place and home of Saint Eknath Maharaj (1533–1599 A.D), after whom the wetland is named. The catchment area of this reservoir is spread over 21,750 sq. kms.

Details of Nathsagar Wetland

No.	Particulars	Area
1.	Total Area of water reservoir (submergence)	35,000 hectare
2.	Catchment area	21,750 sq. kms.
3.	Source of water	River Godavari
4.	Latitude	19°, 26', 2"
5.	Longitude	75°, 26', 2"
6.	Gross storage capacity	2850 mm ³
7.	Controlling level of dam	463.90 m

No.	Particulars	Area
8.	Maximum height of Dam	37 m
9.	Depth (Range)	1 to 30 meters
10.	Backwater spread (In Aurangabad and Ahmednagar Districts)	about 40 km ² .
11.	Hydroelectric plant (Reversible turbine system)	12 mega watts.

Climate : Climate of Aurangabad and Ahmednagar Districts is characterised by hot summer and dryness throughout the year except for the period of South-West monsoon.

Seasons : There are four main seasons in the year.

1)	Cold season	December to February	7°C to 19°C
2)	Hot season	March to May	32°C to 42°C
3)	Monsoon	June to September	22°C to 28°C (580 to 725 mm rainfall)
4)	Post monsoon	October to November	23°C to 32°C

Humidity : Except during the South-West monsoon, when relative humidity are high, the air is generally dry over the area. In summer relative humidity may fall to 20%.

Wind : Winds are generally light to moderate with increase of speed during later half of hot season and in the monsoon. The wind-blow predominantly is from directions of West and North during the hot season. They are mostly from directions between South-West and North-West during the monsoon. For the rest of the year they blow between North-East and South-West directions.

Flora : The main forest type corresponds to group A *i.e.*, Southern Tropical Dry Deciduous Forest (Champion and Seth, 1968). Along the bank of reservoir, *Accaia arebica* and *Accaia nilocita* are the dominant trees, while *Ipomaea* species has proliferated as weed. Seasonal occurrence of short grasses during rains is observed. They dry up soon. The area under the reservoir has fluctuating water level. In summer, area along the banks gets exposed. It involves deposition of salt in dry loam-black soil which is unsuitable for vegetation. Farmers from the rehabilitated villages tempt to cultivate few patches along the banks.

Socio-economic importance : "Nathsagar" wetland was constructed with dual purpose 1. Providing water for Irrigation and 2. Support the population of Aurangabad city for drinking water and water for Industrial needs. The command area under irrigation is spread over in 6 districts mentioned below :

IRIGATION BY THE WETLAND (in Hectares)

No.	District	Paithan Left canal	Paithan Right canal	Majalgaon Right canal	Total
1.	Aurangabad	7,600	1,700	–	9,300
2.	Jalna	36,300	–	–	36,300
3.	Parbhani	98,100	–	58,500	1,56,600
4.	Ahmednagar	–	1,700	–	1,700
5.	Beed	–	38,600	28,300	66,900
6.	Nanded	–	–	7,200	7,200
	Total	1,42,000	42,000	94,000	2,78,000

Network of canals in the command area has changed the agricultural pattern and shift to cash crops. Irrigation facilities enabled the farmers to take cash crops like sugarcane or to cultivate fruit trees over large areas.

Industrial development in Aurangabad is almost totally dependent on water from Nathasagar wetland. Closed pipes bring water to the city. Municipal Corporation of Aurangabad is almost totally dependent on water from this project.

Cattle and other livestock in the villages along the bank of the reservoir also utilize water. Residual artificial manure and pesticides are deposited from the agricultural fields in the catchment area. This has rendered the quality of water in reservoir to 'moderate' level. People bathing in this water complain of getting rash on the body. As the reservoir is rain fed and water is utilized, level of pollutants and salts remains almost constant. Systematic utilization of this water body for fisheries may be beneficial.

Electricity : At the base of the dam, 12 Mega Watt Hydroelectric station is setup. The turbines are reversible. In peak hours, they generate electricity and in the off period pump the water back to the reservoir.

Tourism : Just in the down stream of the Nathasagar Wetland, a beautiful garden is developed. This garden and a small museum are attraction for tourists.

Jaikwadi Bird sanctuary : Back water of Nathasagar Reservoir attracts several birds species, both residents and migratory. As many as 150 bird species were recorded (Vyavahare and Kulkarni, 1986). The reservoir offers shallow bank spread over about 400 to 500 kms. Government of Maharashtra has notified the area of Jaikwadi Reservoir as Bird Sanctuary in November, 1986. The total area of this sanctuary is 314.05 sq. kms. and approximates only to the area of Full Reservoir Level (FRL) of the water body. However, water seldom reaches the FRL.

Collecting stations during the present survey : Faunistic survey of Nathsagar Wetland, was undertaken from 1997–2000. A total of 12 surveys were conducted to collect faunal samples. Observations alone were recorded for higher groups, like Birds, Reptiles and Mammals. Water samples were worked out for physico-chemical parameters and plankton contents. Those were taken from 8 collection stations viz. 1. Sagardarshan, 2. Bramhagavan, 3. Shevta, 4. Sawkheda, 5. Lakhephal, 6. Kaigaon, 7. Dahigaon NE and 8. Ramdoh, fixed at the right and the left bank of the reservoir.

Resume of Faunal Composition of the Wetland : Results of the faunistic surveys are summarized in the table given below :

FAUNAL DIVERSITY OF NATHSAGAR WETLAND

Group	Order	Sub-Order	Family	Sub-Family	Genera	Species	Sub-Species
Mammalia	3	1	8	8	9	10	7
Aves (Aquatic)	9	–	20	–	56	81	–
Reptilia	3	2	9	–	13	13	4
Amphibia	1	–	3	–	6	7	–
Pisces	7	–	12	5	22	32	–
Mollusca	4	–	9	3	12	27	–
Crustacea :							
-Ostracoda	–	1	4	4	16	38	–
-Cladocera	1	–	6	2	21	39	–
-Copepoda	1	–	2	–	4	4	–
Insecta :							
-Odonata	1	2	3	8	11	13	–
-Aq., Semi Aq. Hemiptera	1	1	4	–	6	9	–
Rotifera	1	–	3	–	10	22	–
Total No. of Species and Subspecies						316	

Information on 316 species is recorded in this volume. It is hoped that remaining collection for other groups will be worked out at a later date.

ACKNOWLEDGEMENTS

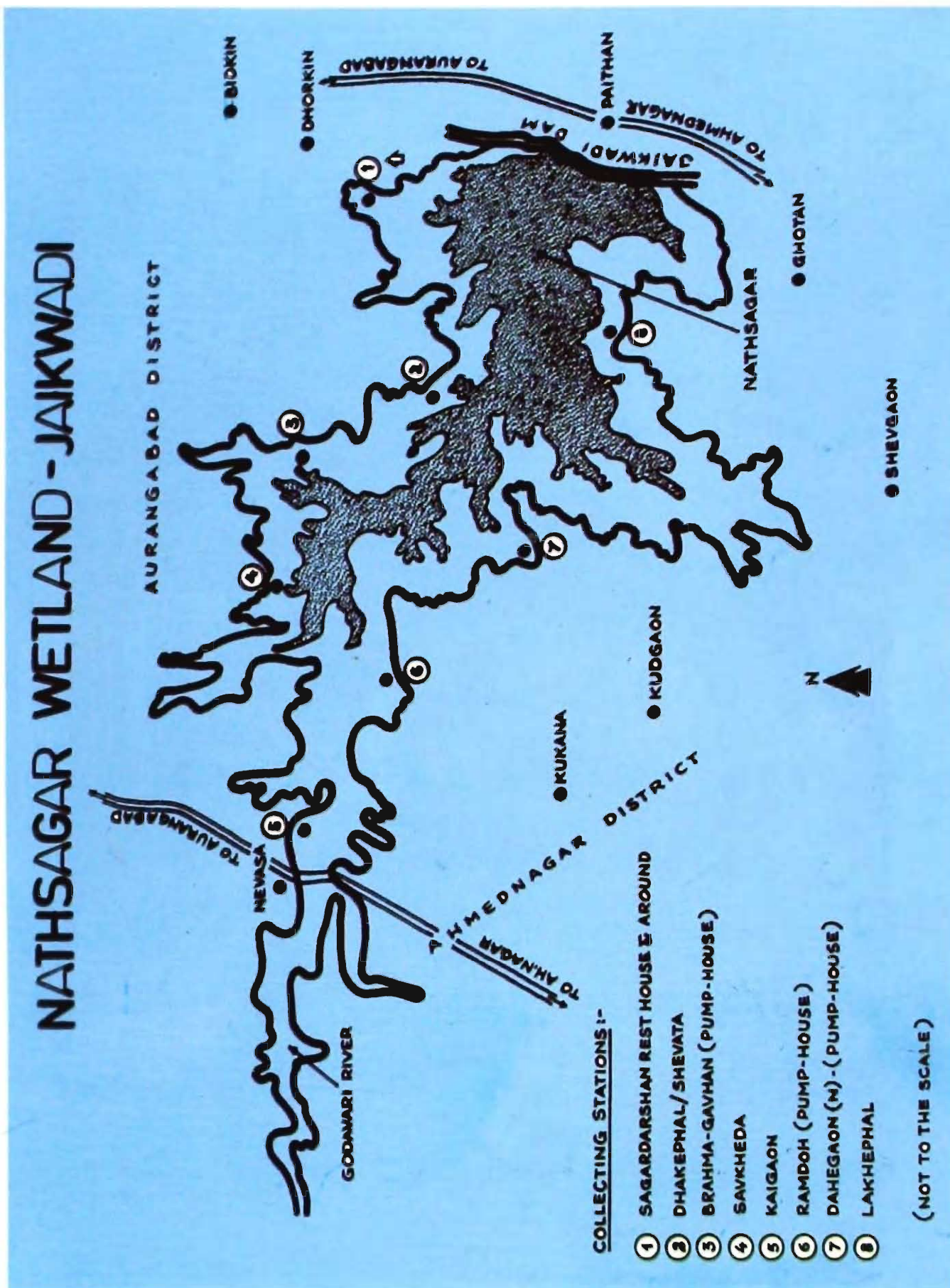
I am grateful to Dr. J.R.B. Alfred, Director, Zoological Survey of India, Kolkata for providing all the facilities for work and his constant encouragement in completing the project on Fauna of Nathsagar Wetland. I desire to express my sincere thanks to all members of the survey teams

who painstakingly collected the samples, and made them available for further studies. Contribution by the experts and authors of the chapters on different groups of fauna is gratefully acknowledged.

I am thankful to the Chief Wildlife Warden and Chief Conservator of Forests, Govt. of Maharashtra, Nagpur, for his cooperation in providing permission to conduct surveys and collect the faunal samples required for the studies. The authorities and staff of the Maharashtra State Forest Department and Irrigation Department, Aurangabad are acknowledged for providing facilities for survey.

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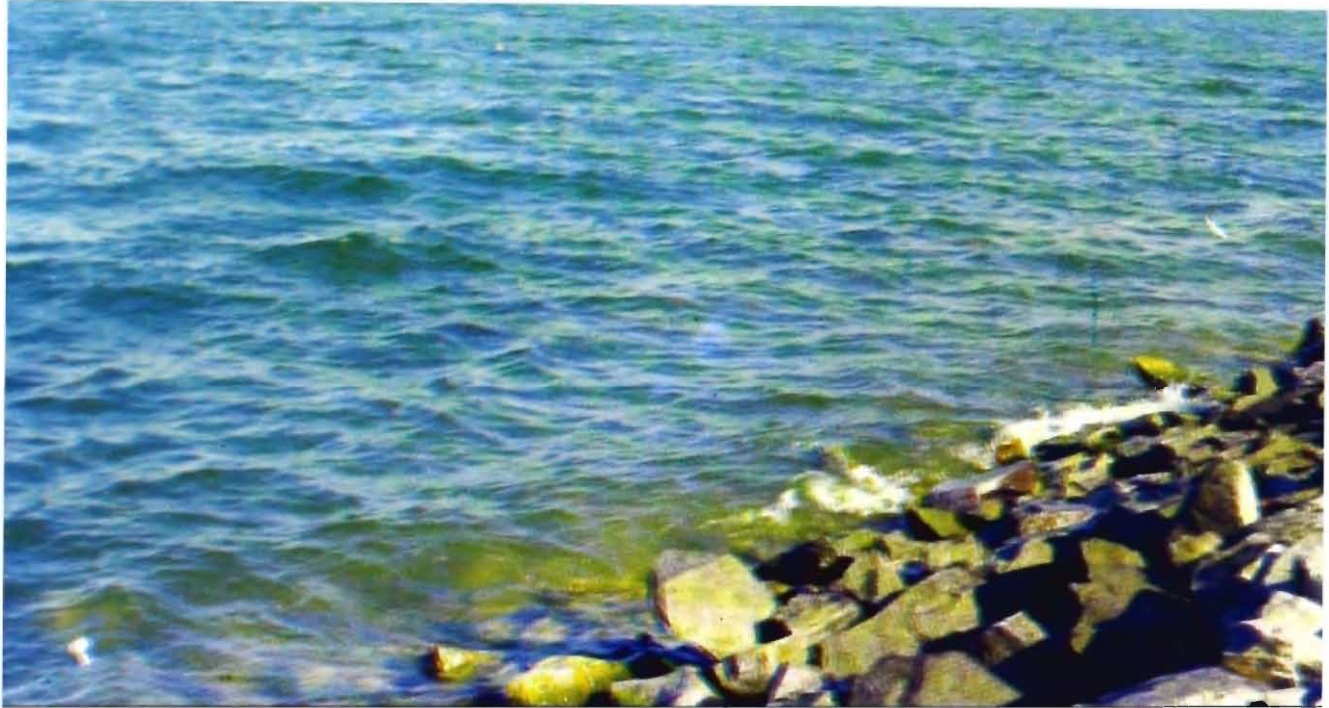
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Entrance gate of Jaikwadi Project (Nathsagar)

MAHABAL : *An Overview*



Panaromic view Jaikwadi Project (Nathsagar)



View of backwaters of Godavari river on which Jaikwadi dam has been constructed



A bridge on Godavari river near Jalkwadi Project



Muddy and sandy areas on the back of Nathsagar wetland

MAHABAL : *An Overview*



Aquatic weeds and marsh of habitat near Kalgaon



Grassy and marshy habitat of wetland near Ramdoh



Pumping station on the bank of wetland



Crabs near Lakhephal area

MAHABAL : *An Overview*



Congregation of molluscs (*Thiara* sp.) on the bank of wetland



Close-up view of molluscs (*Thiara* sp.)



Bivalves, gastropods on sandy habitat at Shewta



A dragonfly (Odonata) near Dahegaon (N)

MAHABAL : An Overview



Fish collection by operating caste net near Shewta



Various species of Fishes collected from wetland area



A flock of Flemings of Lakhephal

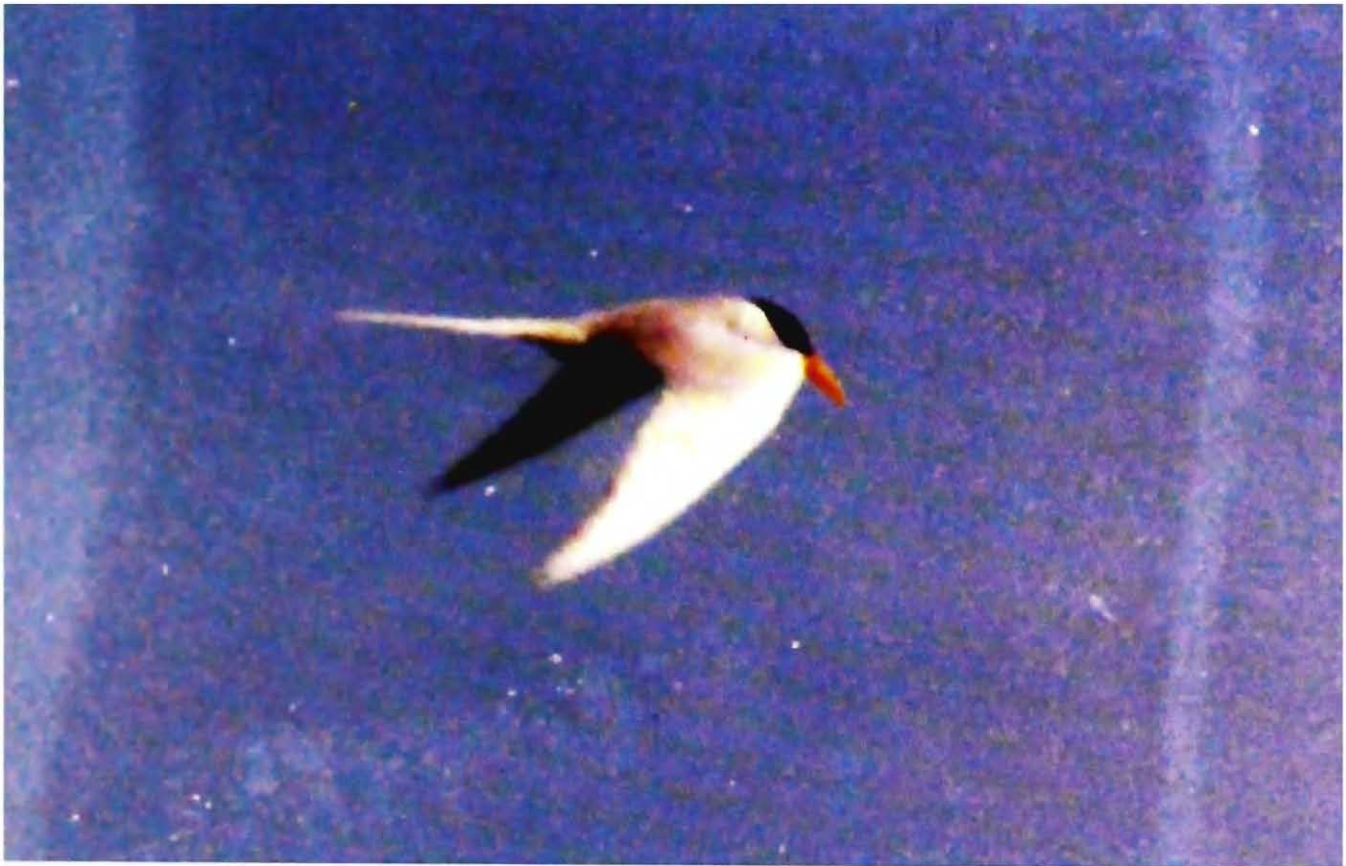


Congregation of Black Ibis, migratory birds and Red wattle Lapwings. On a small Island near Ramdoh

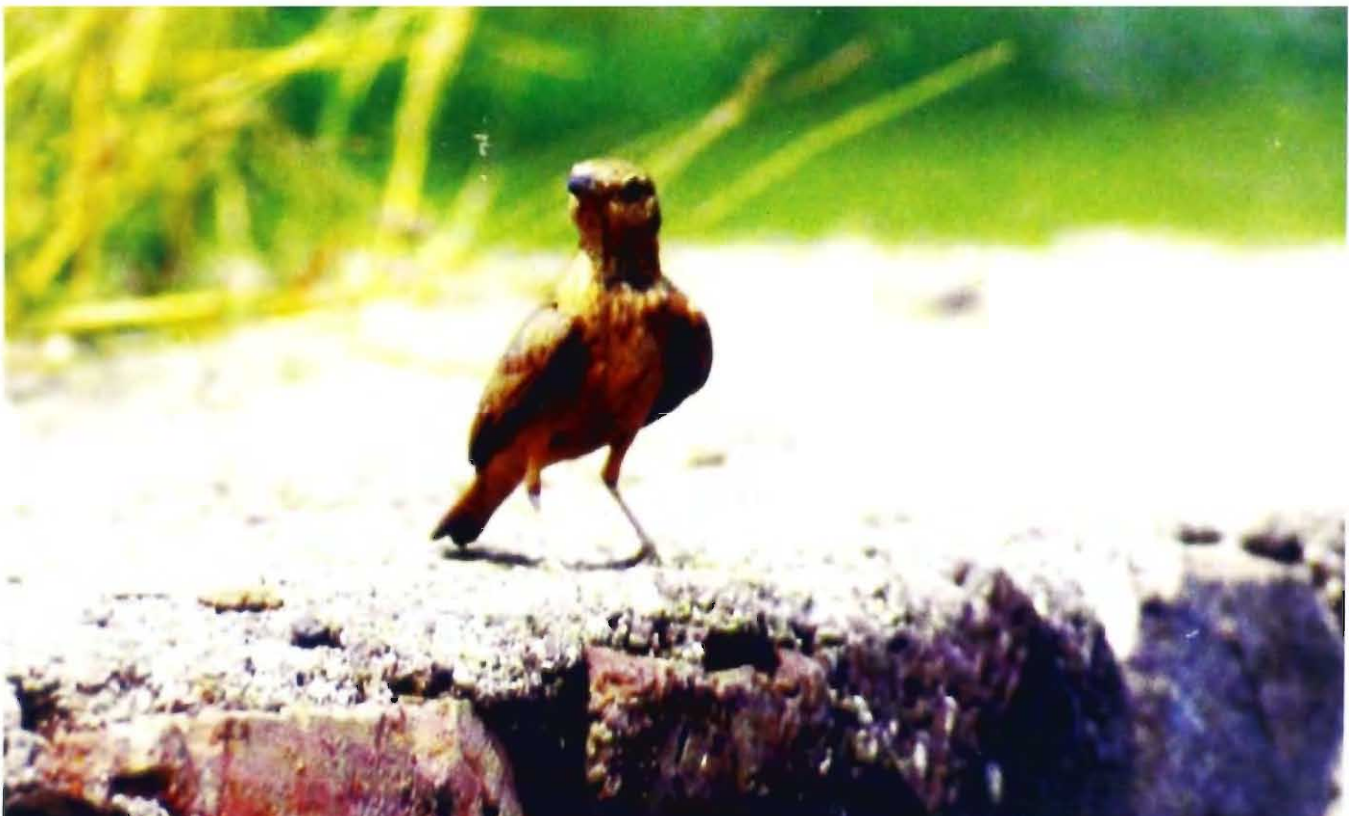


A winter migratory Rosy Pastor on *Butea* tree near Kedgaon

MAHABAL : *An Overview*



A Black headed Gull at Brahma Gavhan



Rufous tailed Finch Lark at Dakephal



A flock of Green Bee-eaters near Dahegaon (N)



Pugmark of a predatory mammal at Ramdoh

HYDROBIOLOGICAL INVESTIGATIONS

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INTRODUCTION

Extensive work on hydrobiology of freshwater bodies of some regions in India have been carried out by number of workers. Mention must be made of some of the important contributions being those of (Ganapati (1940), Alikunhi, *et. al.*, (1955), Das and Srivastava (1956), George (1962, 63), Munawar (1970), Patil (1976), Patil and Panda (1996, 97, 2003), Patil *et. al.*, (1985). In the last decades number of workers published account on the wetland like Prasad (1995), Venkatraman *et. al.*, (2002), Alfred and Nandi (2002) and Patil (2002a, 2002b). Work on the waterbodies of Aurangabad and around by Gautam (1982), Ahmad (1990), Shayertehfar (1990) and Pathak (1999) for their Ph.D., thesis is useful information for this region. Recently, Mussadiq (2000) published papers on ecology & pollution aspects of two perennial waterbodies of Maharashtra.

However, these studies were not focused on details of hydrobiology and biodiversity in plankton in wetlands of Maharashtra. It was with these objectives the present investigation was undertaken from Sept., 1997 to April, 2000 on a freshwater manmade wetland called as Nathsagar (Jayakwadi) with the view to determine variations in various abiotic and biotic factors of this wetland which will provide an idea of basic data in order to formulate various measures for the use of water. The main objective was to prepare a inventory of fauna of this wetland. This was assigned project of Zoological Survey of India, Western Regional Station, Pune to achieve the above objectives. Thus three years hydro-biological work was carried out and the results of the investigations is summarised below. The wetland was visited quarterly and the sampling were made at eight sampling stations as shown in the map (Fig. 1). The water was also collected from surface and the bottom of the reservoir.

Habitat exhibiting many features of the aquatic and terrestrial ecosystems is called as wetland. The wetland is also recognized as an ecosystem where biotic community undergoes changes with time, from aquatic to marshy to mesophytic types which provides proper niches for fishes, residential and migratory birds. Wetland is also a source of food, fodder and other important biological products. The species richness in wetland is very high as it provides good habitat to many invertebrates, macrophytes and vertebrates. The main character of any wetland system

comprises are (a) Physico-chemical factors which determine the type of wetland, (b) Vegetation, (c) Substrate, (d) Decomposer and (e) Biota and wildlife around the water if any. The definition of wetland is that the wetland are lands of transition between terrestrial and aquatic ecosystems wherein the water table is usually at or near the surface of the land which is covered by shallow water.

There are many wetlands in the list of Maharashtra. The present wetland is the best manmade wetland on river Godavari constructed mainly for irrigation purpose in Aurangabad district. Realising the importance of conservation and management of wetland the present investigations were carried out. The following physico-chemical factors viz. dissolved oxygen, carbondioxide, CO_3 , HCO_3 , total alkalinity, chloride, hardness due to calcium and magnesium, Orthophosphate, and nitrate were analyzed. Quarterly this wetland was visited for collecting of water and plankton samples. (Tables 1-8n & Figs 2-9).

GENERAL ACCOUNT AND DESCRIPTION OF WETLAND

The present wetland is situated 40 kms. south of Aurangabad at Paithan. Fig. 1 This town is situated on the right bank of river Godavari and is in latitude $19^{\circ}9'19''$ north and longitude $75^{\circ}26'2''$ east. The name itself shows Pratisthan or Capital city. Today Paithan attains importance through the important pilgrimage of Sant Eknath Maharaj. In this river Godavari, the ashes of dead bodies are brought for ritual performance.

At the base of the dam, 12 mega watt generating capacity hydro-electric plant is set up and the tubrines are reversible. Pisciculture is being developed to yield huge fish catches regularly from this waterbody. The dam water serves a perennial source to the entire population of Aurangabad city. Various industries are settled in and around Aurangabad.

Jaikwadi Bird Sanctuary

Back water of Jaikwadi Dam "Nathsagar" has attracted a number of birds both resident and migratory. As per the criteria set in the Ramsar convention this waterbody holds migratory birds from all over the globe and their number exceeds 10000. Migratory birds have been on record from Jaikwadi area as back as from 1976. In the year 1989 as many as 150 species of birds were recorded.

Government of Maharashtra declared in November 1986 the area of Jaikwadi Reservoir as a bird sanctuary as per wildlife protection act 1972. The Deputy Conservator of Forests and Regional Forest Officer stationed at Aurangabad hold the charge of this wetland. The total area of this bird sanctuary is 314.05 sq. kms. which is approximates only to the full reservoir level of the water body. The area of the wetland is not completely filled up due to less rain.

The water catchment area is 21,750 sq. kms. with depth ranging from 1 metres to 30 metres. The shoreline of backwater is wavy. It is clear that the dam was constructed by displacing some

nearby villages (which are submerged). The main town like Aurangabad, Paithan and Shevgaon are on the way and near to the dam site.

The detail map is given in the end and the morphometric features are also given in the table as follows :

1. Total area of water reservoir (Submerged)	35000 hectares
2. Catchment area	21750 sq/km.
3. Source of water	River Godavari.
4. Latitude	19°39'19"
5. Longitude	75°26'2"
6. Gross Storage capacity	2909 M ³
7. Controlling level of the dam	463.50 M
8. Maximum height of the dam above the lowest point of foundation	37 metres.

Wetland is partially polluted by domestic sewage besides washing and bathing purposes. A small locality called as "Kayegaon" is also adjacent to this dam on Pune Aurangabad road where two rivers Godavari and Pravara join each other.

Climate of Aurangabad district is characterised by hot summer and general dryness throughout the year except during south east monsoon. The year may be divided into four seasons. Cold season from December to February is followed by the hot season from March to May. The period of June to September generally monsoon showed its occurrence. October and November forms the post monsoon season.

Average rainfall at Aurangabad is recorded 725 mm. (28.57) and for Ahmadnagar district it is about 578 mm. (22.79). The variations in the annual rainfall from year to year is very large. December is the coldest month and there is a rapid rise in the both day and night temperatures and in May it touches to highest. There is a record of rise of daily temperature to 45°C to 46°C also. Winds are generally moderate with increase in speed during the later half of the hot seasons and in monsoon season.

The main forest type corresponds to Group A. A Southern Indian Tropical dry deciduous Forests. The bird fauna of this wetland is quite rich. Several birds were seen during this survey.

The list of fishes and mollusca appearing in the reservoir will be given separately for this wetland.

In all eight sampling stations were selected for the present study they are as follows :

- | | |
|-----------------|-------------------|
| 1. Sagardarshan | 5. Lakhephal |
| 2. Bramhagavan | 6. Dahegaon NE |
| 3. Shevta | 7. Kayegaon phata |
| 4. Savkheda | 8. Ramdoh |

1. Sagardarshan : This station is near the Sagardarshan Rest House and is good for collection of water and plankton samples and also for primary productivity study. The water level showed fluctuation near this station. Number of Mollusca were collected from the bank of this station. This station is near to Dam wall.

2. Bramhagavan : It is entirely different from other stations. A small pumping station is seen near to this station. Here boats of thermocol are also available for fishing and aquatic collection. Aquatic vegetation are seen along the bank of this station viz., *Hydrilla*, *Ceratophyllum*, *Lemna* and *Eichhornia crassipes*. Mollusca, Pisces and plankton were the main aquatic collection. Considerable amount of agricultural run off comes in the water from the nearby agricultural land.

3. Shevata : Collection of water and plankton samples were made from this station. It was difficult to take samples due to muddy bank. This spot is always disturbed by villagers since most of the irrigation pumps are fixed on the bank of this station.

4. Savkheda : This station was always difficult to survey since the road is muddy and due to rain it is not possible for the vehicle to reach near this station. However after a walk for 3 kms. one can collect samples. Aquatic vegetation is abundant here, vast area near this station is found under irrigation.

5. Lakhephal : This station is situated on the way to Shevgaon from Paithan where a small town called Ghotan is located, it is near about 8 kms. from Ghotan. Here regular fishing is done by the fisherman. Fig 1.

6. Dehigaon NE : This station can be approached at all the seasons by a tar road. Here water from the wetland is pumped in the field for sugarcane cultivation. Aquatic birds are seen at this station. Here the water samples were taken from the deeper layer of water for physico chemical analysis. The aquatic macrophyte showed predominance at this spot. Collection of Crustacea, fishes and aquatic insects were made near the station. Water and plankton samples were also collected for quantitative and qualitative study.

7. Kayegaon phata : A good sampling station for collection. This station receives considerable amount of dead body ashes which increase pollution in this wetland. Here water is supplied for irrigation. The location of this station is given in Map. A bridge connecting Nagar to Aurangabad is seen on this river near the backwater of the dam. A temple of lord "Shiv" is also located on the bank of this station.

8. Ramdoh : Ramdoh is again difficult station to survey during rainy season due to bad condition of the road. Large amount of agricultural run off enters here in the wetland. Pumping station for irrigation is also seen nearby to this station. Large amount of cow dung enters at this station.

METHOD OF SAMPLING

Water and plankton samples were collected from each station. Water samples were collected by dipping a wide mouth bottle just below the surface of water at a slightly inclined position to avoid bubbling of air and were immediately brought to the field laboratory for chemical analysis which was completed soon. For the estimation of dissolved oxygen water samples were taken in three hundred narrow mouth bottles having a glass stopper and oxygen was estimated as per modified wrinkler method and in the lab by D.O. meter. The physical factors recorded includes temperature, visibility, pH, depth and the chemical factors recorded were dissolved oxygen, free carbondioxide carbonate, bicarbonate, chloride, total hardness due to calcium and magnesium, ammoniacal nitrogen and phosphate. All these factors were estimated as per standard method (APHA 1997) in the laboratory at Western Regional Station, Pune.

Plankton : Plankton samples were collected with the help of conical plankton net of Nylon satin cloth of 200 mesh. per square centimetre to which a rimless test tube was attached at the bottom. Plankton samples were collected by towing the net through surface layer of water. For quantitative analysis live organism were examined. Plankton samples obtained by filtering 40 litres of water through the net for quantitative study. The plankton concentration were preserved in 5% formaldehyde.

The quantitative estimation of plankton for zooplankton and phytoplankton was made with the help of Sedgwick Rafter Cell and by Drop Method respectively. On an average three counts were made for each sample and the main concentration were calculated for zoo and phytoplankton forms. From this data the total count was calculated and various plankters were considered as units of organisms/litre of water.

Climatic condition of Jayakwadi : The temperature fluctuation between surface and bottom water was only 2°C to 3°C. The visibility of water was more at Sagardarshan indicating clear water whereas it was less in other station showing more turbidity due to domestic waste and also planktonic algae. pH was between 6-8. Free carbondioxide was observed at many places where as carbonates availability was nil at certain places of the waterbody.

Chloride contents in the water was in the admissible limit except Bramhagavan, Savkheda and Ramdoh and Lakhephal. High chloride content indicates pollution. It was noticed that the total hardness of water was generally high. Dissolved oxygen content in the water at all the stations were always above 4 mg/litre. A decrease in the D.O. content at the bottom layer of water was observed. Complete anaerobic condition was not seen except one study but the result of summer season may show this type of tendency in the present reservoir. The verticle profile revealed typical clinograde curve. On the basis of abundance of blue green algae (Cyanophyceae), This wetland can be classified as mesotrophic water system.

Aquatic Vegetation : Aquatic weeds are dominant in this wetland and they are problematic in tropical and subtropical countries where warm water and irrigation project favour their growth Patil (2003). At present over abundance of these weeds have been noticed. They are also important in food web, in ecosystem since they provide support, shelter and oxygen to other organisms and play an important role in biological production.

Names of plants :

<i>Jussiaea repens</i> Linnaeus	MA
<i>Ipomea aquatica</i> Forsk	MA
<i>Ipomea</i> sp.	MA
<i>Hydrilla verticillata</i> Route	RS
<i>Vallisneria spiralis</i> Linnaeus	RS
<i>Otella olismoides</i> Pers	RS
<i>Lemna minor</i> Linnaeus	FF
<i>Potomogenton indicus</i> Roxb.	RS
<i>Najas indica</i> Cham	RS
<i>Azola pinnata</i> Roxb.	FF
<i>Ceratophyllum demersum</i> Linnaeus	RS
<i>Eichhornia crassipes</i> (Mark)	FF

MA : Marshy Amphibious, RS : Rooted submerged, FF : Free floating.

OBSERVATION & RESULTS

Temperature : Temperature of water (Tables 1–8) was lowest in month February, 99, January, 2000 and December, 99 and the maximum temperature was recorded in the month of October and July at all the stations and thereafter temperature falls down till the month of February. The maximum temperature was 30.5°C and the minimum 17.5°C.

pH : pH of the water was generally above 5.7 and the range was between 5.7 to 8.2. The maximum pH value was recorded in the month of October, 1999 and the minimum was recorded in the month of April, 2000 at Dehigaon NE. The fluctuations in pH was in the range of 2.5. There was steep rise in pH till it reaches the maximum value of 8.2. The water of present wetland is good for fish rearing. Tables 1-8.

Turbidity : Sacchi disc. is used for transparency and it was visible upto 1 metre at various stations except in monsoon.

Free Carbondioxide : Free Carbondioxide was detected in the water throughout the period of investigation except in few months it was absent at all the stations. The maximum carbondioxide of 42 mg/litre was estimated in the month of July, 98 at Savkheda and the minimum of 0 mg/litre was noticed at many times at all the stations.

Biocarbonate and Carbonate : Biocarbonate content of the water was always below 250 mg/litre and the lowest was recorded 140 mg/litre in Jan., 2000 at Shevta. The carbonate alkalinity showed wide fluctuation and the range of fluctuation was 0-90 mg/litre. The maximum biocarbonate content in the water was found in the month of July, 98 and the value was 250 mg/litre at Bramhagavan.

Hardness : The hardness content of the water showed wide variations and the fluctuations was 118 mg/litre. The maximum hardness value of 220 mg/litre was observed in the month of Sept., 97 at Savkheda and the minimum of 102 mg/litre was noticed in the month of Sept 97 at Sagardarshan.

Dissolved Oxygen : Dissolved oxygen of the water was always above 4 mg/litre and the range of fluctuation was 4.0 to 8.2. The maximum dissolved oxygen content of the water was seen in the month of Nov., 98 the value was 8.2 mg/litre at Savkheda, minimum value 4 mg/litre was observed in the month of July, 98 at Savkheda. Tables 1-8 & Figs 2-9.

Orthophosphate : Maximum phosphate content was 0.8 mg/litre in the month of Sept., 97 at Dahigaon NE, however, lowest values were noticed in the month of April, 99 at Sagardarshan.

Nitrates ; Ammonical Nitrogen : Nitrates values were quite high and the range was 0.02 mg/litre to 0.8 mg/litre at Sagardarshan in Jan., 2000. The maximum value was reported in the month of Jan., 2000 and the minimum value of nitrate was noticed in the month of March, 98 at Lakhephal and Ramdoh.

Chloride : Maximum Chloride content of the water was 142 mg/litre in the month of Sept., 97 at Dahigaon NE and the range was between 40 to 142 mg/litre. The lowest value of chloride content of the water was 40 mg/litre and this value was observed in the month of April, 99 at Sagardarshan.

Temperature : The minimum and maximum temperature of air was in the range of 20 to 32.2°C. The maximum was noticed in the month of October, 99 and the Minimum in December and February.

Thermal stratification : During November the difference of temperature of bottom water and surface water was 2 to 3°C in the afternoon samples. This means the tank is not homothermal and circulation takes place in nocturnal cooling every day indicating well marked temporary thermal stratification for short duration, but in other two seasons of the year the difference is negligible that means there is not persistent thermal stratification like classified temperate lake. Similar type of conclusion have been reported earlier (Jayangouder, 1968) for Nimeta water works.

From the 3 year collected data, it is evident that the abiotic and biotic characteristic of the water of Nathsagar are such that the water of this reservoir does not require any special treatment

for irrigation purpose. However, it is most essential to keep it free from the pollution creating activities of the visitors coming for recreation, picnics from the nearby villages in order to save the reservoir for drinking water purposes in future.

The presence of Clinograde type of oxygen curve is observed in this reservoir that there is not always enough dissolved oxygen in the bottom layers and many time anoxic condition persist Table 8A.

Zooplankton : The zooplankton of the wetland was composed of Rotifers, Cladocera, Copepoda and Crustacean larvae. The different planktonic forms recorded and their qualitative variations is given in list. 43 species of zooplankton were recorded. 22 species of Rotifera, 14 species of Cladocera, 4 Copepods and 3 Ostracods were recorded in the present investigation. Nauplii larvae and copepodid stages were also seen during the sample study and are counted alongwith the zooplankton. (Tables 9 & 11) & (figs 10-15).

Total Annual average % composition of Zooplankton during the different years is given below :

Group	Years			
	1997	1998	1999	2000
Rotifera	41.91	42.62	48.53	48.30
Cladocera	32.59	33.89	29.76	31.13
Copepoda	21.43	22.51	21.42	19.69
Ostracoda	3.96	0.8	0.23	0.88

From the above table, it is clear that the Rotifera was dominant group followed by cladocera, copepoda and ostracods.

Rotifers : This group was almost 50% in the samples *Brachionus calyciflonus*, *B. angularis*, *B. caudatus*, *Filinia*, sp. *Keratella* sp. were the dominant forms in this wetland. The seasonal percentage composition of various group of zooplankton station wise is given in the (Table 9). The maximum of Rotifera was observed 71.81 during the month of Dec., 97 at Station Shevata and the minimum was observed at (26.04%) at Bramhagavan in July, 98.

Cladocera : This was the second largest group observed in the samples dominated by genera *Moina*, *Simocephalus*, *Diaphanosoma* and *Chydorus*. The maximum of 53.33% was observed in the month of Dec., 97 at Bramhagavan and the minimum number % of Cladocera were 18.48 and it was observed at Ramdoh in Jan., 2000.

Copepods : Copepods were third in the % composition represented by *Diaptomus*, *Cyclops*, *Arthocyclops* and nauplii larvae. The copepodids stages were counted with the adult copopods. Efforts were made to identify and place them in particular species of copepods.

Phytoplankton : Total Annual average % composition of Phytoplankton :

Group	Years			
	1997	1998	1999	2000
Myxophyceae	40.77	32.56	37.52	33.10
Chlorophyceae	25.59	38.08	34.91	38.43
Euglenophycene	0.54	0.18	0.09	0.04
Bacillariophyceae	33.17	30.15	27.45	28.43

The phytoplankton consists of Myxophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Myxophyceae and Chlorophyceae were the dominant groups followed by Bacillariophyceae and Euglenophyceae. The seasonal & annual variations is given in (Tables 10 & 12) Figs. 16-21.

The fish fauna was also well presented in the wetland. Every year lakhs of fry of following fishes were released in the wetland viz. *Catla catla*, *Labeo rohita*, *Cyprinus carpio*, *Cirrhina mrigala*, *Labeo rohita* besides other fishes were also present of previous stock. The details of fish fauna will be given separately.

DISCUSSION

Comparison of annual percentage composition of plankton of the wetland studied showed that the tank was rich in phytoplankton and the zooplankton was much more limited. The seasonal changes in the physico-chemical parameters and biotic factors of wetland water are inter-related and inter-dependent, however entries of some of the domestic waste in the nearby wetland area and rain water alters the chemistry of water. This view is further supported by Carter (1960) that in tropic, rainwater plays significant role in regulating biological rhythms. Fluctuations in quantity of nutrients were also observed by Subba Rao & Govind 1964, Adoni (1975) & Patil (1976). Same holds good in the present study.

The secchi transparency was low during summer and it was due to planktonic population while in rainy season it was low due to suspended matter brought in by land run off. The transparency was higher after the sedimentation of suspended particles. pH of water of wetland was ranged between 5.7 to 8.2. The maximum pH was recorded in July, 98 and minimum in April, 2000. The water of wetland is fit for rearing fish as suggested by Ali (1972).

Carbon dioxide was observed during the period of investigation and the range was 0 to 42 mg/litre. Carbonate, Bicarbonate and free CO₂ showed buffering capacity and plays important role in primary production and these three factors shows inter-relationship. Bicarbonate and CO₂

were found to be passive relations while Bicarbonate and Carbonate alkalinity exhibit inverse relations. Similarly it was reverse in case of Carbonate. The free carbondioxide is utilised from bicarbonate during carbon asimilation Patil *et. al.*, (1985), Chouresia & Adoni (1985).

The dissolved oxygen was maximum during winter season, this is because of higher solubility of oxygen at lower temperature. The lower values during summer were due to the higher catabolic rate of aquatic organisms, increase in decomposition and decrease in solubility of oxygen at higher temperature. But in the present investigations the D.O. values did not show any specific pattern. This is in contrast to Hussainy (1967).

In the present study it has been observed that the total hardness was always above 102 mg/L, which indicate that the wetland water is suitable for growth of organisms as pointed by Swingle (1962), Patil (2002) who pointed out that pond water having hardness more than 50 mg/Litre or above are suitable for growth of organisms.

The role of nutrients like phosphate and nitrate in metabolism have been important in eutrophication. The concentration of these nutrients increase after rain due to incoming land run off. At Ramdoh and Dahegaon NE, the lower values of nutrients are due to their utilization in microphytic growth. The specific conductivity of water ranged from 42 to 120 mohm. Ellis (1937) pointed out that for supporting fish population the conductence value should be in the vicinity of $150-500 \times 10^{-6}$ m.

The chloride content increased in rainy season and decreased in winter season and again increased during summer season. Increase in rainy season may be due to incoming organic water of human origin with rain water and in summer due to evaporation. The level of chloride content increase proportionately with pollution Bhatnagar (1984). The dissolved solid values were in the range of 14 to 78 mg/litre. All these abiotic factors reveal that the wetland is in moderate stage of eutrophications. Nevertheless nutrients like phosphate, nitrogen, chloride and alkalinity show the beginning of higher trophic state of wetland.

The zooplankton was composed of Rotifera, Cladocera, Copepoda and Ostracods. Comparison of the annual percentage composition of various group of zooplankton reveal that the rotifer was the dominant group. The rotifer were 41.91% in (1997), 42.62% in (1998), 48.43% (1999), 48.54% (2000) followed by cladocera, copepoda and ostracoda. Cladocera was ranged between 29.76–33.89% and copepoda was ranged from 19.69 to 22.51% and ostracod ranged from 0.23 to 3.16%. The present wetland is used for pisciculture and is stocked heavily with fish. Every year lakhs of carp fry are released into the wetland besides the fry of some fishes of previous stock are also present in the wetland. The forage activities of these large fish fauna is mainly responsible for the depleted number of cladocera and copepods. As given earlier every year fry of major carps like *Catla catla*, *Cirrhina mrigala*, *Labeo rohita*, and *Cyprinus carpio* are released in the tank. The reduced numbers of crustaceans may be due to feeding activities of these fishes. This was further

supported by Brooks & Dodson (1965) that when there is a choice the predator most consistently choose the largest food morsels available and this was further supported by Shetty *et al.*, (1962), Kalninya (1967).

During the period of investigation 22 species of Rotifers were recorded. The major pulse were observed in different months during the study. There was not any specific pattern for their peaks in the present wetland. only one pulse per year in the wetland. This is in contrast to summer periodicity as shown by Nayar, 1970, (Patil) and Singh (2002). Michael (1964) recorded 30 species from Barrackpore and Stated that six of them were dominant. In the present investigation the population of Rotifer were more and there are many opinions regarding this dominance of Rotifers. Balkhi *et al.*, (1984) pointed out that temperature and dissolved oxygen have their influence on abundance of rotifer. But in the present study they did not showed any specific relationship and the peaks were observed at different seasons and summer periodicity of rotifers was not observed in the present tank as shown by (Michael 1964 and Patil, 1976).

As such rotifers are well known for cosmopolitanism (Amren, 1964, Patil *et al.*, 1985). In the present study majority of the Rotifers are cosmopolitan and many of them were observed when the temperature were high, however cosmotropical species were also observed. Green (1972) pointed that *Branchinus* Genus is important in tropical region than temperate and northern area. The present study corroborate the view of Green (1972) and Patil (2003) since as may as six species of rotifers were observed in Nathagar. Green (1972) and Chengalath *et al.*, (1974) pointed out that genus *Northolca* remain complete absent in most of the tropical water and the same holds good in the present study.

No marked relationship was observed with DO, CO₂ and pH and the abundance of Rotifers as shown by Campbell (1941) and Balkhi *et al.*, (1984). The species of indicator of mesotrophic condition *Keratella valga* was present in this wetland. Leentawar (1980) attributed the presence of this species to water quality. The same hold good in the present investigation. In the present study *Keratella cochlearis* was found to be in the surface layers tolerating wide range of temperature. This is in conformity with the observation of Pejler (1957) and he further stated that this form is eurythermal. The cladoceran population was next to Rotifera and the maxima was observed in the month of Dec., 1997 (53.33%) at Bramhagan, 51.27% at Kayegoan phata in Jan., 2000. As many as 14 species of Cladocera were observed in the counting of plankton samples. However, in qualitative sample much more species were observed by our co-worker. *Moina micrura* was found to be dominant in the present wetland. The other common cladocera was *Diaphanosoma sarsi*, *Simocephalus vetulus*, *Chydorus sphaericus* & *Alona* spp. As said earlier the total Cladocera population were less and the reason might be due forage activities of the fish fry and their fingerlings and adult fishes.

The main peak of Cladocera was observed in Dec., 1997 and it was 53.33% and the second smaller peak in Jan., 2000 at Kayegaon. Gulati (1978) stated that if the food supply is high or

increasing, for a stretch of time Cladocera population becomes more. Generally the density of Cladocera is primarily determined by food supply but in the present study it is not true. The decline in Cladoceran or Copepod may be due to fish predators.

The diversity of Cladocera is related to vegetations like *Ceratophyllum*, *Hydrilla*, *Eichhornia* etc. This is in agreement with Shireman and Martin (1978), Patil (2002). Keen (1976) pointed that the chydorids Cladocera attain its original population size which was at the initiation of its study but this does not seem true in the present study.

The group Copepoda mainly consists of genera *Cyclops*, *Mesocyclops*, *Diaptomus* and nauplii larvae. They were found throughout the year of investigation except at few occasions, they were absent. The main peak was observed in the month of July 99, 1998 and it was 42.85% at Kayegaon phata. The availability of food affects fertility of females this indirectly affects birth rate and mortality of Zooplankton as shown by Edmondson (1965), Patil, (2003). Swar and Fernando (1980) pointed out that food is one of the vital factors which control zooplankton population. The present study corroborates their view.

Kow (1953) stated that the peaks of copepods and phytoplankton coincide each other but in the present study they exactly did not coincide but follow one another as said by Patil (1976, 2003).

The D.O. value was quite high since the phytoplankton was rich. This corroborates the view of Patil (2002) for Ujani wetland. The phytoplankton consists of Myxophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. The identification of various groups of algae were made up to generic level. In all 25 species of phytoplankton were seen of which 5 belong to Myxophyceae, 2 to Euglenophyceae, 11 to Chlorophyceae and 7 to bacillariophyceae. Myxophyceae was the dominant group and average annual percentage was 40.87% and this percentage is considerably higher thus the present wetland can be classified as Mesotrophic water system as shown by Patil (2002).

The percentage composition data of phytoplankton reveal that at all the eight sampling stations the Myxophyceae was the abundant group followed by Chlorophyceae, Bacillariophyceae and Euglenophyceae population. The algal species are well known as indicators of population and for classifying the trophic system and have been shown by Patil (1976), Patil *et. al.*, (1985). The maxima of Myxophyceae was observed in the month of July at station Savkheda, when the temperature was not high. This is in contrast to summer peaks as has been shown by Chu & Tiffany (1951). The total phytoplankton was much more when the pH and temperature were high as shown by Vyas & Kumar (1968) and Patil (2002). Chlorophyceae was second largest group in phytoplankton at the wetland and maximum percentage was 51.4 in November, 1998 at Kayegaon phata; 48.24% in Oct., 1999 at Lakhephal during winter seasons and these percentages were not high when temperature and pH was high, this is in contrast to the finding of Munawar (1970) and agrees with the findings of Kant and Anand (1978). Bacillariophyceae was the third largest group in phytoplankton and the maximum percentage of Bacillariophyceae was 50.38% in the month of

Nov., 1998 at station Lakhephal. This group was better presented, this is in agreement to George (1966) who pointed out diatom did not form major group in apparent numerical inferiority is related to food chain as stated by George (1963), he further stated that diatom are completely digested whereas blue green algae can appear again through alimentary canal without any harm, but in the present study we cannot be attributed to it since there is no experimental data. No wellmarked relationship was observed between nutrient like phosphate and ammonical N₂ to the blooms of and green algae and diatoms.

The Euglenophyceae was poorly represented and its occurrence was very irregular as stated by Patil (1976, 2002). The maximum percentage was 2.59 in the month of Sept., 1997 at Sagardarshan. It was absent at station Shevata and Kayegaon phata.

SECONDARY PRODUCTIVITY (ZOOPLANKTON)

List of zooplankton species of Wetland :

A. ROTIFERA

Rotaria sp.

Conochilus unicornis Rosselet

Filinia longiseta Ehrenberg

F. terminalis Plate

Keratella cochlearis Gosse

K. tropica Apstein

K. valga

Asplanchna intermedia Hudson

Asplanchna sp.

Trichocerca cylindrica Imhoff

Trichocerca sp.

Brachionus angularis Gosse

B. calyciflorus Wierzejski

B. caudatus Borrois & Dadey

B. forticula Wierzejski

B. quadridentata Hermann

B. urceolaris O.F. Muller

B. rubens Ehrenberg

Platyais patalus Wierzoski

Ephiphanes macrourus Barrois & Daday

Lecane (M) bulla Gosse

L. closterocerca Schmarda

B. CLADOCRA

- Diaphanosoma sarsi* Richard
Simocphalus vetulus Schlder
Scapholeheris kingi Sars
Moina micrura Jurine
Moina sp.
Ceriodaphnia cornuta Richard
Macrothrix spinosa King
Graptoberia testudinria
Chydorus sphaericus O.F. Muller
Chydorus raticulatus Daday
Chydorus spp.
Alona karua King
Alona rectangula Sars
Pleuroxus adunchus Jurine

C. COPEPODA

1. *Cyclops* sp.
2. *Ectocylops*
3. *Mesocyclops hyalinus* Rehberg
4. *Diaptomus* sp.

D. OSTRACODA

1. *Stenocypris* sp.
2. *Strandesia indica* Hartmann
3. *Cypretta globosa* Sars

List of Phytoplankton :

A. MYXOPHCEAE

1. *Anacystis*
2. *Oscillatoria*
3. *Spirulina*
4. *Anabaena*
5. *Nostoc*

B. CHLOROPHYCEAE

1. *Eudorina*
2. *Pandorina*
3. *Pediastrum*
4. *Closterium*
5. *Scenedesmius*

6. *Spirogyra*
7. *Cosmerium*
8. *Hydrodicton*
9. *Spirogyra*
10. *Volvox*
11. *Staurastrum*

C. EUGLENPHYCEAE

1. *Euglena*
2. *Phacus*

D. BACILLARIOPHYCEAE

1. *Cyclotella*
2. *Fragillaria*
3. *Pinnularia*
4. *Cymbella*
5. *Synedra*
6. *Navicula*
7. *Asterionella*

SUMMARY

Hydrobiology of freshwater wetland Nathsagar, Aurangabad dist., has been studied for about three years. Various physicochemical factors have been studied and some of these factors have been co-related and discussed with fauna and flora. The Clinograde type of oxygen curve was observed in the reservoir. Rotifers, Cladocerans, Copepods and Ostracoda were recorded during the three years study. The annual percentage composition of these different groups of zooplankton is given in the chart. Rotifer was the dominant group followed by Cladocera, Copepoda and Ostracods. Phytoplankton was represented by Myxophyceae, Euglenophyceae, Chlorophyceae and Bacillariophyceae. The annual percentage composition of various groups of plankton is given. Eighteen species of fishes were recorded in the tank but the annual average production is very low. The wetland at present is leased for rearing fishes and prawns to fisherman society. The wetland is Mesotrophic ecosystem. In all 43 species of zooplankton were seen while counting plankton samples. Their seasonal variations is given in the tables.

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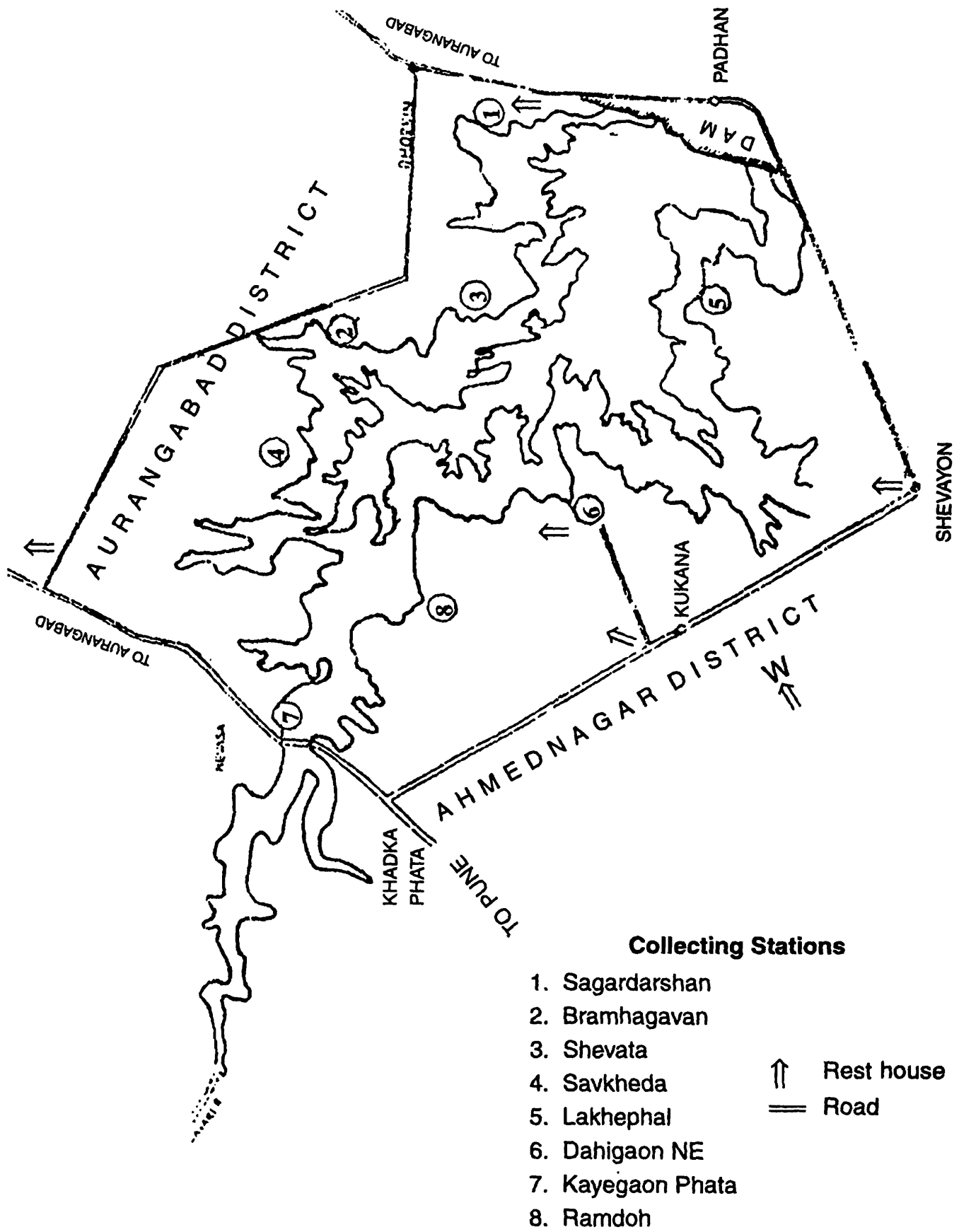


Fig. 1. : Nathasagar Wetland.

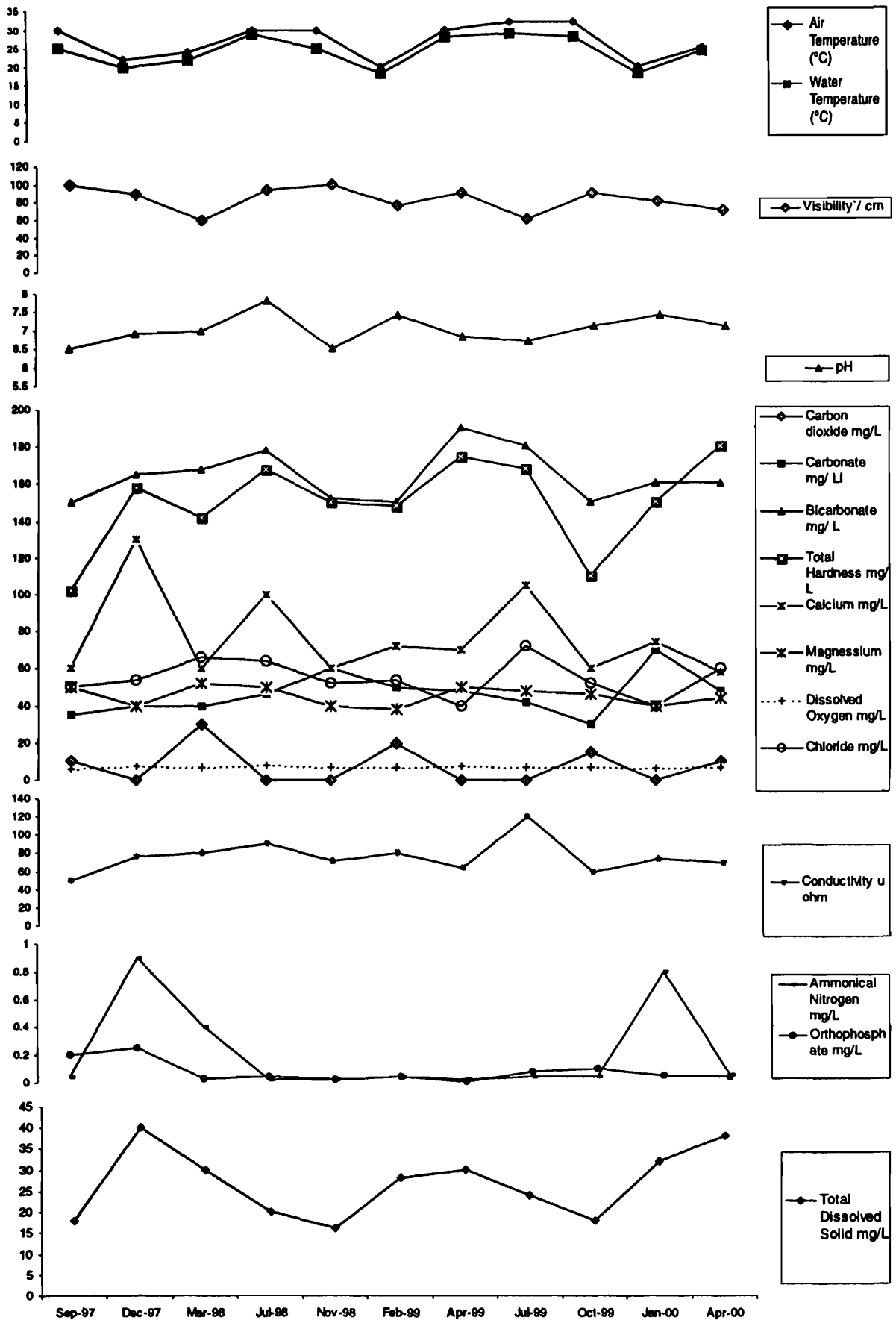


Fig. 2. : Graph showing seasonal variations in physicochemical characteristics at station No. 1 Sagardarshan.

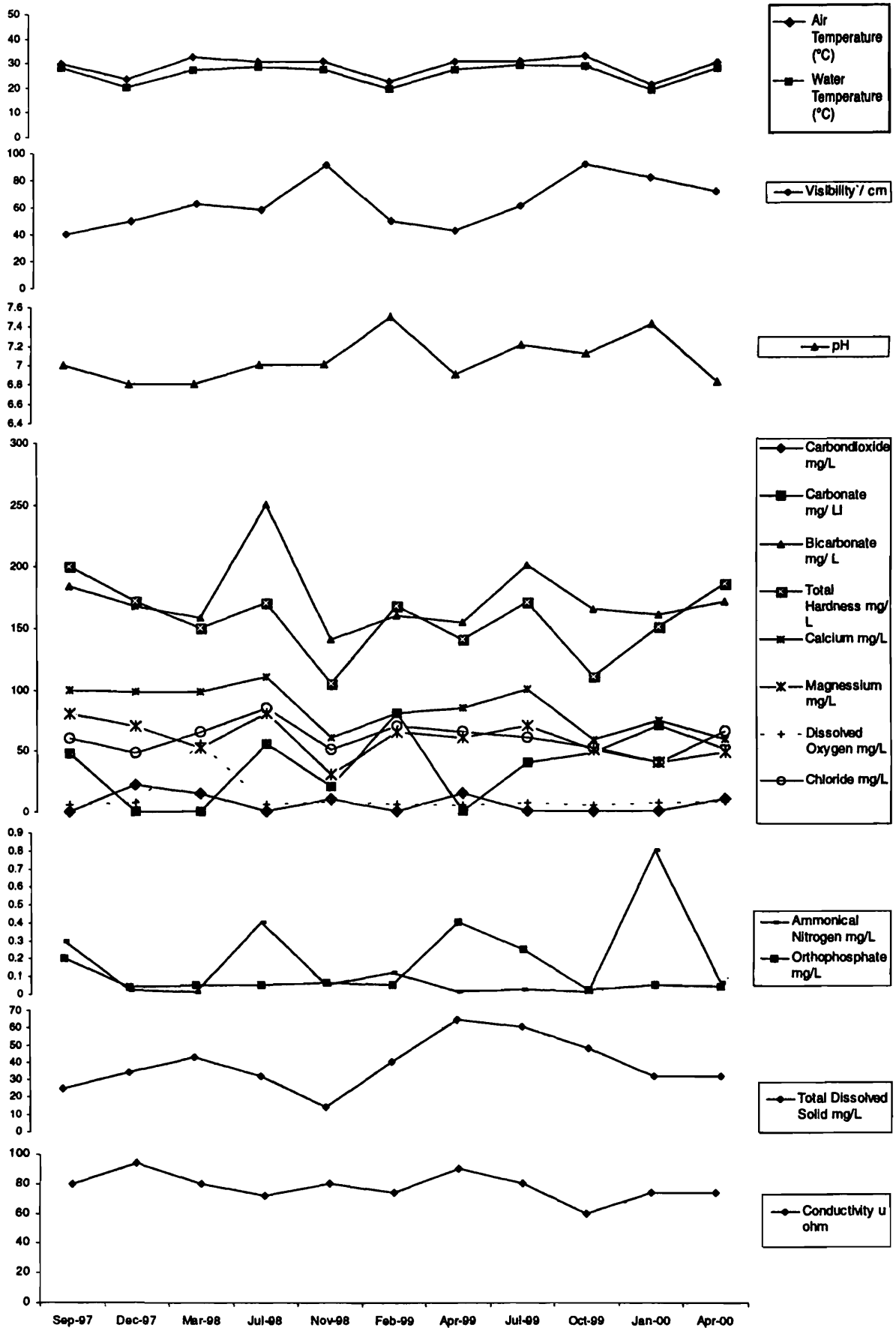


Fig. 3. : Graph showing seasonal variations in physicochemical characteristics at station No. 2 Bramhagavan.

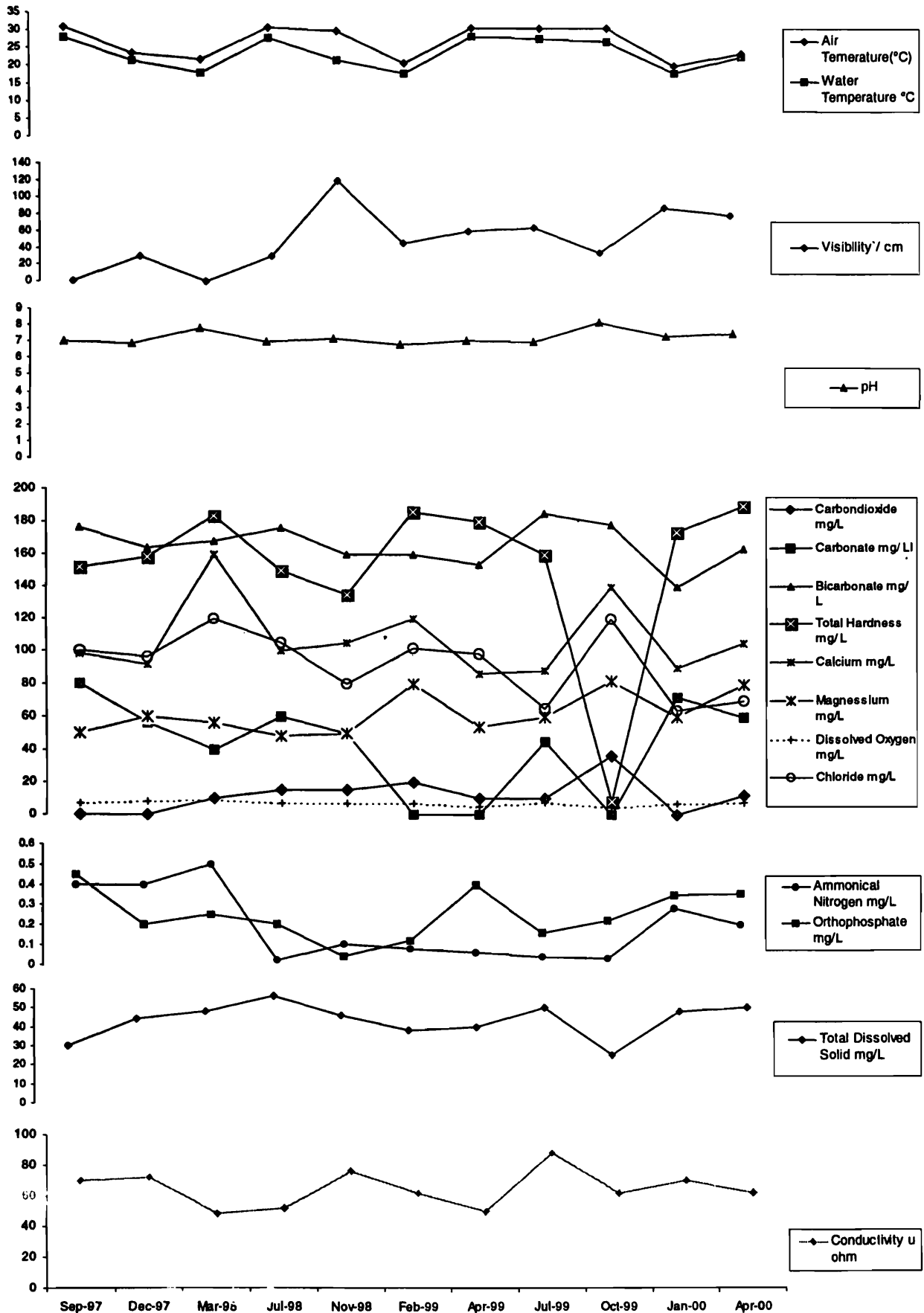


Fig. 4. : Graph showing seasonal variations in physicochemical characteristics at station No. 3 Seveta.

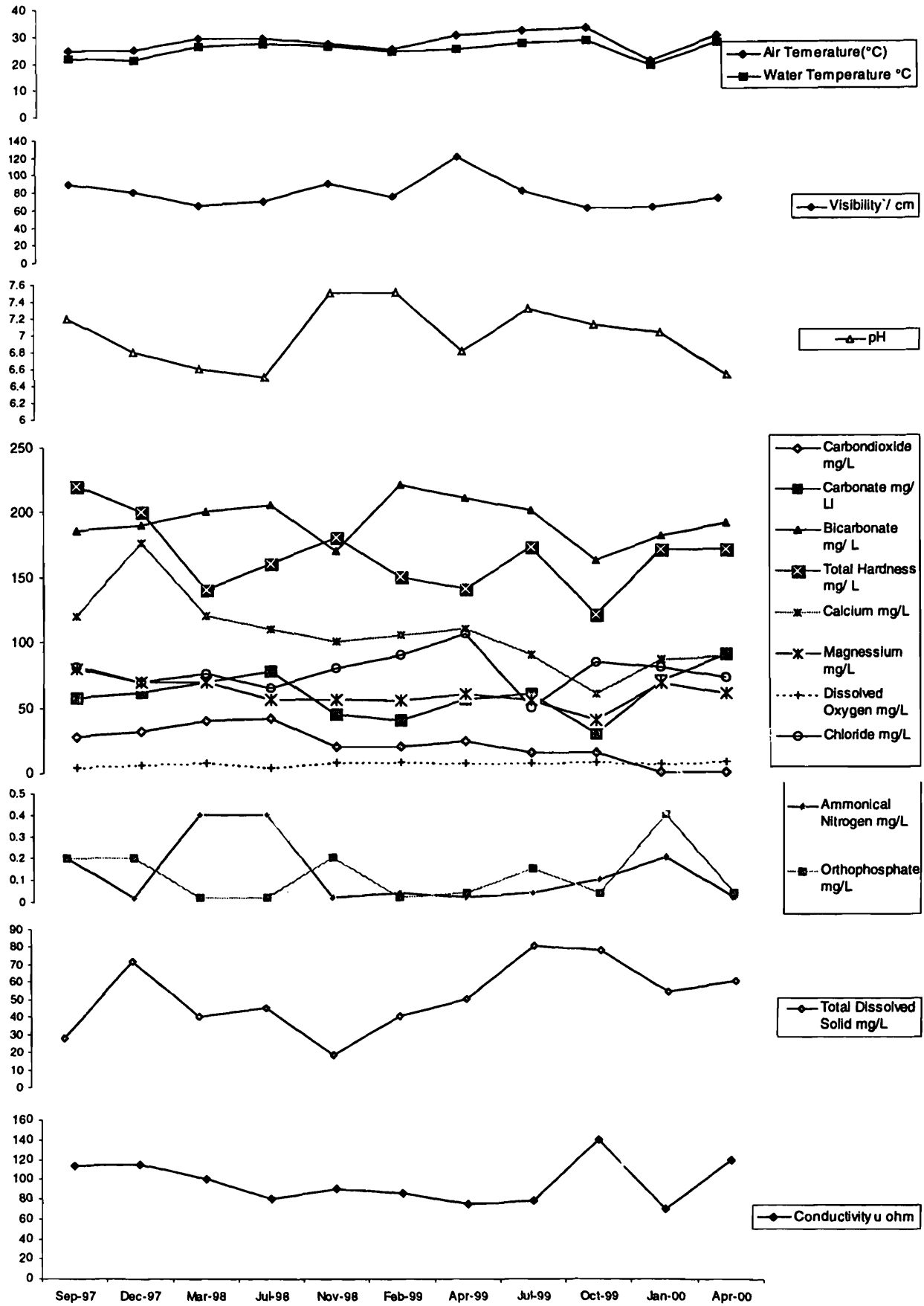


Fig. 5. : Graph showing seasonal variations in physicochemical characteristics at station No. 4 Savkheda.

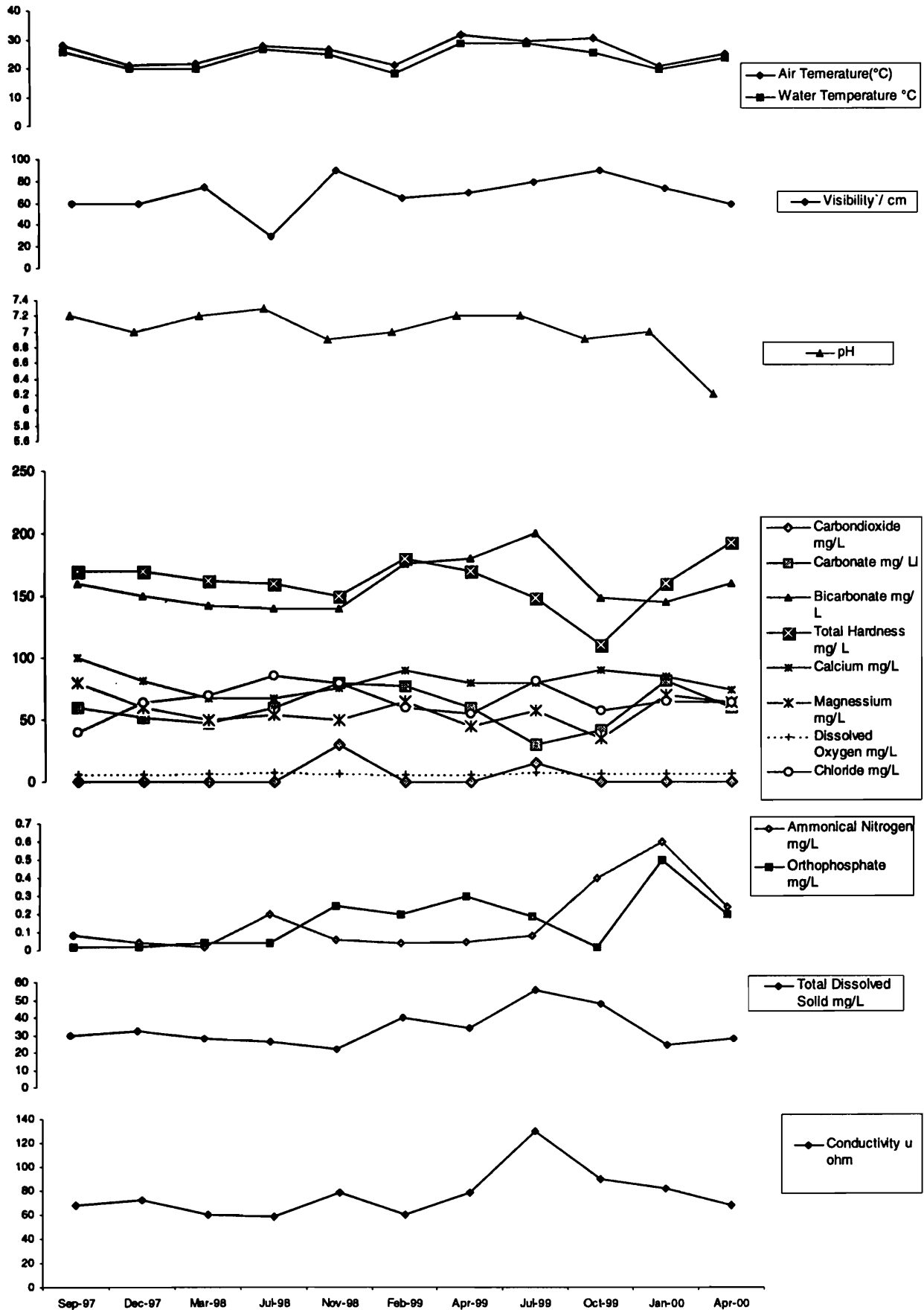


Fig. 6. : Graph showing seasonal variations in physicochemical characteristics at station No. 5 Lakhepal.

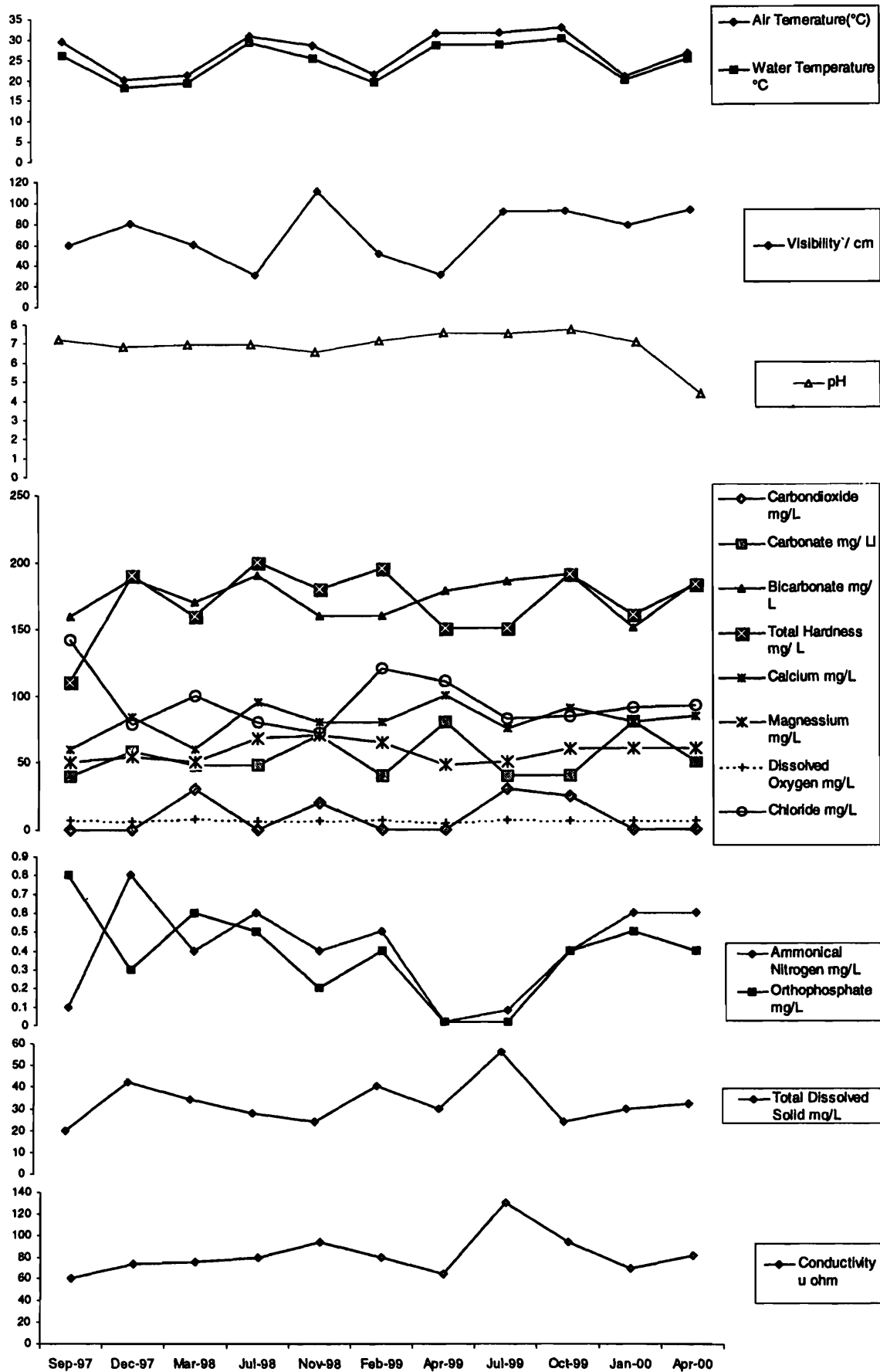


Fig. 7. : Graph showing seasonal variations in physicochemical characteristics at station No. 6 Dhangon NE

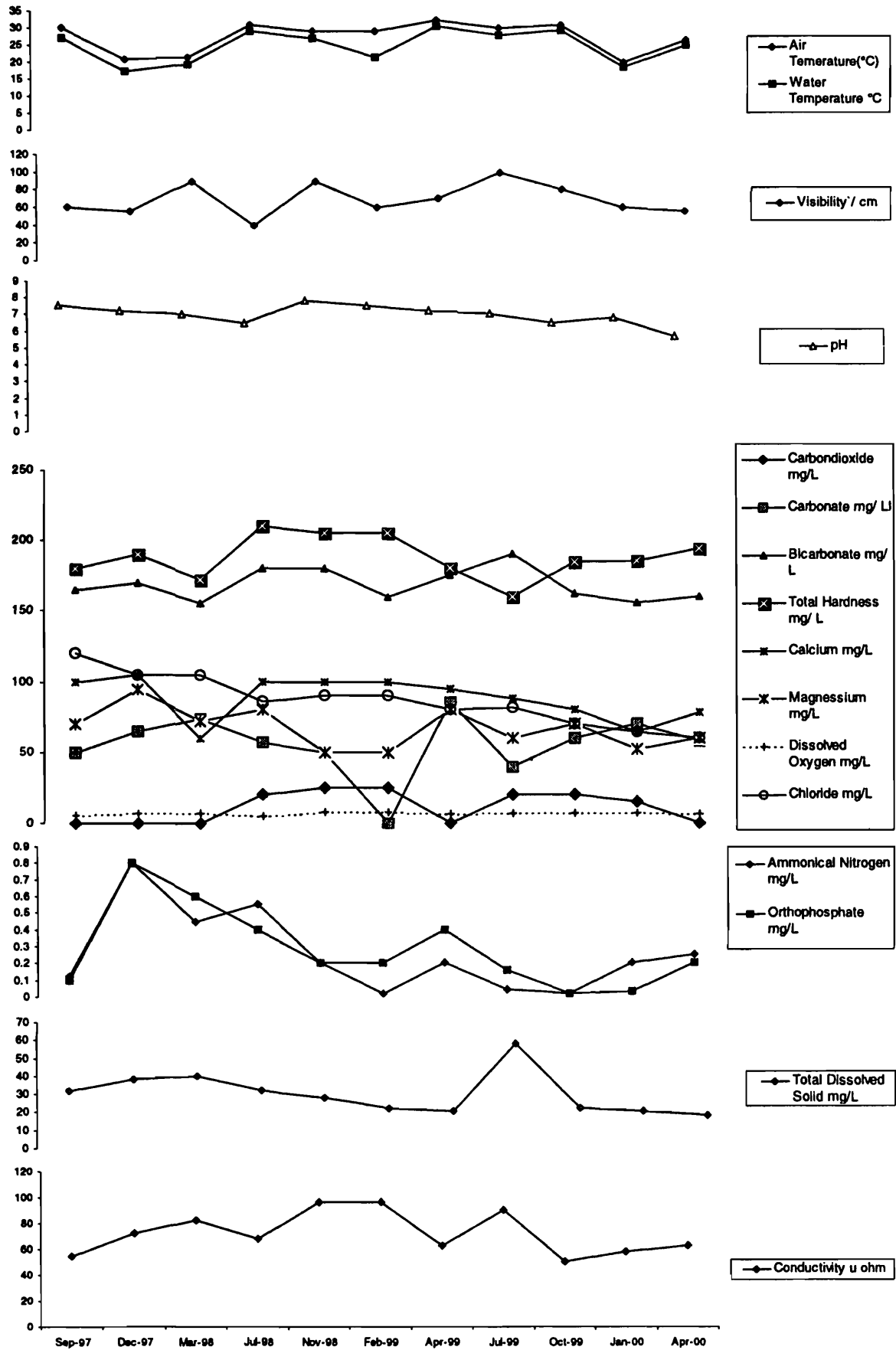


Fig. 8. : Graph showing seasonal variations in physicochemical characteristics at station No. 7 Kayegaon Phata

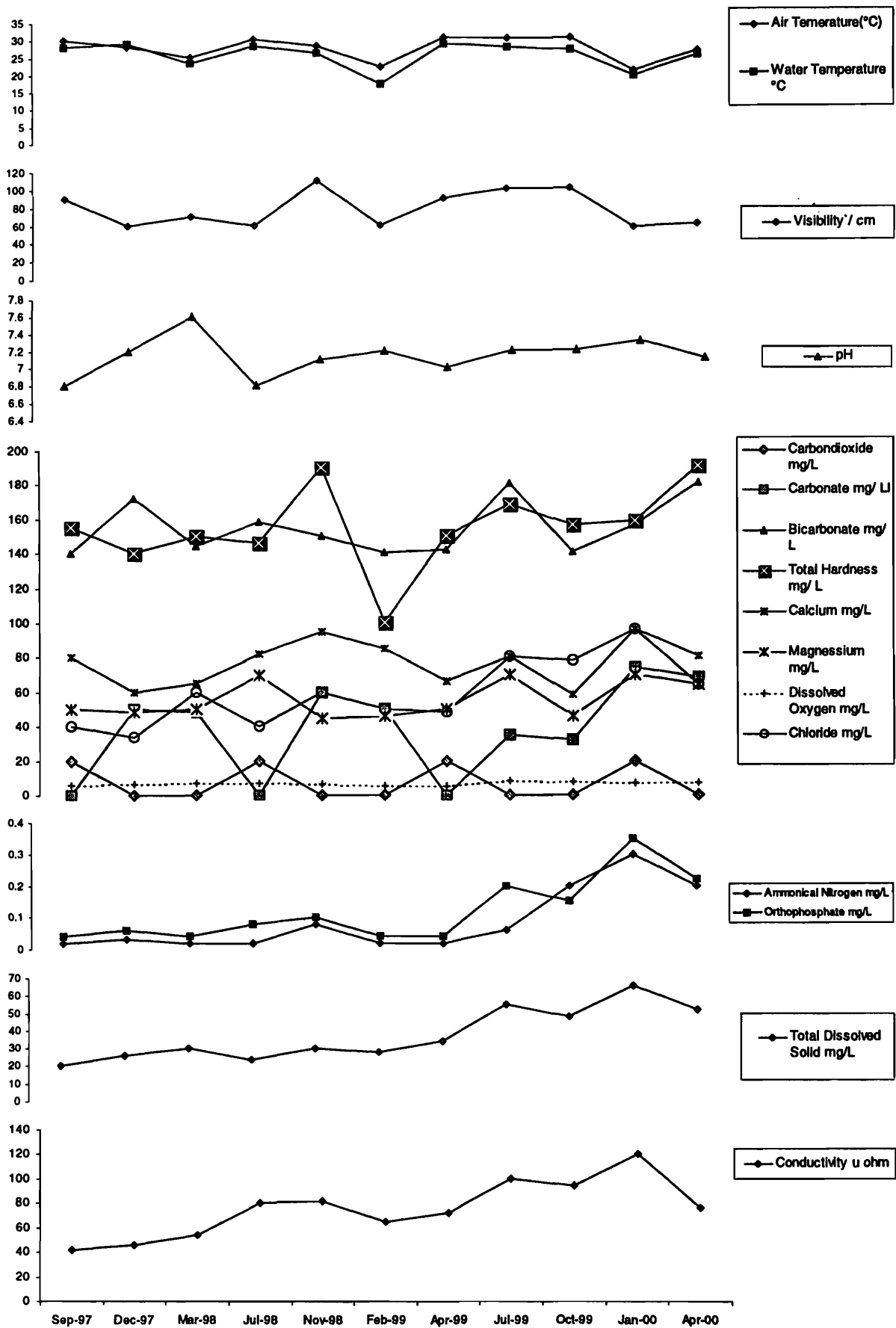


Fig. 9. : Graph showing seasonal variations in physicochemical characteristics at station No. 8 Raamodh

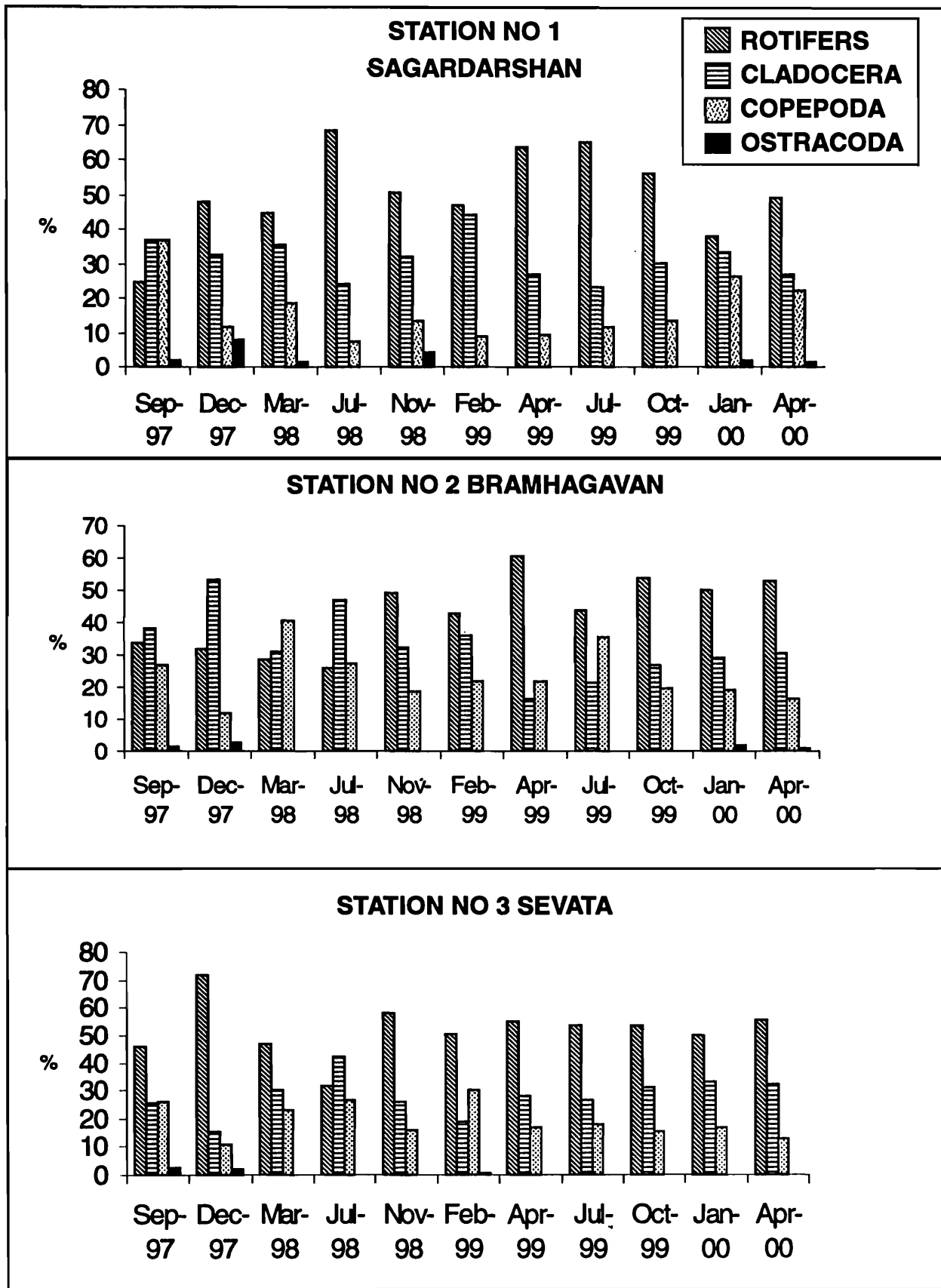


Fig. 10. : Seasonal variations in % composition of zooplankton in various months during 1997–2000 in Nathsagar wetland

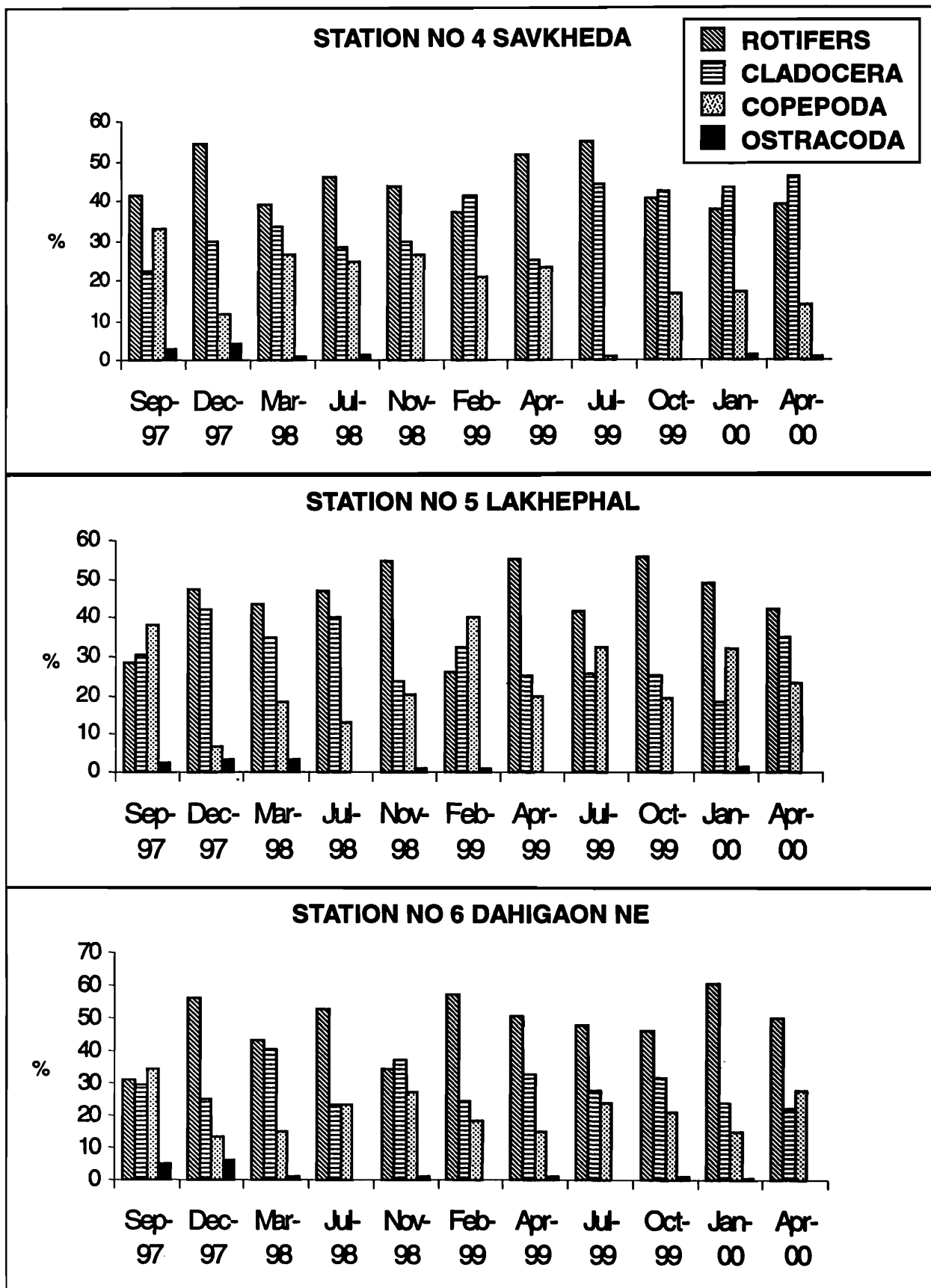


Fig. 11. : Seasonal variations in % composition of zooplankton in various months during 1997–2000 in Nathsagar wetland

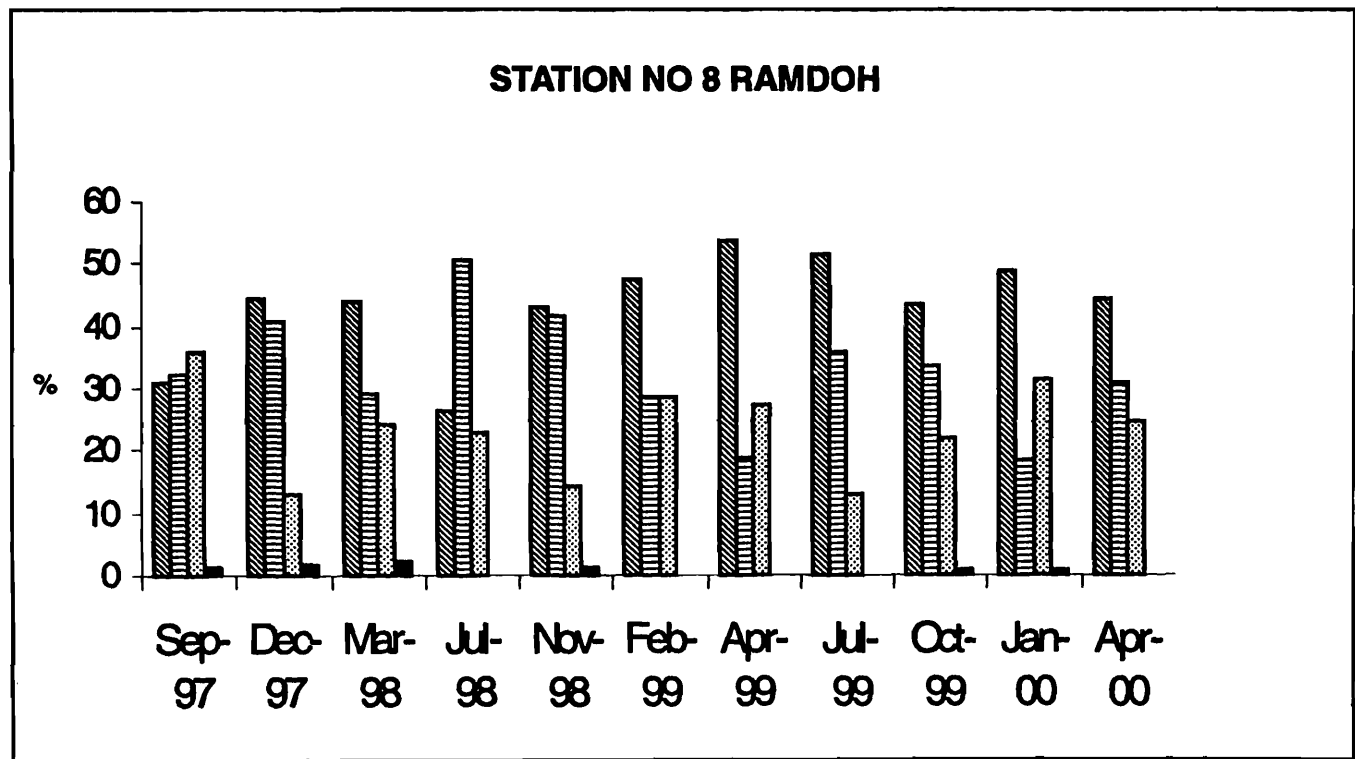
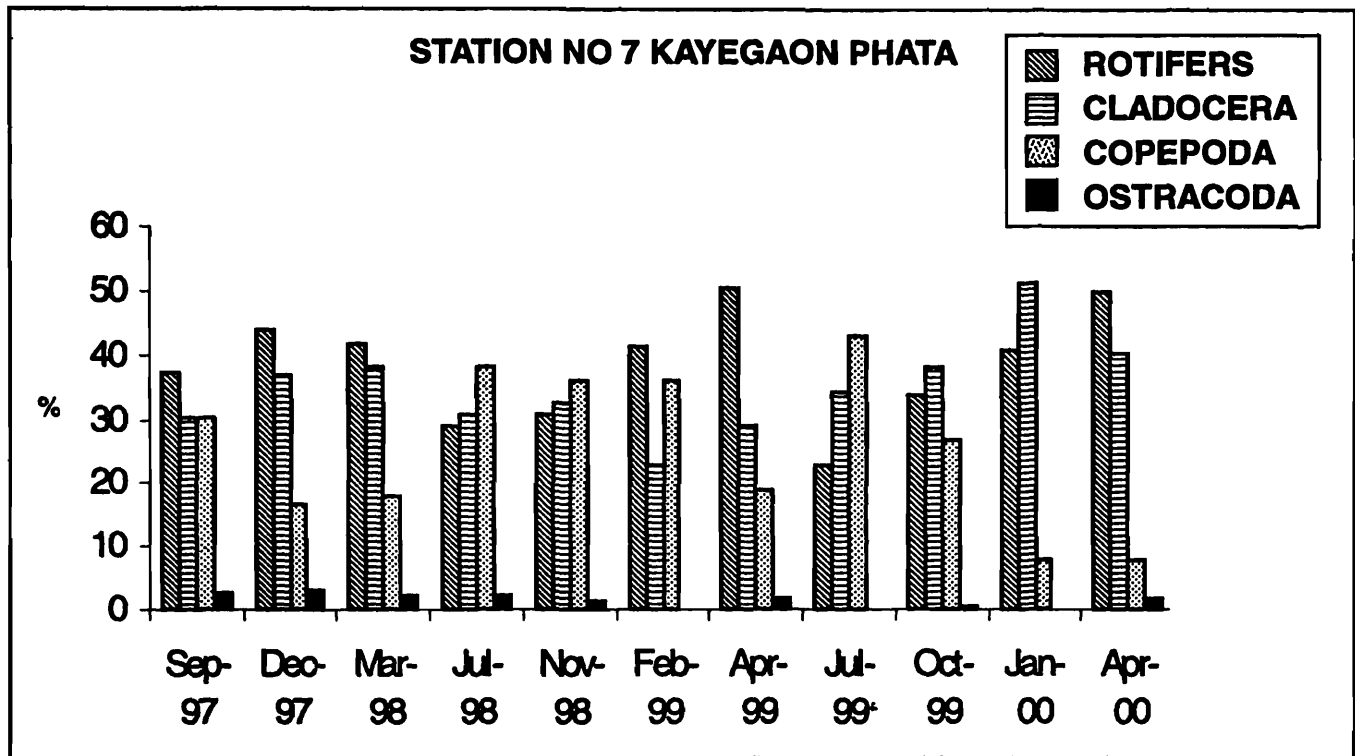


Fig. 12. : Seasonal variations in % composition of zooplakton in various months during 1997-2000 in Nathsagar wetland

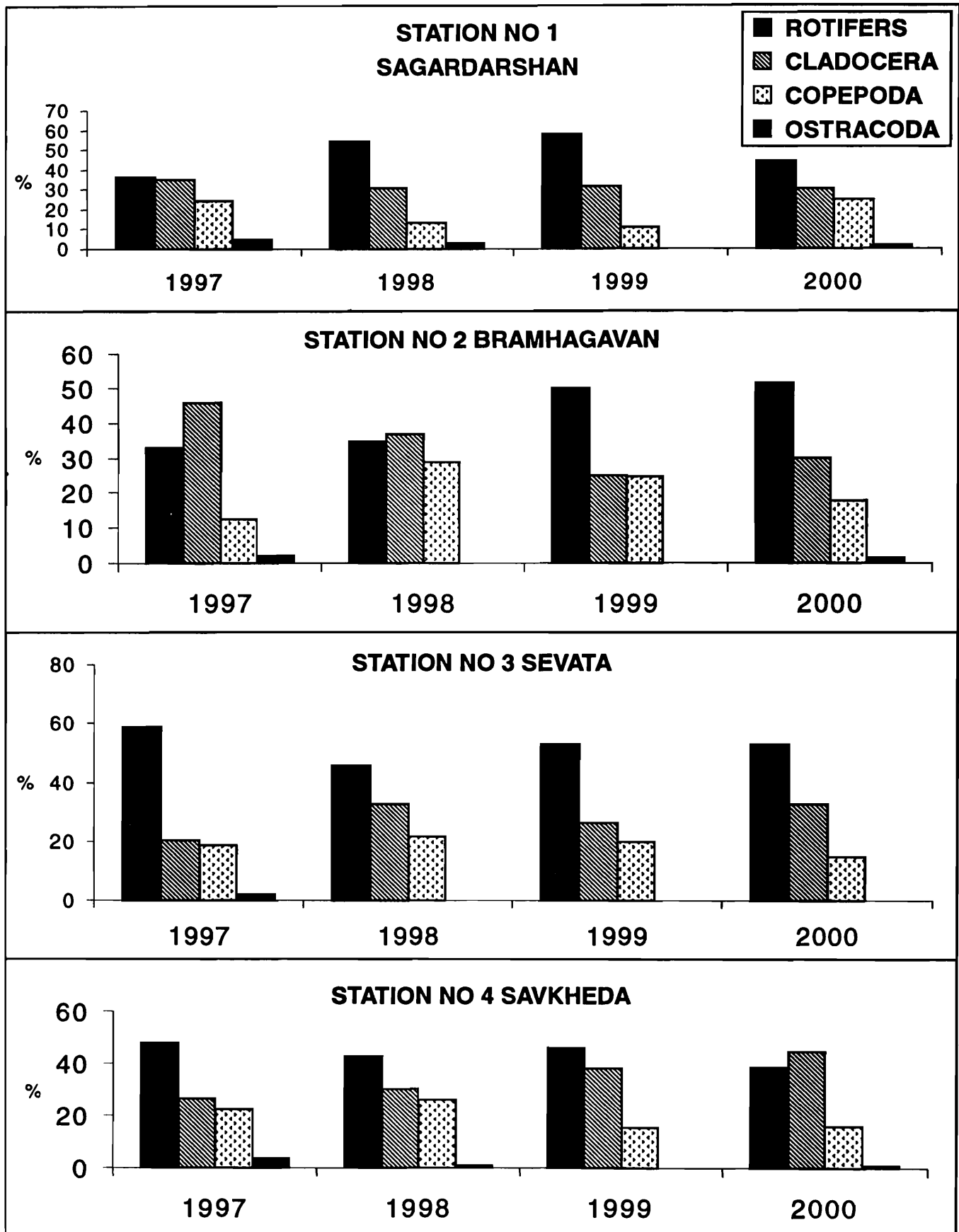


Fig. 13. : Annual average % composition of zooplankton at various station.

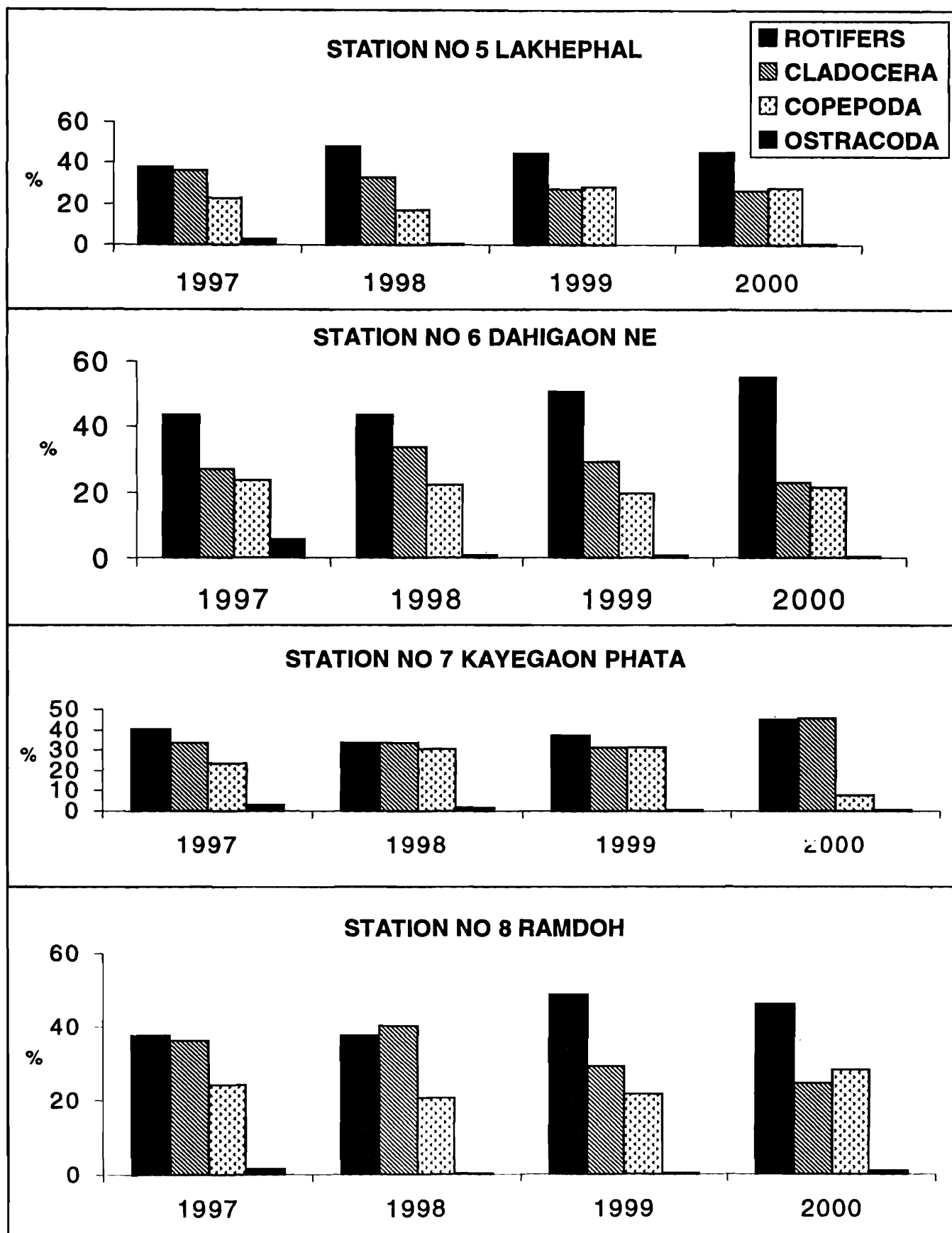


Fig. 14. : Annual average % composition of zooplankton at various station.

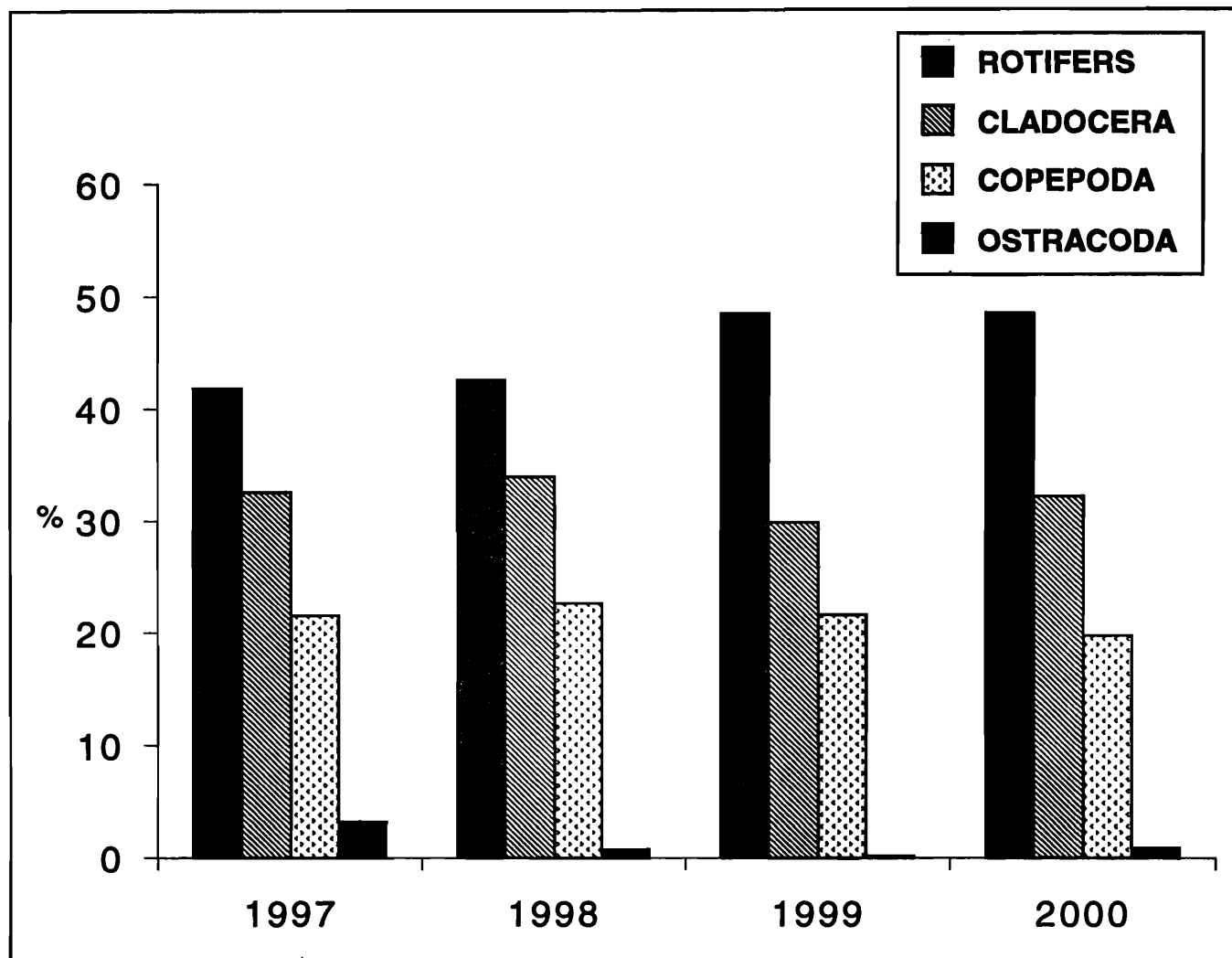


Fig. 15. : Total annual average % composition of zooplankton in Nathsagar during 1997–2000.

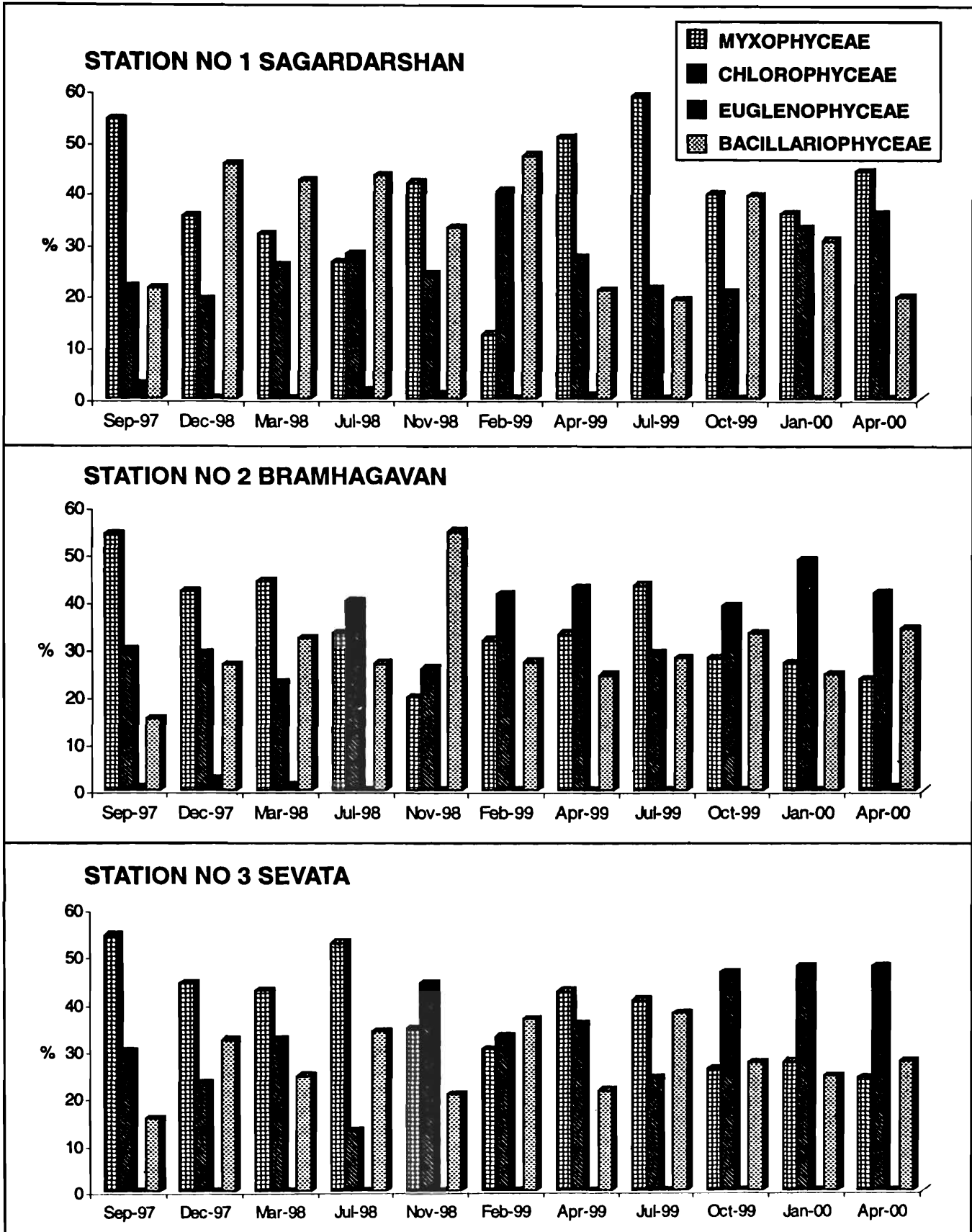


Fig. 16. : Seasonal variations in % composition of Phytoplankton in various months during 1997–2000 in Nathsagar wetland

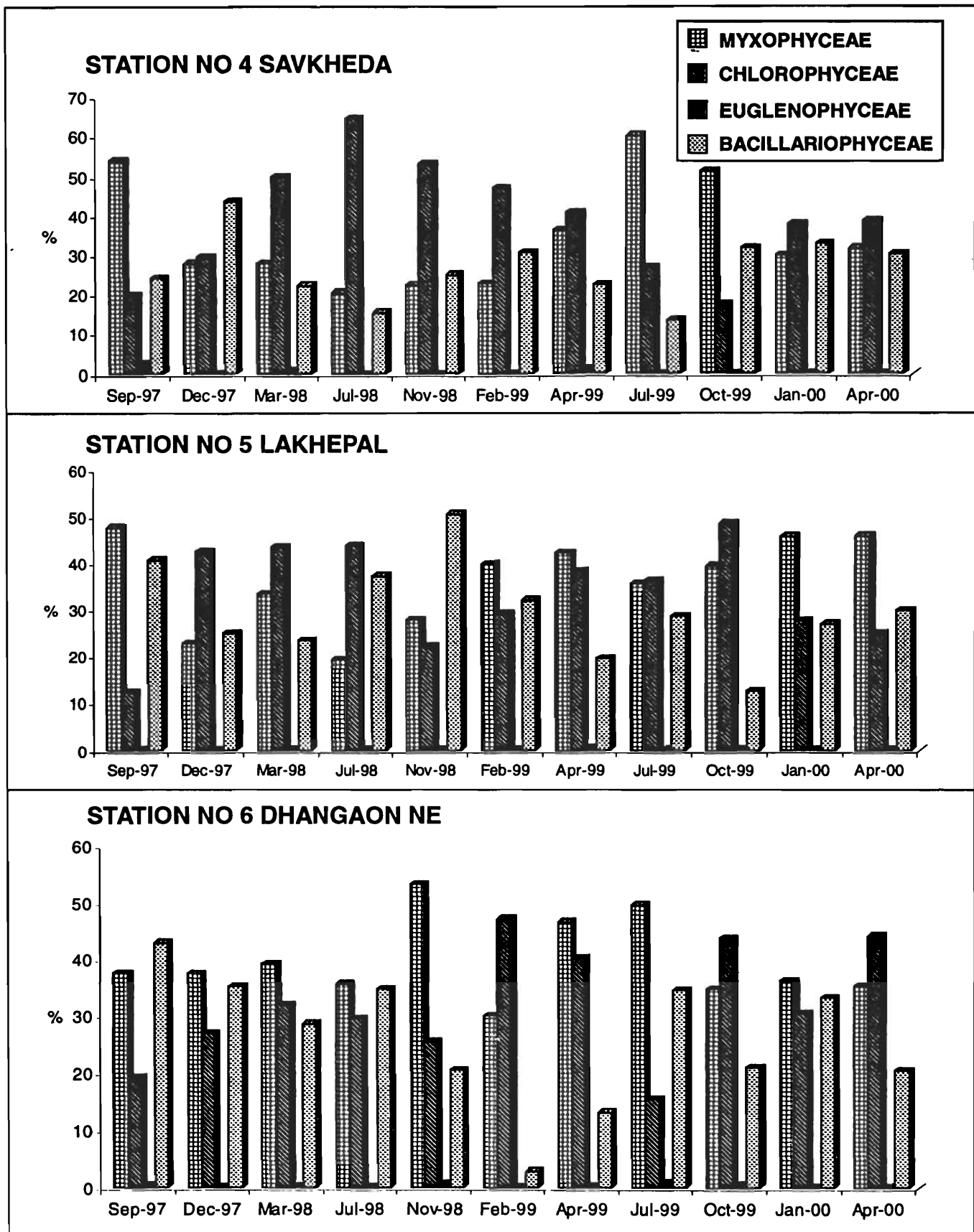


Fig. 17. : Seasonal variations in % composition of Phytoplankton in various months during 1997–2000 in Nathsagar wetland

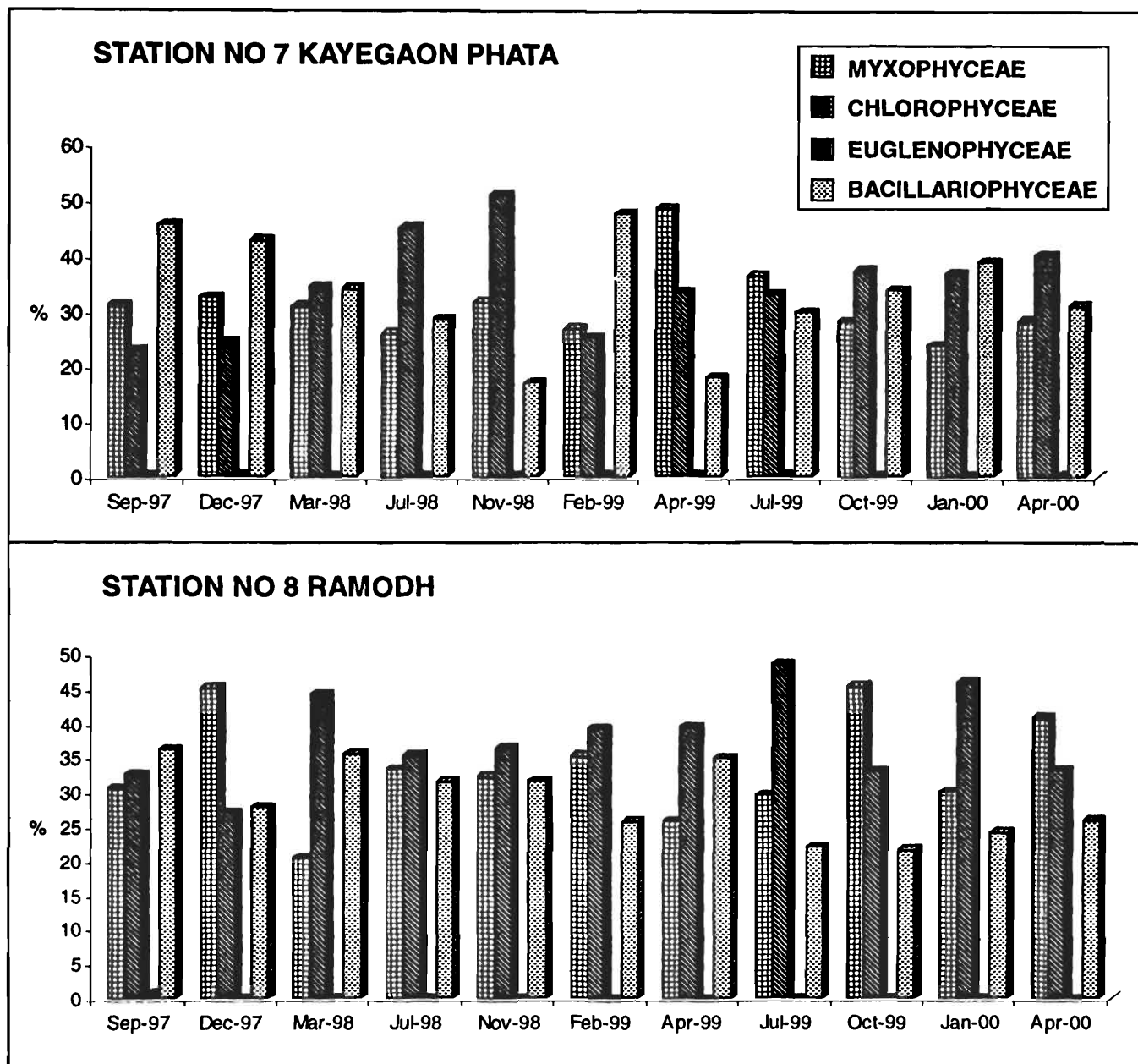


Fig. 18. : Seasonal variations in % composition of Phytoplakton in various months during 1997–2000 in Nathsagar wetland

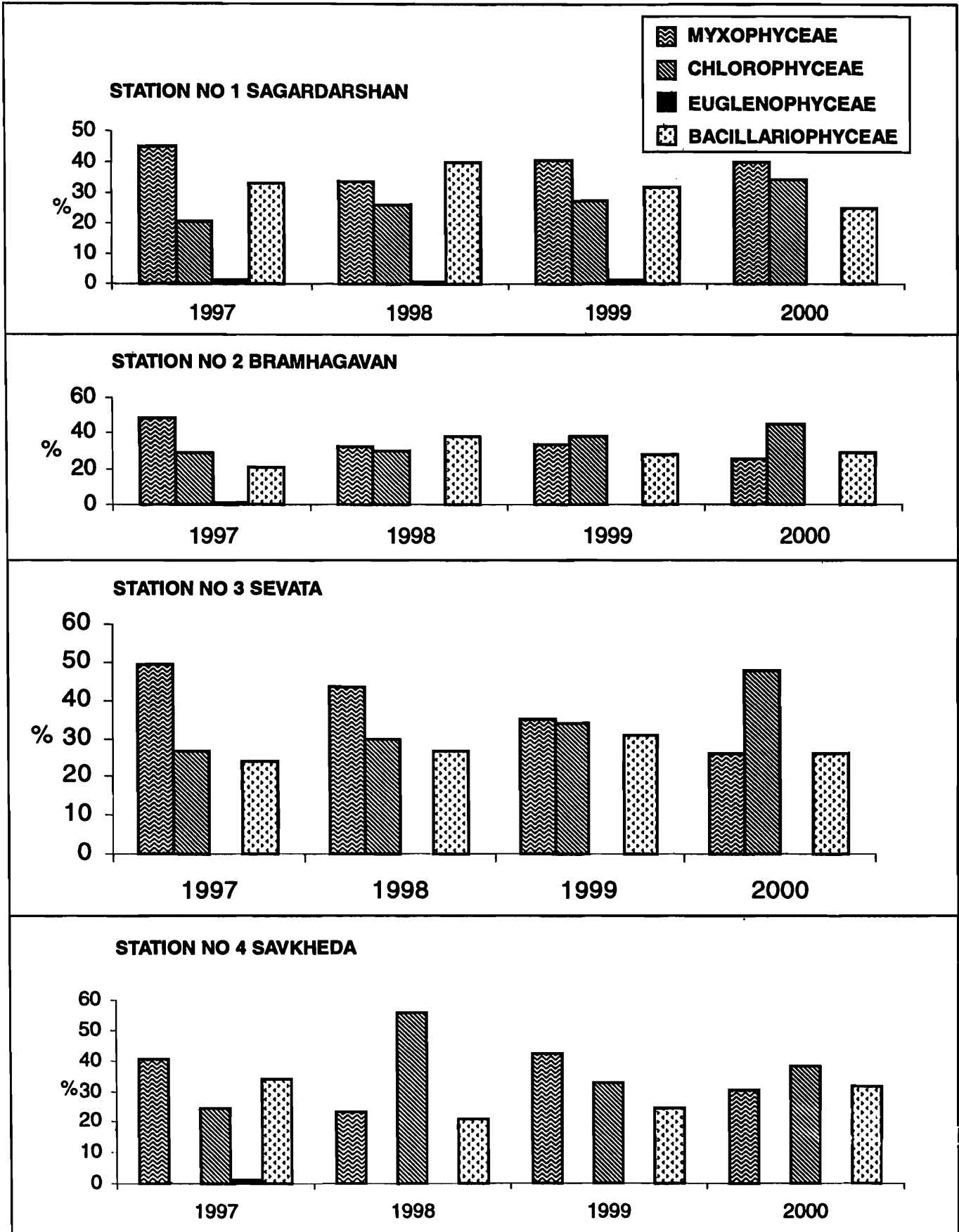


Fig. 19. : Graphs of annual average composition of Phytoplankton at various stations

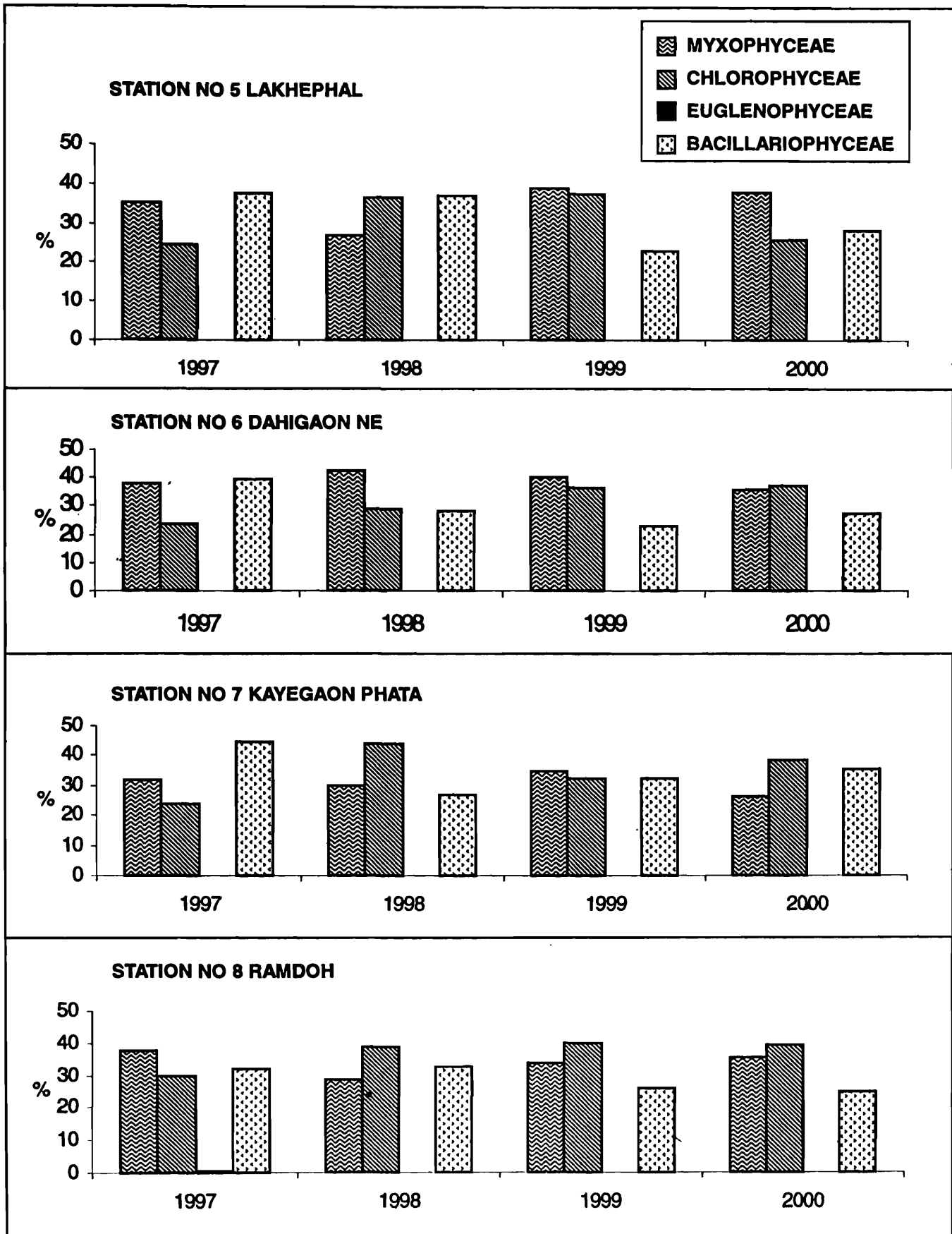


Fig. 20. : Graphs of annual average composition of Phytoplankton at various stations

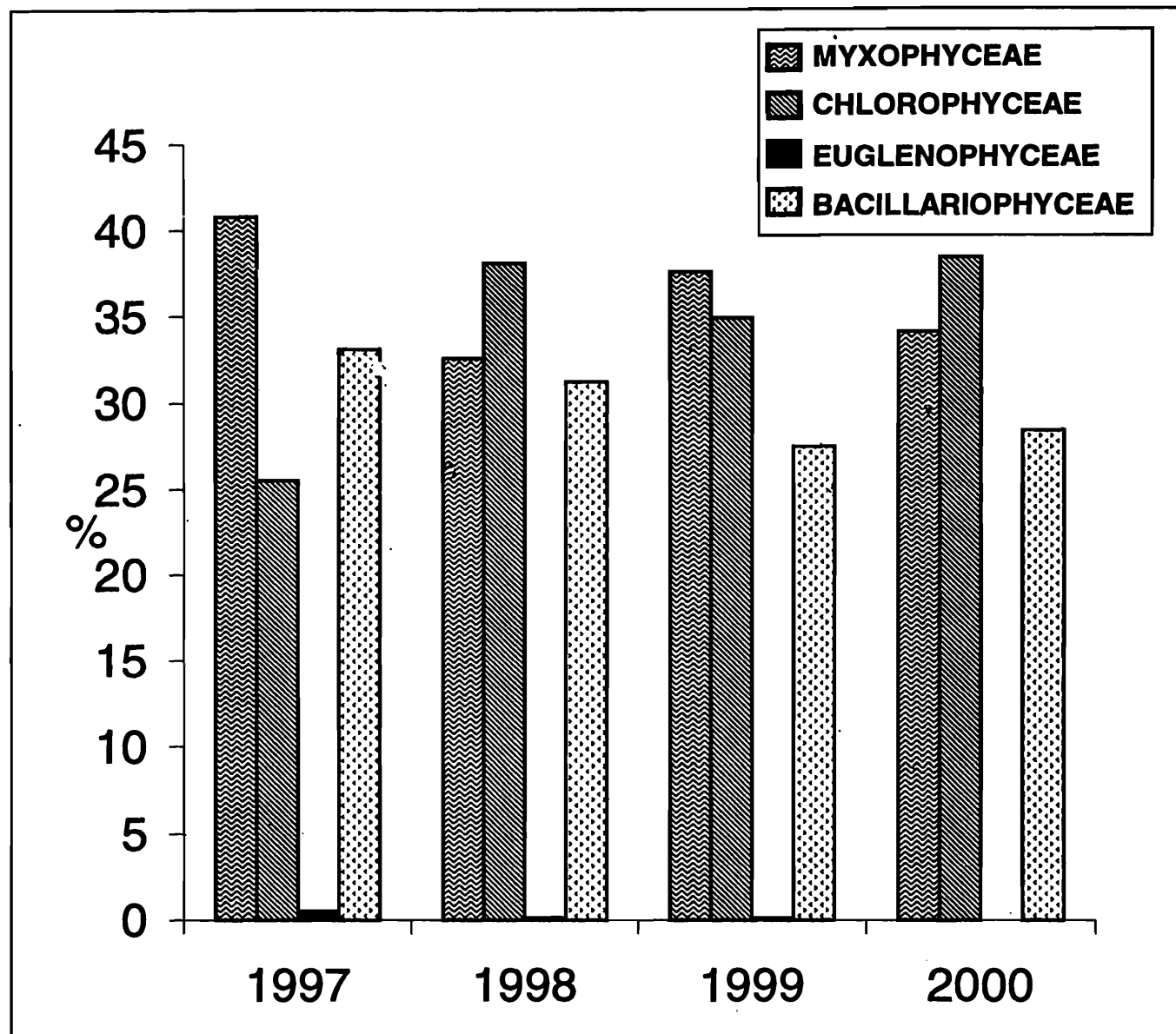


Fig. 21. : Total annual average % composition of phytoplankton in different years.

Table 1. : Seasonal variations in various physico-chemical parameters.**Station No. 1. SAGARDARSHAN**

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	30.00	22.00	24.00	30.00	30.00	20.00	30.00	32.00	32.00	20.00	25.00
Water temp. °C	25.00	20.00	22.00	29.00	25.00	18.00	28.00	29.00	28.00	18.00	24.00
Visibility/cm	100.00	90.00	60.00	94.00	100.00	76.00	90.00	60.00	90.00	80.00	70.00
pH	6.50	6.90	7.00	7.80	6.50	7.40	6.80	6.70	7.10	7.40	7.10
Corbondioxide Mg/L	10.00	0	30.00	0	0	20.00	0	0	15.00	0	10.00
Carbonate Mg/L	35.00	40.00	40.00	46.00	60.00	50.00	48.00	42.00	30.00	70.00	48.00
Bicarbonate Mg/L	150.00	165.00	168.00	178.00	152.00	150.00	190.00	180.00	150.00	160.00	160.00
Total hardness Mg/L	102.00	158.00	142.00	168.00	150.00	148.00	174.00	168.00	110.00	150.00	180.00
Calcium Mg/L	60.00	130.00	60.00	100.00	60.00	72.00	70.00	105.00	60.00	74.00	58.00
Magnesium Mg/L	50.00	40.00	52.00	50.00	40.00	38.00	50.00	48.00	46.00	40.00	44.00
Dissolved oxygen Mg/L	6.10	7.60	7.20	8.00	6.90	7.10	7.40	7.10	6.80	6.60	7.20
Chloride Mg/L	50.00	54.00	66.00	64.00	52.00	54.00	40.00	72.00	52.00	40.00	60.00
NH ₄ N Mg/L	0.04	0.90	0.40	0.02	0.02	0.04	0.02	0.40	0.04	0.80	0.06
Phosphate Mg/L	0.20	0.25	0.03	0.04	0.02	0.04	0.01	0.08	0.10	0.05	0.04
Total dissolved solid Mg/L	18.00	40.00	30.00	20.00	16.00	28.00	30.00	24.00	18.00	32.00	38.00
Conductivity μ Ohm.	50.00	76.00	80.00	90.00	72.00	80.00	64.00	120.00	60.00	74.00	70.00

Table 2. : Seasonal variations in various physico-chemical parameters.**Station No. 2. BRAMHAGAVAN**

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	29.50	23.00	30.00	30.00	30.00	22.00	30.00	30.00	32.00	20.00	29.00
Water temp. °C	28.00	20.00	27.00	28.00	27.00	19.00	27.00	28.50	28.00	18.0	26.50
Visibility/cm	40.00	50.00	62.00	58.00	90.00	150.00	42.00	60.00	90.00	80.00	70.00
pH	7.00	6.80	6.80	7.00	7.00	7.50	6.90	7.20	7.10	7.40	6.80
Corbondioxide Mg/L	0	22.00	15.00	0	10	0	15.00	0	0	0	10.00
Carbonate Mg/L	48.00	0	0	55.00	20.00	80.00	0	40.00	48.00	70.00	50.00
Bicarbonate Mg/L	184.00	168.00	158.00	250.00	140.00	160.00	154.00	200.00	160.00	160.00	170.00
Total hardness Mg/L	200.00	172.00	150.00	170.00	105.00	168.00	140.00	170.00	110.00	150.00	185.00
Calcium Mg/L	100.00	98.00	98.00	110.00	60.00	80.00	84.00	100.00	58.00	74.00	58.00
Magnesium Mg/L	80.00	70.00	52.00	80.00	30.00	65.00	60.00	70.00	50.00	40.00	48.00
Dissolved oxygen Mg/L	5.60	7.10	5.60	5.80	7.00	5.60	5.00	6.80	5.10	6.60	7.40
Chloride Mg/L	60.00	48.00	65.00	84.00	50.00	70.00	65.00	60.00	52.00	40.00	65.00
NH ₄ N Mg/L	0.30	0.02	0.01	0.40	0.05	0.12	0.01	0.02	0.01	0.80	0.06
Phosphate Mg/L	0.20	0.04	0.05	0.05	0.06	0.05	0.04	0.25	0.02	0.05	0.04
Total dissolved solid Mg/L	25.00	34.00	43.00	32.00	14.00	40.00	64.00	60.00	48.00	32.00	32.00
Conductivity μ Ohm.	80.00	94.00	80.00	72.00	80.00	74.00	90.00	80.00	60.00	74.00	74.00

Table 3. : Seasonal variations in various physico-chemical parameters.

Station No. 3. SHEVTA

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	31.00	23.50	22.00	31.00	30.00	21.00	31.00	31.00	31.00	20.50	24.00
Water temp. °C	28.00	21.50	18.00	28.00	22.00	18.00	28.50	28.00	27.00	18.50	23.00
Visibility/cm	0	30.00	0	30.00	120.00	45.00	60.00	65.00	35.00	88.00	80.00
pH	7.00	6.40	7.80	7.00	7.20	6.80	7.10	7.00	8.20	7.40	7.69
Corbondioxide Mg/L	0	0	10.00	15.00	15.00	20.00	10.00	10.00	36.00	0	12.00
Carbonate Mg/L	80.00	56.00	40.00	60.00	50.00	0	0	45.00	0	72.00	60.00
Bicarbonate Mg/L	176.00	164.00	168.00	176.00	160.00	160.00	154.00	185.00	178.00	140.00	164.00
Total hardness Mg/L	152.00	158.00	184.00	150.00	135.00	186.00	180.00	160.00	800.00	174.00	190.00
Calcium Mg/L	98.00	92.00	160.00	100.00	105.00	120.00	86.00	88.00	140.00	90.00	105.00
Magnesium Mg/L	50.00	60.00	56.00	48.00	50.00	80.00	64.00	60.00	82.00	60.00	80.00
Dissolved oxygen Mg/L	6.80	8.10	8.20	6.80	7.10	6.80	5.20	7.40	4.40	6.80	7.40
Chloride Mg/L	100.00	96.00	120.00	105.00	80.00	102.00	98.00	65.00	120.00	64.00	70.00
NH ₄ N Mg/L	0.40	0.40	0.50	0.20	0.01	0.08	0.06	0.04	0.03	0.28	0.20
Phosphate Mg/L	0.45	0.20	0.25	0.20	0.04	0.12	0.40	0.16	0.22	0.35	0.36
Total dissolved solid Mg/L	30.00	44.00	48.00	56.00	46.00	38.00	40.00	70.00	25.00	48.00	50.00
Conductivity μ Ohm.	70.00	72.00	48.00	52.00	76.00	62.00	50.00	88.00	62.00	70.00	62.00

Table 4. : Seasonal variations in various physico-chemical parameters.**Station No. 4. SAVKHEDA**

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	25.00	25.00	29.20	29.00	27.00	24.80	29.90	31.50	32.60	20.00	29.00
Water temp. °C	22.00	21.00	26.20	27.00	26.00	23.80	25.00	27.00	28.00	18.00	26.50
Visibility/cm	90.00	80.00	65.00	70.00	90.00	74.00	120.00	80.00	60.00	60.00	70.00
pH	7.20	6.80	6.60	6.50	7.50	7.50	6.80	7.30	7.10	7.00	6.50
Corbondioxide Mg/L	28.00	32.00	40.00	42.00	20.00	20.00	24.00	15.00	15.00	0	0
Carbonate Mg/L	58.00	62.00	70.00	78.00	45.00	40.00	56.00	60.00	30.00	70.00	90.00
Bicarbonate Mg/L	186.00	190.00	200.00	205.00	170.00	220.00	210.00	200.00	162.00	180.00	190.00
Total hardness Mg/L	220.00	200.00	180.00	160.00	180.00	150.00	140.00	172.00	120.00	170.00	170.00
Calcium Mg/L	120.00	176.00	120.00	110.00	100.00	105.00	110.00	90.00	60.00	86.00	88.00
Magnesium Mg/L	86.00	90.00	70.00	56.00	56.00	55.00	60.00	55.00	40.00	68.00	60.00
Dissolved oxygen Mg/L	5.20	6.40	8.00	4.00	8.20	7.80	7.10	7.20	8.20	6.80	7.70
Chloride Mg/L	82.00	90.00	76.00	65.00	80.00	90.00	106.00	50.00	84.00	80.00	72.00
NH ₄ N Mg/L	0.20	0.02	0.40	0.40	0.02	0.04	0.02	0.04	0.10	0.20	0.02
Phosphate Mg/L	0.20	0.20	0.02	0.02	0.20	0.02	0.04	0.15	0.04	0.40	0.04
Total dissolved solid Mg/L	28.00	72.00	40.00	45.00	18.00	40.00	50.00	80.00	78.00	54.00	60.00
Conductivity μ Ohm.	114.00	115.00	100.00	80.00	90.00	86.00	74.00	78.00	140.00	70.00	120.00

Table 5.: Seasonal variations in various physico-chemical parameters.

Station No. 5. LAKHEPHAL

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	28.00	21.00	22.00	28.00	27.00	21.50	32.00	30.00	31.00	21.00	25.50
Water temp. °C	26.00	20.00	20.00	27.00	25.00	18.50	29.00	29.00	26.00	20.00	24.00
Visibility/cm	60.00	60.00	75.00	30.00	90.00	65.00	70.00	80.00	90.00	74.00	60.00
pH	7.20	7.00	7.20	7.30	6.90	7.00	7.20	7.20	6.90	7.00	6.20
Corbondioxide Mg/L	0	0	0	0	30.00	0	0	15.00	0	0	0
Carbonate Mg/L	60.00	52.00	48.00	60.00	80.00	78.00	60.00	30.00	42.00	82.00	60.00
Bicarbonate Mg/L	160.00	150.00	142.00	140.00	140.00	176.00	180.00	200.00	148.00	145.00	160.00
Total hardness Mg/L	170.00	170.00	162.00	160.00	150.00	180.00	170.00	148.00	110.00	160.00	192.00
Calcium Mg/L	100.00	82.00	68.00	68.00	76.00	90.00	80.00	80.00	90.00	85.00	74.00
Magnesium Mg/L	80.00	60.00	50.00	54.00	50.00	65.00	45.00	58.00	35.00	70.00	64.00
Dissolved oxygen Mg/L	5.60	6.20	6.80	7.20	6.90	5.90	6.00	7.60	6.70	7.00	6.90
Chloride Mg/L	40.00	64.00	70.00	86.00	80.00	60.00	55.00	82.00	58.00	65.00	84.00
NH ₄ N Mg/L	0.08	0.04	0.02	0.20	0.06	0.04	0.05	0.08	0.40	0.60	0.24
Phosphate Mg/L	0.02	0.02	0.04	0.04	0.25	0.20	0.30	0.19	0.02	0.50	0.20
Total dissolved solid Mg/L	30.00	32.00	28.00	26.00	22.00	40.00	34.00	56.00	48.00	24.00	28.00
Conductivity μ Ohm.	68.00	72.00	60.00	58.00	78.00	60.00	98.00	130.00	90.00	82.00	68.00

Table 6. : Seasonal variations in various physico-chemical parameters.**Station No. 6. DHAIGAON NE**

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	29.50	20.00	21.00	30.50	28.00	21.00	31.00	31.00	32.00	20.00	25.50
Water temp. °C	26.00	18.00	19.00	29.00	25.00	19.00	28.00	28.00	29.50	19.00	24.00
Visibility/cm	60.00	80.00	60.00	30.00	110.00	50.00	30.00	90.00	90.00	76.00	90.00
pH	7.20	6.80	6.90	6.90	6.50	7.10	7.50	7.40	7.60	6.90	5.7
Corbondioxide Mg/L	0	0	30.00	0	20.00	0	0	30.00	25.00	0	0
Carbonate Mg/L	40.00	58.00	48.00	48.00	70.00	40.00	80.00	40.00	40.00	80.00	50.00
Bicarnonate Mg/L	160.00	188.00	170.00	190.00	160.00	160.00	178.00	185.00	180.00	150.00	184.00
Total hardness Mg/L	160.00	190.00	160.00	260.00	180.00	195.00	150.00	150.00	190.00	160.00	102.00
Calcium Mg/L	60.00	84.00	60.00	95.00	80.00	80.00	100.00	75.00	90.00	80.00	84.00
Magnesium Mg/L	50.00	54.00	50.00	68.00	70.00	65.00	48.00	50.00	60.00	60.00	60.00
Dissolved oxygen Mg/L	7.00	6.00	7.60	6.10	6.20	7.10	5.00	7.40	6.30	6.20	6.00
Chloride Mg/L	142.00	78.00	100.00	80.00	72.00	120.00	110.00	82.00	84.00	90.00	92.00
NH ₄ N Mg/L	0.10	0.80	0.40	0.60	0.40	0.50	0.02	0.08	0.40	0.60	0.60
Phosphate Mg/L	0.80	0.30	0.60	0.50	0.20	0.40	0.02	0.02	0.40	0.50	0.40
Total dissolved solid Mg/L	20.00	420.00	34.00	28.00	24.00	40.00	30.00	56.00	24.00	30.00	32.00
Conductivity μ Ohm.	60.00	74.00	76.00	80.00	94.00	80.00	64.00	130.00	94.00	70.00	82.00

Table 7. : Seasonal variations in various physico-chemical parameters.

Station No. 7. KAYEGAON FATA

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	30.00	21.00	21.50	31.00	29.00	22.00	32.50	30.00	31.00	20.00	26.50
Water temp. °C	27.00	17.50	19.50	29.00	27.00	21.50	30.50	28.00	29.50	18.50	25.00
Visibility/cm	60.00	55.00	90.00	40.00	90.00	60.00	70.00	100.00	180.00	60.00	55.00
pH	7.50	7.20	7.00	6.50	7.80	7.50	7.20	7.0	6.50	6.80	5.70
Corbondioxide Mg/L	0	0	0	20.00	25.00	25.00	0	20.00	20.00	15.00	0
Carbonate Mg/L	50.00	65.00	74.00	57.00	50.00	0	85.00	40.00	60.00	70.00	58.00
Bicarnonate Mg/L	165.00	170.00	155.00	180.00	180.00	160.00	175.00	190.00	162.00	155.00	160.00
Total hardness Mg/L	180.00	170.00	172.00	210.00	205.00	180.00	180.00	160.00	184.00	180.00	194.00
Calcium Mg/L	100.00	105.00	60.00	100.00	100.00	100.00	95.00	88.00	80.00	64.00	78.00
Magnesium Mg/L	70.00	95.00	72.00	80.00	50.00	50.00	80.00	60.00	70.00	52.00	60.00
Dissolved oxygen Mg/L	6.00	7.00	7.20	5.20	8.00	8.00	6.40	7.00	7.20	7.00	6.80
Chloride Mg/L	120.00	105.00	105.00	86.00	90.00	90.00	80.00	82.00	70.00	64.00	60.00
NH ₄ N Mg/L	0.12	0.80	0.40	0.55	0.20	0.02	0.20	0.04	0.02	0.02	0.25
Phosphate Mg/L	0.10	0.80	0.60	0.40	0.20	0.20	0.40	0.16	0.02	0.03	0.20
Total dissolved solid Mg/L	32.00	38.00	40.00	32.00	28.00	22.00	20.00	58.00	22.00	20.00	18.00
Conductivity μ Ohm.	55.00	72.00	82.00	68.00	96.00	96.00	62.50	50.00	50.00	58.00	62.00

Table 8. : Seasonal variations in various physico-chemical parameters.

Station No. 8. RAMDOH

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
Air temp. °C	30.00	28.00	25.00	30.00	28.00	22.00	30.50	30.00	30.00	20.50	26.00
Water temp. °C	28.00	27.00	23.00	28.00	26.00	17.00	28.50	27.50	26.50	19.00	25.00
Visibility/cm	90.00	60.00	70.00	60.00	110.00	60.00	90.00	100.00	100.00	56.00	60.00
pH	6.80	7.20	7.60	6.80	7.10	7.20	7.00	7.20	7.20	7.30	7.10
Corbondioxide Mg/L	20.00	0	0	20.00	0	0	20.00	0	0	20.00	0
Carbonate Mg/L	0	50.00	48.00	0	60.00	50.00	0	35.00	32.00	74.00	68.00
Bicarnonate Mg/L	140.00	172.00	144.00	158.00	150.00	140.00	142.00	180.00	140.00	196.00	180.00
Total hardness Mg/L	155.00	140.00	150.00	146.00	190.00	130.00	150.00	168.00	156.00	158.00	190.00
Calcium Mg/L	80.00	60.00	65.00	82.00	95.00	80.00	66.00	80.00	58.00	96.00	80.00
Magnesium Mg/L	50.00	48.00	50.00	70.00	45.00	46.00	50.00	70.00	46.00	70.00	64.00
Dissolved oxygen Mg/L	5.60	6.20	6.80	6.80	6.40	5.20	5.20	8.00	7.60	7.00	7.20
Chloride Mg/L	40.00	34.00	60.00	40.00	60.00	50.00	48.00	80.00	78.00	96.00	64.00
NH ₄ N Mg/L	0.02	0.03	0.02	0.02	0.08	0.02	0.02	0.06	0.20	0.30	0.20
Phosphate Mg/L	0.04	0.06	0.04	0.08	0.10	0.04	0.04	0.20	0.15	0.35	0.22
Total dissolved solid Mg/L	20.00	26.00	30.00	24.00	30.00	28.00	34.00	55.00	48.00	66.00	52.00
Conductivity μ Ohm.	42.00	46.00	54.00	80.00	82.00	65.00	72.00	100.00	24.00	120.00	76.00

Table 8A. : Distribution of dissolved oxygen in Nathsagar wetland at various stations in November 1998.

Depth in M.	Stations			
	Sagardarshan	Bramhagavan	Kayegaon	Ramdoh
Surface	6.9	7.1	8	6.4
1 meter	6	6.3	7.1	6
1.5 meter	5.2	5.4	4.8	3.4
2 meter	4.8	3.2	2.1	1.8
Bottom	2.1	1.6	0.5	0

Table 8B. : Temperature variations at different depth in Nathsagar wetland during January 2000.

Depth in M.	Stations			
	Sagardarshan	Bramhagavan	Kayegaon	Ramdoh
Surface	18	18	18	18.5
1 meter	17.5	17.5	17.5	18.5
1.5 meter	17	17.5	17	17.5
2 meter	17	17	16.5	17
Bottom	17	16.5	16.5	17

Table 9. : Percentage composition of zooplankton of Nathsagar wetland during different months at various sampling stations.

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
STATION NO. 1 : SAGARDARSHAN											
Rotifer	24.54	48.07	44.73	68.18	50.66	47.05	63.55	65.21	56.06	38.03	49.20
Cladocera	36.81	32.69	35.52	24.24	32.00	44.11	27.11	23.18	30.30	33.33	26.98
Copepoda	36.81	11.53	18.42	7.57	13.33	8.82	9.32	11.59	13.63	26.66	22.22
Ostracoda	1.81	7.69	1.31	0	4.00	0	0	0	0	1.66	1.58
STATION NO. 2 : BRAMHAGAVAN											
Rotifer	33.75	32.00	29.71	26.04	49.05	42.50	60.48	43.52	53.69	50.00	52.52
Cladocera	38.12	53.33	30.69	46.87	32.07	35.83	16.58	21.18	26.84	29.09	30.30
Copepoda	26.87	12.00	39.59	27.08	18.86	21.66	21.95	35.29	19.46	19.09	16.16
Ostracoda	1.25	2.66	0	0	0	0	0	0	0	1.81	1.01
STATION NO. 3 : SEVATA											
Rotifer	45.63	71.81	47.12	31.57	58.01	50.37	54.81	53.33	53.43	50.00	55.55
Cladocera	25.50	15.45	29.88	42.10	25.95	18.79	28.14	26.66	31.29	33.10	31.85
Copepoda	26.17	10.90	22.98	26.31	16.03	30.07	17.03	18.00	15.26	16.89	12.59
Ostracoda	2.68	1.81	0	0	0	0.75	0	0	0	0	0
STATION NO. 4 : SAVKHEDA											
Rotifer	41.23	54.28	38.88	45.88	43.56	37.39	51.51	55.00	40.45	37.88	39.23
Cladocera	22.74	30.00	33.33	28.23	29.70	41.46	25.25	44.00	42.74	43.47	46.15
Copepoda	33.17	11.42	26.66	24.70	26.73	21.13	23.23	1.00	16.79	17.39	13.84
Ostracoda	2.84	4.28	1.11	1.17	0	0	0	0	0	1.24	0.76

Table 9. : (Cont'd.).

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
STATION NO. 5 : LAKHEPHAL											
Rotifer	28.63	47.37	43.33	46.78	54.76	26.26	55.00	41.57	55.55	48.78	41.86
Cladocera	30.70	42.10	35.00	40.36	23.80	32.32	25.00	25.84	25.00	18.29	34.88
Copepoda	38.17	7.01	18.33	12.84	20.23	40.40	20.00	32.58	19.44	31.70	23.25
Ostracoda	2.48	3.50	3.33	0	1.19	1.10	0	0	0	1.21	0
STATION NO. 6 : DAHIGAON NE											
Rotifer	31.38	55.88	43.14	52.97	34.56	57.27	50.63	48.00	46.31	60.30	50.00
Cladocera	29.28	25.00	40.60	23.52	37.03	24.54	32.91	28.00	31.57	23.66	22.22
Copepoda	34.30	13.23	15.22	23.52	27.16	18.18	15.18	24.00	21.05	15.26	27.77
Ostracoda	5.04	5.88	1.01	0	1.23	0	1.26	-	1.05	0.76	0
STATION NO. 7 : KAYEGAON PHATA											
Rotifer	37.17	43.67	41.66	29.00	30.64	41.15	50.46	22.86	33.75	40.72	50.00
Cladocera	30.08	36.84	38.09	30.66	32.25	22.78	28.97	34.28	38.12	51.27	40.25
Copepoda	30.08	16.54	17.85	38.00	35.88	36.05	18.70	42.85	26.87	8.00	8.05
Ostracoda	2.65	3.00	2.38	2.33	1.20	0	1.86	0	1.25	0	1.69
STATION NO. 8 : RAMDOH											
Rotefer	30.86	44.44	44.09	26.60	42.85	47.65	53.71	51.28	43.44	48.91	44.32
Cladocera	32.09	40.74	29.13	50.45	41.42	28.57	19.00	35.89	37.60	18.48	30.93
Copepoda	35.80	12.96	24.40	22.93	14.28	23.80	27.27	12.82	22.13	13.52	24.74
Ostracoda	1.23	1.85	2.36	0	1.42	0	0	0	0.82	1.08	0

Table 10. : Percentage composition of phytoplankton of Nathsagar wetland during different months at various sampling stations.

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
STATION NO. 1 : SAGARDARSHAN											
Myxophyceae	54.32	35.29	31.87	26.63	41.86	12.44	51.01	59.23	39.80	36.11	44.37
Chlorophyceae	21.70	19.23	25.85	28.09	24.17	40.30	27.27	21.53	20.70	33.08	35.87
Euglenophyceae	2.59	0	0	1.33	0.79	0	0.50	0	0	0	0
Bacillariophyceae	21.37	45.47	42.27	43.94	33.17	47.26	21.21	19.23	39.49	30.81	19.75
STATION NO. 2 : BRAMHAGAVAN											
Myxophyceae	54.13	42.21	44.24	33.20	19.52	31.57	32.92	43.35	27.88	26.92	23.53
Chlorophyceae	29.48	29.07	22.68	40.07	25.70	41.35	42.79	28.78	38.88	48.72	41.76
Euglenophyceae	0.48	2.19	0.88	0	0	0	0	0	0	0	0.58
Bacillariophyceae	15.90	26.53	32.19	26.71	54.77	27.06	24.27	27.85	33.23	24.35	34.12
STATION NO. 3 : SEVATA											
Myxophyceae	54.39	44.33	42.77	52.85	34.82	30.27	42.68	40.75	26.08	27.67	24.20
Chlorophyceae	29.88	23.26	32.53	13.05	44.44	33.01	35.82	21.23	46.55	47.80	47.97
Euglenophyceae	0	0	0	0	0	0	0	0	0	0	0
Bacillariophyceae	15.72	32.40	24.69	34.09	20.73	36.71	21.49	37.92	27.36	24.55	27.83
STATION NO. 4 : SAVKHEDA											
Myxophyceae	53.84	27.54	27.61	20.30	22.27	22.65	36.10	60.00	51.13	29.63	31.38
Chlorophyceae	19.78	29.15	49.59	64.36	52.85	46.87	40.68	26.66	17.22	37.67	38.46
Euglenophyceae	2.34	0	0.54	0	0	0	0.86	0	0	0	0
Bacillariophyceae	24.03	43.30	22.25	15.33	24.87	30.46	22.35	13.33	31.64	32.69	30.15

Table 10. : (Cont'd.).

	Sept., 1997	Dec., 1997	Mar., 1998	July, 1998	Nov., 1998	Feb., 1999	Apr., 1999	July, 1999	Oct., 1999	Jan., 2000	Apr., 2000
STATION NO. 5 : LAKHEPHAL											
Myxophyceae	47.35	22.74	33.33	19.19	27.63	39.59	42.07	35.41	39.20	45.58	45.47
Chlorophyceae	12.28	42.33	43.33	43.65	21.98	28.47	38.12	36.11	48.24	27.56	24.78
Euglenophyceae	0	0	0	0	0	0	0.42	0	0	0	0
Bacillariophyceae	40.35	34.92	23.33	37.15	50.38	31.93	19.38	28.47	12.56	26.85	29.74
STATION NO. 6 : DAHIGAON NE											
Myxophyceae	37.50	37.54	39.31	35.67	53.35	30.03	46.67	49.30	34.76	36.20	35.31
Chlorophyceae	19.16	27.06	32.07	29.57	25.55	47.23	40.27	15.45	43.77	30.47	44.20
Euglenophyceae	0.44	0	0	0	0.62	0	0	0.74	0.43	0	0
Bacillariophyceae	42.90	35.39	28.61	34.75	20.47	22.74	13.05	34.51	21.03	33.33	20.48
STATION NO. 7 : KAYEGAON PHATA											
Myxophyceae	31.29	32.65	31.18	26.20	31.89	26.87	48.34	36.53	28.32	23.91	28.44
Chlorophyceae	22.90	24.50	34.65	45.20	51.14	25.28	33.77	33.40	37.57	36.95	40.34
Euglenophyceae	0	0	0	0	0	0	0	0	0	0	0
Bacillariophyceae	45.80	42.85	34.16	28.59	16.96	47.84	17.88	30.06	34.10	39.13	31.21
STATION NO. 8 : RAMDOH											
Myxophyceae	30.61	45.10	20.40	33.33	32.33	35.25	25.80	29.56	45.34	30.00	40.81
Chlorophyceae	32.65	27.06	44.14	35.24	36.21	39.10	39.35	48.49	33.05	45.88	33.33
Euglenophyceae	00.68	0	0	0	0	0	0	0	0	0	0
Bacillariophyceae	36.05	27.83	35.45	31.43	31.55	25.64	34.83	21.93	21.60	24.11	25.85

Table 11. : Annual average percentage composition of zooplankton at different stations in Nathsagar wetland during 1997–2000.

	1997	1998	1999	2000
STATION NO. 1 : SAGARDARSHAN				
Rotifer	36.30	54.52	57.96	43.76
Cladocera	34.75	30.58	31.17	30.15
Copepoda	24.17	12.10	10.85	24.44
Ostracoda	4.75	2.77	0	1.62
STATION NO. 2 : BRAMHAGAVAN				
Rotifer	32.87	34.60	50.07	51.26
Cladocera	45.72	36.54	25.10	29.69
Copepoda	12.43	28.84	24.89	17.72
Ostracoda	1.95	0	0	1.41
STATION NO. 3 : SEVATA				
Rotifer	58.72	45.56	52.98	52.77
Cladocera	27.47	32.64	26.22	32.47
Copepoda	18.53	21.77	20.09	14.74
Ostracoda	2.24	0	0	0
STATION NO. 4 : SAVKHEDA				
Rotifer	47.75	42.77	46.08	38.55
Cladocera	26.37	30.42	38.36	44.81
Copepoda	22.29	26.03	15.53	15.61
Ostracoda	3.56	0.76	0	1.09
STATION NO. 5 : LAKHEPHAL				
Rotifer	38.00	48.39	44.59	45.32
Cladocera	36.40	33.05	27.04	26.58
Copepoda	22.59	17.15	28.10	27.47
Ostracoda	2.99	0.39	0.27	0.60
STATION NO. 6 : DAHIGAON NE				
Rotifer	43.68	43.54	50.55	55.15
Cladocera	27.14	33.71	29.25	22.93
Copepoda	23.76	21.96	19.60	21.51
Ostracoda	5.46	0.74	0.57	0.38

Table 11. : (Cont'd.).

STATION NO. 7 : KAYEGAON PHATA				
Rotifer	40.39	33.76	37.05	45.36
Cladocera	33.46	34.00	31.03	45.76
Copepoda	23.31	30.57	31.11	8.02
Ostracoda	2.82	1.97	0.77	0.85
STATION NO. 8 : RAMDOH				
Rotifer	37.65	37.85	49.01	46.21
Cladocera	36.41	40.94	29.26	24.70
Copepoda	24.38	20.73	21.50	28.13
Ostracoda	1.54	0.47	0.20	0.95

Table 12. : Annual average percentage composition of phytoplankton at different stations in Nathsagar wetland during 1997–2000.

	1997	1998	1999	2000
STATION NO. 1 : SAGARDARSHAN				
Myxophyceae	44.80	33.46	40.62	40.24
Chlorophyceae	20.47	26.03	27.45	34.48
Euglenophyceae	1.29	0.70	0.12	0
Bacillariophyceae	33.42	39.79	31.80	25.28
STATION NO. 2 : BRAMHAGAVAN				
Myxophyceae	48.17	32.32	33.93	25.22
Chlorophyceae	29.27	29.48	37.95	45.24
Euglenophyceae	1.33	0.29	0	0.29
Bacillariophyceae	21.20	37.89	28.10	29.23
STATION NO. 3 : SEVATA				
Myxophyceae	49.36	43.48	34.94	25.93
Chlorophyceae	26.57	30.00	34.15	47.88
Euglenophyceae	0	0	0	0
Bacillariophyceae	24.06	26.5	30.87	26.17

Table 12. : (Cont'd.).

STATION NO. 4 : SAVKHEDA				
Myxophyceae	40.69	23.39	42.49	30.50
Chlorophyceae	24.46	55.60	32.85	38.07
Euglenophyceae	1.17	00.18	0.21	0
Bacillariophyceae	33.66	20.81	24.45	31.42
STATION NO. 5 : LAKHEPHAL				
Myxophyceae	35.04	26.71	39.06	45.52
Chlorophyceae	27.30	36.32	37.73	26.17
Euglenophyceae	0	0	0.10	0
Bacillariophyceae	37.63	36.95	23.08	28.29
STATION NO. 6 : DAHIGAON NE				
Myxophyceae	37.52	42.77	40.19	35.75
Chlorophyceae	23.11	29.06	36.68	37.33
Euglenophyceae	0.22	0.20	0.29	0
Bacillariophyceae	39.14	27.94	22.83	26.90
STATION NO. 7 : KAYEGAON PHATA				
Myxophyceae	31.97	29.75	35.01	26.18
Chlorophyceae	23.70	43.66	32.50	38.64
Euglenophyceae	0	0	0	0
Bacillariophyceae	44.32	26.57	32.57	35.17
STATION NO. 8 : RAMDOH				
Myxophyceae	37.85	28.65	33.98	35.40
Chlorophyceae	29.85	38.53	39.99	39.60
Euglenophyceae	0.34	0	0	0
Bacillariophyceae	31.94	32.81	26.00	24.98

THE FRESHWATER OSTRACODA

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INTRODUCTION

The members of Subclass Ostracods inhabit in both marine and freshwater. The Suborder, Podocopa represents freshwater Ostracods. They are more common in Indian freshwater and most of them are benthonic. Some of them occur among aquatic vegetations and algal mats and few are planktonic. According to their stay in water they exhibits different pattern like Limnetic, free swimming, creepers on plants and burrowers. They are also called seed shrimps. Indian species ranges between 0.5 mm to 2 mm in length. They are nearly 1700 species of which nearly one third occur in freshwater. They are an important component in the food chain of aquatic organisms. Our knowledge on Ostracods fauna of Maharashtra is rather poor. Studies on Indian Ostracods by Victor and Fernando (1979) is helpful. The important contributions in this field are of Baird (1859); Klie (1927); Gurney (1907); Arora (1931; Hartmann (1964); Michael & Victor (1975); Deb (1972, 1983) and Harshey (1985). Harshey & Patil (1988) erected new species *Strandesia jabalpurensis* from Jabalpur. The present paper is based on the surveys conducted of Nathsagar Wetland from July 1997 to March, 2000 incorporating earlier records of freshwater Ostracods of Maharashtra which resulted to 38 species belonging to 15 genera spread over 4 families. Species actually collected from Nathsagar Wetland have been indicated by (*). In the present collection 9 species of Ostracods belonging to 6 genera, 2 families have been recorded from Nathsagar Wetland.

The present paper form the part of the study of freshwater fauna of Nathsagar Wetland.

SYSTEMATIC LIST

Phylum ARTHROPODA

Class CRUSTACEA

Subclass OSTRACODA

Order PODOCOPIDA

Suborder PODOCOPA

Superfamily CYPRIDACEA

Family CYPRIDIDAE

Subfamily CYPRIDINAE

Tribe CYPRIDINI

Genus *Cypris* O. F. Muller, 1776

- *1. *Cypris subglobosa* Sowerby
- 2. *Cypris dravidensis* Victor and Michael
- 3. *Cypris debi* Deb
- 4. *Cypris elongata* Deb
- 5. *Cypris globosa* Deb

Genus *Sataracypris* Deb, 1983

- 6. *Sataracypris gibbosa* (Baird)

Tribe EUCYPRIDINI

Genus *Eucypris* Vavra, 1891

- 7. *Eucypris compressa* Deb
- 8. *Eucypris sonia* Deb
- 9. *Eucypris gomti* Deb
- 10. *Eucypris munia* Deb
- 11. *Eucypris indica* Deb
- 12. *Eucypris inequalis* Deb
- 13. *Eucypris himani* Deb

Genus *Strandesia* Stuhlmann, 1888

- *14. *Strandesia labiata* Hartmann
- *15. *Strandesia parva* Hartmann
- 16. *Strandesia saetosa* Hartmann
- 17. *Strandesia rotunda* Hartmann

Tribe CYPRINOTINI

Genus *Cyprinotus* Brady, 1886

- *18. *Cyprinotus cingalensis* Brady
- 19. *Cyprinotus incongruens* (Ramdohr)
- 20. *Cyprinotus malini* Deb

Genus *Cypricercus* Sars, 1894

21. *Cypricercus indrani* Deb

Genus *Heterocypris* Claus, 1892

22. *Heterocypris dentatomarginalis* (Baird)

Genus *Hemicypris* Sars, 1903

23. *Hemicypris anomala* (Klie)

Subfamily CYPRETTINAE

Genus *Cypretta* Vavra, 1895

24. *Cypretta fontinalis* Hartmann

25. *Cypretta gargi* Deb

26. *Cypretta globulus* (Sars)

Subfamily STENOCYPRINAE

Genus *Stenocypris* Sars, 1889

- *27. *Stenocypris major* (Baird)

- *28. *Stenocypris derupta* Vavra

- *29. *Stenocypris hislopi* Ferguson

30. *Stenocypris khopoliensis* Deb

31. *Stenocypris sohni* Deb

Genus *Chrissia* Hartmann, 1957

32. *Chrissia humilis indica* (Klie)

- *33. *Chrissia krishnakantai* (Deb)

Genus *Parastenocypris* Hartmann

34. *Parastenocypris canaliculata* Hartmann

Subfamily CYPRIDOPSINAE

Genus *Cypridopsis* Brady, 1868

35. *Cypridopsis dispar* Hartmann

Family CYCLOCYPRIDIDAE

Genus *Physocypris* Vavra, 1897

- *36. *Physocypris furfuracea* (Brady)

Family NOTODROMADIDAE

Genus *Indiacypris* Hartmann, 1964

37. *Indiacypris dispar* Hartmann

Family ILYOCYPRIDIDAE

Genus *Ilyocypris* Brady and Norman, 1889

38. *Ilyocypris australiensis* Sars

*The species actually collected and studied.

SYSTEMATIC ACCOUNT

Phylum ARTHROPODA

Class CRUSTACEA

Subclass OSTRACODA

Order PODOCOPIDA

Suborder PODOCOPA

Superfamily CYPRIDACEA

Family CYPRIDIDAE

Subfamily CYPRIDINAE

Tribe CYPRIDINI

Genus *Cypris* O. F. Muller, 1776

*1. *Cypris subglobosa* Sowerby

1840. *Cypris subglobosa*, Baird, 1859, P. 232, Pl. 63, Fig. 2.

1898. *Cypris granulata*, Daday, 1898, P. 73, Abb. 36.

1906. *Eucypris subglobosa*, Vavra, P. 420, Taf. 24, Fig. 9-13.

1932. *Cypris subglobosa* Sowerby, 1840, Klie, P. 458. 1938, P. 22.

1964. *Cypris subglobosa* Sowerby, 1840, Hartmann; P. 92, Abb. 34, a, b.

Diagnostic characters : Valves subglobular, tumid, both anterior and posterior margins broadly rounded; dorsum convex. Natatory setae of the second antenna setulate, claws pectinate. Fureal ramai symmetrical slender; subterminal claws slightly more than ½ the length of terminal claw. This can be distinguished from the other species by its tumid valves with the characteristic timple shaped depressions on the valve surface.

Material examined and locality : 2 ♀♀, Sawkheda, 24-09-1997, Coll. R. M. Sharma; 3 ♀♀, Bramhagavan, 4-12-1997, Coll. S. G. Patil; 1 ♀, Sagardarshan, 31-07-1998, Coll. D. B. Bastawade; 2 ♀♀, Lakhepal, 20-11-1998. Coll. S. G. Patil; 3 ♀♀, Ramdoh, 23-11-1998, Coll. S. G. Patil;

1 ♀, Lakhepal, 22-02-1999, Coll. A. S. Mahabal; 5 ♀♀, Dahigaon, 10-07-1999, Coll. S. G. Patil; 1 ♀, Bramhagavan, 28-03-2000, Coll. R. H. Kamble.

Distribution : Nagpur, Bombay, Pandharpur, Ujani, Maharashtra; Bhopal, Madhya Pradesh; Chittoor, Guntur, Yanam Godavari delta, Andhra Pradesh; Kanyakumari, Tamil Nadu; Trivandrum, Kerala;

Source : Victor and Fernando (1979), S. G. Patil (2002).

2. *Cypris dravidensis* (Victor and Michael)

1975. *Cypris globosa*, Victor and Michael, *J. Nat. Hist.*, 9 : 366.

1979. *Cypris dravidensis*, Victor and Fernando, *Rec. zool. Surv. Ind.*, 74(2) : 163-165.

Distribution : Pandharpur, Ujani, Maharashtra; Madurai District, Tamil Nadu.

Source : Victor and Fernando (1979); S. G. Patil (2002).

3. *Cypris debi* Deb

1983. *Cypris debi* Deb, *Rec. zool. Surv. India*, 81 : 137-138.

Distribution : Rain water pond, 6 kms. from Karad, On Karad Satara road (Bangalore Road), Maharashtra State.

Source : Deb (1983).

4. *Cypris elongata* Deb

1983. *Cypris elongata* Deb, *Rec. zool. Surv. India*, 81 : 138-139.

Distribution : Pond inside Satara fort, Maharashtra.

Source : Deb (1983).

5. *Cypris globosa* Deb

1983. *Cypris globosa* Deb, *Rec. zool. Surv. India*, 81 : 139-140.

Distribution : Pond near Inspection Bunglow, Satara, Maharashtra.

Source : Deb (1983).

Genus *Sataracypris* Deb, 1983

6. *Sataracypris gibbosa* (Baird)

1837. *Cypris gibbosa* Baird, *Mag. Zool. and Bot.*, 1 : 137.

1983. *Sataracypris gibbosa* (Baird), Deb, *Rec. zool. Surv. India*, 81 : 160-161.

Distribution : Pond near Inspection Bunglow, Satara, Maharashtra.

Source : Deb (1983).

Tribe EUCYPRIDINI

Genus *Eucypris* Vavra, 18917. *Eucypris compressa* Deb1983. *Eucypris compressa* Deb, *Rec. zool. Surv. India*, **81** : 141-142.*Distribution* : Pond at Pachgani, Maharashtra.*Source* : Deb (1983).8. *Eucypris sonia* Deb1983. *Eucypris sonia* Deb, *Rec. zool. Surv. India*, **81** : 142-143.*Distribution* : Pond near Inspection Bungalow, Satara, Maharashtra.*Source* : Deb (1983).9. *Eucypris gomti* Deb1983. *Eucypris gomti* Deb, *Rec. zool. Surv. India*, **81** : 143-145.*Distribution* : Pond near inspection Bungalow, Satara, Maharashtra.*Source* : Deb (1983).10. *Eucypris munia* Deb1983. *Eucypris munia* Deb, *Rec. zool. Surv. India*, **81** : 145-146.*Distribution* : Pond near inspection Bungalow, Satara, Maharashtra.*Source* : Deb (1983).11. *Eucypris indica* Deb1983. *Eucypris indica* Deb, *Rec. zool. Surv. India*, **81** : 146-147.*Distribution* : Pond at Panchgani, Maharashtra.*Source* : Deb (1983).12. *Eucypris inequalis* Deb1983. *Eucypris inequalis* Deb, *Rec. zool. Surv. India*, **81** : 148-149.*Distribution* : Panchgani (Unused well), Maharashtra.*Source* : Deb (1983).13. *Eucypris himani* Deb1983. *Eucypris himani* Deb, *Rec. zool. Surv. India*, **81** : 150-151.*Distribution* : Duttuwadi, 0.7 km from Pune on way to Singhgarh, Maharashtra.*Source* : Deb (1983).

Genus *Strandesia* Stuhlmann, 1888

*14. *Strandesia labiata* Hartmann

1964. *Strandesia labiata* Hartmann, *Int. Rev. Gesamten Hydrobiol. Syst. Beith*; 3 : 1-55.

Diagnostic characters : Valves tuberculate, right valve with an anteroventral tip like projection, Furcal romus with a terminal seta which is shorter than claws.

Material examined and locality : 2 ♀ ♀, Shevata, 4-12-1997, Coll. S. G. Patil.

Distribution : Bombay, Maharashtra; Girnar, Kathiawar, Gujarat; Cochin, Kerala and Pondichery, Tamil Nadu; Hyderabad, Andhra Pradesh, Sikkim.

Source : Victor and Fernando (1979).

*15. *Strandesia parva* Hartmann

1964. *Strandesia parva* Hartmann, *Int. Rev. Gesamten Hydrobiol. Syst. Beith.*, 3 : 1-55.

Diagnostic characters : Left valve overlaps the right angular dorsum, both the claws smooth; dorsal margin armed with inconspicuous spines along the entire length.

Material examined and locality : 2 ♀ ♀, Shevata, 4-12-1997, Coll. S. G. Patil.

Distribution : Bombay, Ujani Wetland, Maharashtra; Jodhpur, Rajasthan; Malabar coast, Kerala and Palni Hills, Tamil Nadu.

Source : Victor and Fernando (1979) and S. G. Patil (2002).

16. *Strandesia saetosa* Hartmann

1964. *Strandesia saetosa* Hartmann, *Int. Rev. Gesamten Hydrobiol. Syst. Beith.*, 3 : 1-55.

Distribution : Barsi, Maharashtra; Malabar coast, Kerala.

Source : Victor and Fernando (1979).

17. *Strandesia rotunda* Hartmann

Distribution : Bombay, Maharashtra; Girnar, Kathiawar, Gujarat; Cochin, Kerala and Pondichery, Tamil Nadu.

Source : Victor and Fernando (1979).

Tribe CYPRINOTINI

Genus *Cyprinotus* Brady, 1886

*18. *Cyprinotus cingalensis*, Brady

1886. *Cyprinotus cingalensis* Brady, *J. Linn. Soc. Zool.*, 19 : 302.

1979. *Cyprinotus cingalensis*, Victor and Fernando, *Rec. zool. Surv. Ind.*, 74(2) : 180-181.

Diagnostic characters : Right valve tuberculated margin of the left valve smooth, valve surface smooth with scultered hairs and natatory setae of II antenna extends beyond the tip of terminal claws.

Material examined : 2 ♀♀, Lakhephal, 09-07-1999, Coll. S. G. Patil.

Distribution : Poona, Nathsagar Wetland, Ujani Wetland, Maharashtra.

Source : Victor and Fernando (1979) and S. G. Patil (2002).

19. *Cyprinotus incongruens* (Ramdohr)

Distribution : Aurangabad, Maharashtra.

Source : Victor and Fernando (1979).

20. *Cyprinotus malini* Deb

1983. *Cyprinotus malini* Deb, *Rec. zool. Surv. India*, **81** : 152-153.

Distribution : Duttuwadi, 0.7 km. from Poona, on way to Singhgarh.

Source : Deb (1983).

Genus *Cypricercus* Sars, 1894

21. *Cypricercus indrani* Deb

1983. *Cypricercus indrani* Deb, *Rec. zool. Surv. India*, **81** : 154-155.

Distribution : From rain water pond on Mahabaleshwar Panchgani Road, 0.5 km. from Mahabaleshwar.

Source : Deb (1983).

Genus *Heterocypris* Claus, 1892

22. *Heterocypris dentatomarginatus* (Baird)

1859. *Cypris dentatomarginatus* Baird, *Proc. zool. Soc. Lond.*, **389** : 233.

1979. *Heterocypris dentatomarginatus*, Victor and Fernando, *Rec. zool. Surv. India*, **74(2)** : 182-183.

Distribution : Nagpur, Maharashtra.

Source : Victor and Fernando (1979).

Genus *Hemicypris* Sars, 1903

23. *Hemicypris anomala* (Klie)

1938. *Heterocypris anomala* Klie, *Bull. Biogeogr. Soc. Jpn.*, **8** : 23.

1979. *Hemicypris anomala*, Victor and Fernando, *Rec. zool. Surv. India*, **74(2)** : 183-184.

Distribution : South Bombay, Maharashtra; Vridachalam, Tirupattur, Pondicherry, Madurai District Tamil Nadu; Travancore, Kerala.

Source : Victor and Fernando (1979).

Subfamily CYPRETTINAE

Genus *Cypretta* Vavra, 1895

24. *Cypretta fontinalis* Hartmann

Distribution : Mountainous terrains of Maharashtra, Palni Hills, Tamil Nadu, Travancore, Kerala.

Source : Victor and Fernando (1979).

25. *Cypretta gargi* Deb

1983. *Cypretta gargi* Deb. *Rec. zool. Surv. India*, **81** : 163-164.

Distribution : Temporary Pond at Karla, 13 kms south of Lonavala, on Bombay Poona Road.

Source : Deb (1983).

26. *Cypretta globulus* (Sars)

1889. *Cypridopsis globulus* Sars, *Arch. Math. Natur. Kristiania*, **8** : 53.

1931. *Cypretta globulus* Sars, Arora, *Bull. Dep. Zool. Punjab Univ.*, **1** : 88.

1979. *Cypretta globulus* (Sars), Victor and Fernando, *Rec. zool. Surv. India*, **74(2)** : 191-192.

Distribution : Ujani Wetland, Maharashtra; Andhra Pradesh and Lahor.

Source : Victor and Fernando (1979) and S. G. Patil (2002).

Genus *Stenocypris* Sars, 1889

*27. *Stenocypris major* (Baird)

1859. *Cypris cylindrica major* Baird, *Proc. zool. Soc. Lond.*, **389** : 233.

1979. *Stenocypris major*, Victor and Fernando, *Rec. zool. Surv. India*, **74(2)** : 193-194.

Diagnostic Characters : Valve surface is variable either with punctuations alone or also with a sparse distribution of hairs. Furcal rami asymmetrical, terminal seta ½ the length of terminal claw.

Material examined and locality : 3 ♀♀, Kaigaon phata, 07-12-1997, Coll. S. G. Patil; 2 ♀♀, Shevata, 29-07-1998, Coll. D. B. Bastawade; 2 ♀♀, Sagardarshan, 29-03-2000, Coll. R. H. Kamble.

Distribution : Bombay area, Ujani Wetland, Maharashtra; Bhopal, Madhya Pradesh; Palni Hills, Madurai Dist, Trichy District, Ramnad District, Madras, Tamil Nadu; Trivandrum, Kerala; Girnar reservoir, Gujarat and West Bengal.

Source : Victor and Fernando (1979) and S.G. Patil (2002).

***28. *Stenocypris derupta* Vavra**

1906. *Stenocypris derupta* Vavra, *Zool. Jb. (Syst.)* : 23 : 426.

1979. *Stenocypris derupta*, Victor and Fernando, *Rec. zool. Surv. India*, 74(2) : 195-196.

Diagnostic characters : Valves elliptical; laterally elongate interiorly rounded and posteriorly pointed, natatory setae of second antenna setulate and does not extend upto the tip of the terminal claws.

Material examined and locality : 2 ♀♀, Sagardarshan, 06-07-1999, Coll. S. G. Patil.

Distribution : Pandharpur, Maharashtra; Guntur, Andhra Pradesh, Vaigai Nursery, Andipatti (Madurai District), Tamil Nadu.

Source : Victor and Fernando (1979).

***29. *Stenocypris hislopi* Ferguson**

1969. *Stenocypris hislopi* Ferguson, *Oliver and Boyd. Edin.* : 69.

1979. *Stenocypris hislopi*, Victor and Fernando, *Rec. zool. Surv. India*, 74(2) : 196-197.

Diagnostic characters : The toothed end claw of the third thoracic leg is unique characters of this species, and the left furcal ramus of *S. hislopi* has smooth dorsal margin to separate it from the *S. major*.

Material examined and locality : 3 ♀♀, Dahiphal, 21-02-1999, Coll. A. S. Mahabal; 2 ♀♀, Ramdoh, 21-04-1999, Coll. R. M. Sharma.

Distribution : Nagpur, Maharashtra; Kovur, Andhra Pradesh; Salem, Tamil Nadu.

Source : Victor and Fernando (1979).

30. *Stenocypris khopoliensis* Deb

1983. *Stenocypris khopoliensis* Deb., *Rec. zool. Surv. India*, 81 : 156-157.

Distribution : Khopoli, rain water Pond at Karla, 13 kms. South of Lonavala on Bombay Poona Road.

Source : Deb (1983).

31. *Stenocypris sohni* Deb

1983. *Stenocypris sohni* Deb, *Rec. zool. Surv. India*, 81 : 157-158.

Distribution : Rain water pond at Kolhapur, 8 kms. North of Inspection Bunglow.

Source : Deb (1983).

Genus *Chrissia* Hartmann, 1957

32. *Chrissia humilis indica* (Klie)

Distribution : Bombay, Ujani Wetland, Maharashtra; Travancore (Kerala); Pondicherry, Kanyakumari, Tamil Nadu; and West Bengal.

Source : Victor and Fernando (1979) and S. G. Patil (2002).

*33. *Chrissia krishnakantai* (Deb)

1972. *Stenocypris krishnakantai* Deb, *J. zool. Soc. India*, 1 : 93.

1979. *Chrissia krishnakantai*, Victor and Fernando, *Rec. zool. Surv. India*, 74(2) : 204-205.

Diagnostic characters : Anterior margin broadly rounded and posterior margin pointed, radial bond of septa absent; surface hairy.

Material examined and locality : 2 ♀ ♀, Kaigaon, 22-11-1998, Coll. S. G. Patil.

Distribution : Maharashtra : Nathsagar Wetland and Satara.

Source : Victor and Fernando (1979).

Genus *Parastenocypris* Hartmann, 1964

34. *Parastenocypris canaliculata* Hartmann

Distribution : Nagpur, Maharashtra.

Source : Victor and Fernando (1979).

Subfamily CYPRIDOPSINAE

Genus *Cypridopsis* Brady, 1868

35. *Cypridopsis dispar* Hartmann

1964. *Cypridopsis dispar* Hartmann, *Abb. 61, a-f; Abb. 62, a-f*, p. 136.

Distribution : Pandharpur and Tulsidam, Maharashtra; Hyderabad, Guntur and Kovur, Andhra Pradesh; Trichy District, Madurai Dist and Madras, Tamil Nadu; Mysore in Karnataka.

Source : Victor and Fernando (1979).

Family CYCLOCYPRIDIDAE

Genus *Physocypris* Vavra, 1897

*36. *Physocypris furfuracea* (Brady)

1886. *Cypris furfuracea* Brady, *J. Linn. Soc. Zool.*, 19 : 299.

1979. *Physocypris furfuracea*, Victor and Fernando, *Rec. zool. Surv. India*, 74(2) : 215-216.

Diagnostic characters : *Physocypris furfuracea* (Gurney) was widely known as *P. tubercata* but it is redescribed as *P. furfuracea* Brady by Victor and Fernando (1979).

Material examined and locality : 2 ♀♀, Dahigaon, 27-09-1997, Coll. R. M. Sharma; 3 ♀♀, Shevata, 07-07-1999, Coll. S. G. Patil.

Distribution : Pandharpur, Nathsagar Wetland, Maharashtra; Madurai District, Selam, Sri Rangam and Pondicherry, Tamil Nadu; Kovur and Guntur, Andhra Pradesh; Kathiawar Peninsula, Gujarat.

Source : Victor and Fernando (1979).

Family NOTODROMADIDAE

Genus *Indiacypris* Hartmann, 1964

37. *Indiacypris dispar* Hartmann

Distribution : Aurangabad, Barsi and Kandheri, Maharashtra; Palni hills, Tamil Nadu, Ernakulum, Quilon, Kerala.

Source : Victor and Fernando (1979).

Family ILYOCYPRIDIDAE

Genus *Ilyocypris* Brady and Norman, 1889

38. *Ilyocypris australiensis* Sars

Distribution : Aurangabad, Maharashtra.

Source : Victor and Fernando (1979).

SUMMARY

The freshwater Ostracods reported in the present study belong to the Superfamily Cypridacea. They have been spread into four families, 15 genera representing 38 species on the basis of earlier record and the present study. Out of these 38 species 9 species are recorded for the first time from Nathsagar Wetland, District Aurangabad and Ahmadnagar area.

Ostracods are relatively non-mobile and their dispersal is passive transport by birds and insects as stated by (Klie, 1939). Here attempts were made to provide a distribution of freshwater Ostracods of Maharashtra. However, more surveys in this region will undoubtedly reveal the existence of much more fauna than what is known now.

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CLADOCERA : CRUSTACEA

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INTRODUCTION

Nathsagar-Jaikwadi wetland is large waterspread area in Maharashtra State near Paithan. In 1986 it has been notified by state government as Bird Sanctuary as large flocks of migratory birds visiting this place including flamingoes. The comprehensive studies of various faunal components of Jaikwadi wetland was taken by Zoological Survey of India, Pune and the present study based on the extensive collections made by various tour parties in all seasons throughout year.

Cladocera, subclass of Branchiopoda of class Crustacea are freshwater microcrustaceans also called as water fleas are the major component in planktonic ecosystem. Cladocerans are not studied well from Indian wetlands. However there are some scattered studies are available. Vankataraman, 1988, 1990, 1992 studied cladocera of Keoladeo National Park; Yousuf *et al.*, 1984 study cladocera from Anchar lake, Kashmir; Pandit *et al.*, 1982 studied cladocera of Kashmir wetlands and Rane, 2002 published account on cladocera fauna of Ujani wetland of Maharashtra.

MATERIALS AND METHODS

This study focuses on the taxonomical and distributional study of cladocera from Jaikwadi wetland. Cladocera collected by using plankton nets with circular mouth about 30 cms diameter made from bolting silk. The samples were collected in shallow waters, among the vegetation and in open deep waters. In most localities vertical hauls from bottom to surface were made at some distance away from the shore. Samples from over-grown littoral region were collected by using a wide mouth glass bottle, roughly 100 liters of water were taken from among the plants and poured and filtered through plankton net. Sample collected were then preserved in 5% of formalin. Temporary slides were made using glycerine as mounting media and identification was carried out under the compound microscope.

SYSTEMATIC LIST

Phylum ARTHROPODA

Class CRUSTACEA

Subclass BRANCHIOPODA

Order CLADOCERA

Family I SIDIDAE Sars, 1865

Genus *Diaphanosoma* Fischer, 1850

1. *Diaphanosoma excisum* Sars, 1885
2. *Diaphanosoma sarsi* Richard, 1895

Family II DAPHNIIDAE Straus, 1820

Genus *Ceriodaphnia* Dana, 1853

3. *Ceriodaphnia cornuta* Sars, 1885

Genus *Simocephalus* Schoedler, 1858

4. *Simocephalus vetulus* (O. F. Muller, 1776)
5. *Simocephalus latirostris* Stingelin, 1906

Subfamily SCAPHOLEBERINAE

Genus *Scapholeberis* Schoedler, 1858

6. *Scapholeberis kingi* Sars, 1903b

Family III MOINIDAE Goulden, 1967

Genus *Moina* Baird, 1850

7. *Moina micrura* Kurz, 1874
8. *Moina micrura dubia* (Gurne and Richard, 1892)
9. *Moina brachiata* (Jurine, 1820)

Family IV BOSMINIDAE Sars, 1865

Genus *Bosminopsis* Richard, 1895

10. *Bosminopsis deitersi* Richard, 1895

Genus *Bosmina* Baird, 1845

11. *Bosmina longirostris* (O. F. Muller, 1776)

Family V MACROTHRICIDAE Baird, 1843

Genus *Macrothrix* Baird, 1843

12. *Macrothrix spinosa* King, 1853

Genus *Echinisca* Liévin, 1848

13. *Echinisca triserialis* (Brady, 1886)
14. *Echinisca capensis monodi* Gauthier, 1930

Family VI CHYDORIDAE Stebbing, 1902

Subfamily CHYDORINAE Stebbing, 1902

Genus *Pleuroxus* Baird, 1843

15. *Pleuroxus laevis* Sars, 1862a
16. *Pleuroxus denticulatus* Birge, 1879

Genus *Chydorus* Leach, 1816

17. *Chydorus kallipygos* Brehm, 1933a
18. *Chydorus ventricosus* Daday, 1898
19. *Chydorus sphaericus* (O. F. Muller, 1776)
20. *Chydorus reticulatus* Daday, 1898
21. *Chydorus eurynotus* Sars, 1901

Genus *Ephemeroporus* Frey, 1982

22. *Ephemeroporus barroisi* (Richard, 1982)

Genus *Dunhevedia* King, 1853

23. *Dunhevedia crassa* King, 1853
24. *Dunhevedia crassa ciliocaudata* (Sovinski, 1891)

Genus *Pseudochydorus* Fryer, 1968

25. *Pseudochydorus globosus* (Baird, 1843)

Genus *Camptocercus* Baird, 1843

26. *Camptocercus rectirostris* Schoedler, 1862

Genus *Alona* Baird, 1843

27. *Alona davidi* Richard, 1895a
28. *Alona davidi punctata* (Daday, 1898)

29. *Alona rectangula richardi* (Stingelin, 1895)
 30. *Alona pulchella* King, 1853
 31. *Alona intermedia* Sars, 1862
 32. *Alona archeri* Sars, 1888

Genus *Graptoleberis* Sars, 1862a

33. *Graptoleberis testudinaria nathsagarensis* ssp. nov.

Genus *Leydigia* Kurz, 1875

34. *Leydigia acanthocercoides* (Fischer, 1854)
 35. *Leydigia australis* Sars, 1886

Genus *Biapertura* Smirnov, 1971

36. *Biapertura karua* King, 1853
 37. *Biapertura verrucosa* (Sars, 1901)

Genus *Kurzia* Dybowski and Grochoviski, 1894

38. *Kurzia longirostris* (Daday, 1898)

Genus *Indialona* Petkovaski, 1966

39. *Indialona ganapati* Petkovski, 1966.

SYSTEMATIC ACCOUNT

1. *Diaphanosoma excisum* Sars

1885. *Diaphanosoma excisum* Sars, *Norske. vidensk. Selsk. Forhandl. Christiania.*, 8: p. 13-18, pl. 2, figs. 1-3.
 1933a. *Diaphanosoma paucispinosum* Brehm, *Arch. Hydrobiol., Suppl.*, 11 : p. 656-659, fig. 3.

Material examined : Nathsagar wetland 3 exs., Gangapur, 13.10.99; 2 exs., Randoh, 14.10.99 (Coll. P. P. Kulkarni); 1 ex., Lachephal, 26.9.97; 4 exs., Dahigaon, 20.4.99 (Coll. R. M. Sharma); 10 exs., Kayagaon, 7.12.97 (Coll. S. G. Patil); 2 exs., Sagardarshan, 23.2.99 (Coll. A. Mahabal); 1 ex., Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Female length 0.8 mm. Posterior end of carapace abruptly truncate, carapace almost oblong. Post-ventral corner of valve with variable number of denticles followed by delicate cilia. Duplicature joining ventral shell margin at nearly right angle. Head large, oblong-quadrate; eye relatively large with numerous lenses, located in the frontal portion of head. Reflexed antenna not reaching posterior margin of valves. Postabdomen narrow with fine setules. Claw with three basal spines decreasing in size proximally.

Distribution : India : West Bengal, Tripura, Rajasthan, Bihar, Maharashtra, Tamil Nadu.
Elsewhere : Common in tropics and subtropics.

2. *Diaphanosoma sarsi* Richard

1894a. *Diaphanosoma sarsi* Richard, *Revue biol. du Nord France*, vi, p. 365, pl. 15, Figs. 1-8.

1898. *Diaphanosoma singalense* Daday, *Terms. Fezetek*, 21 : p. 62-68, figs. 32a-b.

Material examined : Nathasagar wetland - 8 exs., Nathasagar dam, 7.7.99 (Coll. S. G. Patil); 1 ex., Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Female length - 0.7 mm. Carapace oblong, transversely truncate behind with almost rectangular at posterodorsal corner. Posteroventral corner armed with series of small denticles (12-20) followed by small setae. Shell duplicature broad on distal end. Well defined head, slightly tapering distally. Eye large and situated near anterior margin of head. Antenna not reaching hind edge of carapace. Postabdomen narrow. Claw with three basal spines and setae at concave margin.

Distribution : India : Bihar, Rajasthan, Meghalaya, West Bengal, Tamil Nadu, Tripura, Maharashtra. *Elsewhere* : Pantropical.

3. *Ceriodaphnia cornuta* Sars

1885. *Ceriodaphnia cornuta* Sars, *Norske, Vidensk, Selsk, Forhandl. Christiania.*, 8 : p. 26-28, pl. 5, figs. 1-3.

1894b. *Ceriodaphnia rigaudi* Richard, *Revue Biol. Nord. France*, 6 : p. 367.

Material examined : Nathasagar wetland - 5 exs., Kayagaon, 7.12.97 (Coll. S. G. Patil); 10 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 3 exs., Sagardarshan, 11.10.99 (Coll. P. P. Kulkarni); 20 exs., Dahigaon, 20.4.99 (Coll. R. M. Sharma); 4 exs., Kayagaon, 7.12.97 (Coll. S. G. Patil); 2 exs., Lakhaphal, 22.2.99 (Coll. A. Mahabal); 3 exs., Saukheda, 12.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 0.55 mm., Carapace of female rather tumid, broad oval; produced into projection, lying slightly above the longitudinal axis; valve reticulate with polygonal and hexagonal cells. Head small, separated from body by a distinct ocular depression. Short and deflexed rostrum. Head with short horn over eye and anteriorly in few specimens. Eye large, ocellus small. Antennules small fusiform, lateral sensory seta distal to middle. Post-abdomen with 5-6 anal spine. Claw short, stout and setulate.

Distribution : India : West Bengal, Tripura, Bihar, Rajasthan, Meghalaya, Maharashtra. *Elsewhere* : Comotropical, China and Japan.

4. *Simocephalus vetulus* (O. F. Muller)

1778. *Daphne vetula* O. F. Muller, *Havniae*, p. 199, No. 2399.

1898. *Simocephalus vetuloides* Sars, *Zool. Mus. Imp. Acad. Sco.*, 3 : p. 5-6, pl. VI, figs. 11-12.

1852. *Daphania elizabethae* King, *Pap. and Proc. R. Soc. Van. Diemen Land*. Hover Town, 2(2) : p. 243-253.

1935. *Simocephalus elizabethae* : Sewell, *Int. Rev. Ges. Hydr. u. Hydr.*, Leipzig, 31(3-4) : p. 210-211.

Material examined : Nathsagar wetland - 2 exs, Sagardharshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Saukheda, 25.2.99 (Coll. A. Mahabal); 5 exs., Bramhagavan, 10.10.99; 3 exs., Saukheda, 12.10.99 (Coll. P. P. Kulkarni); 3 exs., Lakhaphal, 18.4.99; 2 exs., Shevta, 17.4.99 (Coll. R. M. Sharma); 2 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil).

Diagnostic characters : Carapace rounded-trigonal in outline, no posterior spine present, posterodorsal corner with blunt angle. Dorsal margin strongly arched; posterior part of it with distinct denticles. Head round in front and small. Eye moderately large, ocellus large and elongated. Postabdomen broad with about 10 anal spines, curved and ciliated. Claw long, curved and denticulate.

Distribution : India : Punjab, Tripura, Kashmir, Andaman and Nicobar Islands, Karnataka, W. Himalaya, Rajasthan, Bihar, West Bengal, Maharashtra. *Elsewhere* : Cosmopolitan.

5. *Simocephalus latirostris* Stingelin

1906. *Simocephalus latirostris* Stingelin, *Ann. Biol. Lacustre, Brasells*, 14 : p. 187-189, figs. 5-7.

1971. *Simocephalus latirostris* (Stingelin) : Biswas, *Rec. zool. Surv. India*, 63 : p. 115, figs. 6 B-D.

Material examined : Nathsagar wetland 1 ex., Sagardharshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Ramdoh, 14.10.99; 2 exs., Gangapur, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 1.2 mm. Carapace almost oval, produced posteriorly into distinct conical spine bearing spinules near tip. Posterior region of dorsal margin of valve with spinules. Inner ventral margin with setae. Carapace markings reticulate with hexagon. Head with long beak like broadened rostrum. Frons are evenly rounded. Eye and ocellus present. Ocellus triangular or rhomboidal. Antennules slightly longer than rostrum with lateral seta near the base. Postabdomen less broad with 5 anal spines, proximal most anal spine very small. Claw long slender and with ciliated concave margin.

Distribution : India : Rajasthan, Tamil Nadu. This is first record from Maharashtra. *Elsewhere* : Pantropical.

6. *Scapholeberis kingi* Sars

1903b. *Scapholeberis kingi* Sars, *Archiv. Math. Natur. Christiania*, 25 : p. 8-10, pl. 1 figs. 2a-c.

1853. *Daphnia mucronata* King, *Proc. R. Soc. van Diemens Land*. 2 : pl. 2E.

1916. *Scapholeberis kingi* Sars, *Ann. S. Afr. Mus. Capetown*, 15 : p. 314-315, pl. 32, figs. 3b.

Material examined : Nathsagar wetland 20 exs., Sagardharshan, 3.7.98 (Coll. P. D. Rane); 5 exs., Ramdoh, 14.10.99; 2 exs., Gangapur, 13.10.99; 2 exs., Dhakaphal, 9.10.99 (Coll. P. P. Kulkarni); 11 exs., Ramdoh, 23.11.99; 7 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil).

Diagnostic characters : Length of female 0.7 mm. Carapace oval-quadrangular. Posteroventral corner produced into short spine pointing backward. Ventral margin of valve almost straight slightly

angular in front; densely ciliated. Valve sculptured with distinct transverse striae, strong in the posterior part. Head rounded at anterior region, ventral margin deeply concave. Rostrum short and blunt. Eye large; ocellus relatively small and located close to tip of rostrum. Antennule's short, immovable, located behind the rostrum. Postabdomen short and broad with 4-5 anal spines. Claw moderately long, stout with setae on its concave margin.

Distribution : India : West Bengal, Kashmir and Nilgiri Hills, Rajasthan, Meghalaya, Assam, Tamil Nadu, Maharashtra, Andaman and Nicobar Islands. *Elsewhere* : Africa, North and South America, South-East Asia, China, Sri Lanka.

7. *Moina micrura dubia* (Gurue and Richard)

1892. *Moina dubia* Gurue and Richard, *Mem. Soc. Zool. France*, Paris, 5 : p. 527-530, figs. 1 & 2.

1953. *Moina dubia* : Brehm, *Osterr. Zool. Z.*, Vienna, 4(3) : p. 334-336.

1969. *Moina micrura dubia* : Goulden, *Trans. Amer. Phil. Soc., N.S.*, 58(6) : p. 32, figs. 10E & 11F.

Material examined : Nathsagar wetland 3 exs., Teloegaon, 9.2.01 (Coll. P. P. Kulkarni), 5 exs., Ramdoh, 14.10.97 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.6 mm. Proximal part of ventral margin of valve with strong spines, distal part with groups of spinules. Absence of across any ridge on end claw and head depression at an angle of 70°. Postabdomen has distinct pecten of about 15 teeth and the two sensory setae at the base of second antenna are long. Absence of hairs on the head. Other characters are similar with the typical *Moina micrura*.

Distribution : India : Rajasthan, West Bengal, Bihar, South India. Recorded first time in Maharashtra. *Elsewhere* : Java, Australia, Africa (Sahara, Uganda, Congo, Transuaal and Kenya) and Europe.

8. *Moina micrura* Kurz

1874. *Moina micrura* Kurz, *Sitzber. K. Acad. Wiss. Wein. Math. Nath.*, 70 : p. 13-15, pl. I, fig. 1.

Material examined : Nathsagar wetland 2 exs., Ramdoh, 14.10.99; 1 ex., Brahmhagavan, 10.10.99 (Coll. P. P. Kulkarni); 10 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Saukheda, 25.2.99 (Coll. A. Mahabal); 4 exs., Kaigaon, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 1.1 mm. Head large with well developed supraocular depression. Anterior and ventral margin of head evenly rounded. Eye large. Valve reticulated; ventral margin of valve with 11-25 long setae followed by groups of short setae. Antennules large, thin, originate well behind the eye with basal seta. Postabdomen short, slender and with distal conical part; distal margin with bident and 5-9 feathered lateral setae. Claw long, curved, ventral base of claw with 3-7 teeth; concave margin with fine setae, proximal setae comparatively larger and forming a distinct pecten.

Distribution : India : West Bengal, Nilgiri Hills, Bihar, Rajasthan, Maharashtra. *Elsewhere* : Africa, Syria, USSR, France, Philippines.

9. *Moina brachiata* (Jurine, 1820)

1820. *Monocules brachiatus* Jurine, *Historie Monocles Geneve*, Geneva and Paris, p. 131, pl. 12, figs. 1, 2.

1850. *Moina brachiata* Baird, *Natural History, Brit. Entom., Ray, Soc.*, London, 102 : pl. IX, figs. 1, 2.

Material examined : Nathsagar wetland 2 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Saukheda, 12.10.99 (Coll. P. P. Kulkarni); 2 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil).

Diagnostic characters : Length of female 1.1 mm. Head broad; supraocular depression located above eye. Eye situated near the dorsal margin of head. Antennules long and thin with sensory seta located laterally. Ventral margin of valve with 35-41 long setae at anterior two thirds of valve margin followed by groups of shorter setae. Post-abdomen large and rather long, its dorsal margin with long bident tooth and 9-14 feathered teeth. Claw with large pecten of 11-14 teeth followed by short setae; ventrally claw with 5-8 thin teeth.

Distribution : India : Kashmir, Rajasthan, Meghalaya. *Elsewhere* : Europe, England, Russia, Mongolia, Italy, Greece, Africa, Philippines. Throughout the old world.

10. *Bosminopsis deitersi* Richard

1895. *Bosminopsis deitersi* Richard, *Bull. Soc. Zool. de France*, 20 : p. 96, figs. 1-4.

Material examined : Nathsagar wetland - 100 exs., Ramdoh, 14.10.99; 5 exs., Kaigaon, 14.10.99; 2 exs., Gangapur, 13.10.99; 10 exs., Shevgaon, 14.10.97 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.23 mm. Body oval, posterodorsal corner of valves distinct; posteroventral corner with small micro-like process and with 1 or 2 spinules before it. Head very large, with a long rostrum and with supraocular depression. Antennules long, united with each other at basal part and with about 5-6 sensory setae on the ventral side near apex. Postabdomen proximally. Claw large with one large basal spine.

Distribution : India : Delhi, Madhya Pradesh, Tripura. *Elsewhere* : Asia, Africa, North and South America.

11. *Bosmina longirostris* (O. F. Muller, 1776)

1776. *Lynceus longirostris* (O. F. Muller), *Havniae*, p. 76, tab. 10, figs. 7-8.

1862a. *Bosmina longirostris* Sars, *Forhandi vidensk. Selesk. Christiania*, p. 162.

Material examined : Nathsagar wetland - 10 exs., Dhakephal, 9.10.99; 2 exs., Saukheda, 12.10.99 (Coll. P. P. Kulkarni); 2 exs., Lakhaphal 22.2.99 (Coll. A. Mahabal).

Diagnostic characters : Length of female - 0.6 mm. Body almost oval, posterodorsal corner of valve angular, posteroventral corner produced into backwardly directed spine (mucro). Head large,

more or less arched in front of eye. Eye usually very large. A small sensory hair situated nearer to eye than to base of antennule. Antennules almost parallel to each other, delicate and curved; Olfactory setae on lateral and near base of each antennule. Antenna with 3 and 4 segmented rami. Postabdomen almost quadrate. Claw with proximal pecten of 3-6 spinnules and distal pecten of 7-10 spines continued distally into minute spinnules.

Distribution : India : Kashmir, Meghalaya, West Bengal, Maharashtra, Tripura. *Elsewhere* : Cosmopolitan.

12. *Macrothrix spinosa* King

1852. *Macrothrix spinosa* King, *Pap. Proc. R. Soc. van. Diemens Land*. Hover Town, 2(2) : p. 25-26, pl. 6E.

1888. *Macrothrix spinosa* Sars, *Forh. Vid., Selsk, Christiania*, 7 : p. 25-32, pl. 3, figs. 1-6.

Material examined : Nathsagar wetland 5 exs., Ramdoh, 14.10.99 (Coll. P. P. Kulkarni); 4 exs., Sagardarshan, 23.2.99 (Coll. A. Mahabal); 2 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil); 2 exs., Sagardarshan 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Length of female - 0.3 mm. Carapace broadly oval. Dorsal margin almost evenly arched, ventral margin subangulate in middle and obliquely ascending posteriorly. Posterior end with short protuberance along the axis of body. Head sub-triangular with prominent rostral projection. Head with arched ridge. Antennules enlarged at apex; anterior margin with several fine incisions and clusters of setules and with ventral angulation. Shell reticulate and dorsal surface with distinct squamous sculpture. Ventral edge of valves serrate and armed with slender spines. Eye large, ocellus small and located near the tip of rostrum. Postabdomen short, bilobed with strong anal denticles along dorsal edge and row of minute lateral spines. Claw very short with setae on concave margin.

Distribution : India : Rajasthan, Manipur, Maharashtra, Andaman and Nicobar Islands, Tripura and Tamil Nadu. *Elsewhere* : Cosmopolitan.

13. *Echinisca triserialis* (Brady, 1886)

1886. *Macrothrix triserialis* Brady, *J. Linn. Soc. Lond. Zool.* London, 19 : p. 295, pl. 37, figs. 16-20.

1971. *Echinisca triserialis* : Smirnov, *Zool. Inst. Acad. Nauk. USSR, New Ser*, 112 : p. 109-110, figs. 81-89.

Material examined : Nathsagar wetland 1 ex., Ramdoh, 14.10.99, 1 ex., Dhakephal, 9.10.99 (Coll. P. P. Kulkarni); 10 exs., Kayagaon, 7.12.97 (Coll. S. G. Patil).

Diagnostic characters : Length of female 0.5 mm. Body almost oval, dorsal margin slightly arched, ventral more strongly arched and protuberant in the middle. Valves reticulate, dorsal margin with serrations in the posterior region. Ventral margin with serrations and bristles and serrations on posteroventral margin arranged in groups of three. Head large, with ridge over its edges. Rostrum small. Eye large; ocellus small and located near tip of rostrum. Antennules slender, cylindrical and

olfactory setae unequal in length; antennules with notches on anterior margin, sensory seta situated near the base. Postabdomen large, bilobed with anal spines on both lobes. Claw short and curved.

Distribution : India : West Bengal, Rajasthan, Maharashtra, Tripura, Tamil Nadu, Andaman and Nicobar Islands. *Elsewhere* : Cosmotropical.

14. *Echinisca capensis monodi* Gauthier

1930. *Macrothrix capensis* var. *monodi* Gauthier, *Bull. Mus. Nat. Hist. Natur. Paris*, II : p. 92-116.

1959. *Guernella monodi* Rey and Saint, *Annales de Limnologie*, p. 177-182.

Material examined : Nathsagar wetland - 1 ex., Ramdoh, 14.10.99; 2 exs., Sagardarshan, 11.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.9 mm. Body almost rounded oval; dorsal and ventral margin evenly arched, posterior end with small protuberance above the axis of body. Shell marked with pentagonal reticulation. Dorsal body smooth, ventral margin slightly serrated, minute, blunt teeth posteriorly with long setae. Head with small rostrum. Plate of labrum with transverse ridges. Eye moderately large near vertex. Ocellus small, at the tip of rostrum. Antennule long, straight, with three large spine and sensory seta near the base. Postabdomen moderately large, bilobed; preanal parts with dense setae. Postanal part with row of spines. Claw short and curved.

Distribution : India : Tripura and firstly recorded in Maharashtra State. *Elsewhere* : Sri Lanka, Malaysia, Africa.

15. *Pleuroxus laevis* Sars

1862. *Pleuroxus laevis* Sars, *Forhandl. Vidensk. Selask. Christiania*, p. 164-165.

Material examined : Nathsagar wetland 1 ex., Sagardarshan, 3.7.88 (Coll. P. D. Rane); 2 exs., Brahadgavan, 10.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.42 mm. Dorsal margin of body uniformly convex, ventral margin only slightly convex. Posterodorsal corner distinct and slightly projecting. Posteroventral corner with a denticle; small setae all along the inner side of the posterior margin. Rostrum long, directed posteroventrally. Antennules ending before middle of rostrum; anterior margin of antennule with sensory seta on the distal end. Plate of labrum with convex anterior margin and broad apex. Ocellus small than eye situated near to eye than apex of rostrum. Postabdomen taper distally; anal spines irregularly distributed. Claw with two basal spines and setae on concave margin. Maximum height of valves about 2-3 times that of posterior margin.

Distribution : India : Kashmir. This is only second record of species in India and first record from Maharashtra. *Elsewhere* : Holarctic region, Africa, Sri Lanka, European USSR.

16. *Pleuroxus denticulatus* Birge

1879. *Pleuroxus denticulatus* Birge, *Trans. Wis. Acad. Arts. and Letts.*, 4 : p. 20-21, pl. 1, fig. 21.

Material examined : Nathsagar wetland - 1 ex., Ramdoh, 25.11.99 (Coll. S. G. Patil).

Diagnostic characters : Length of female - 0.35 mm. Body broadly oval, dorsal margin arched, ventral posterior margin straight with 2 denticles. Maximum height of valves about 3-5 times that of posterior margin. Valve striated. Rostrum long, pointed. Antennules ending far from apex of rostrum. Eye and ocellus present. Postabdomen tapering distally, with 3-4 large distal anal spines and about 10 anterior to them. Group of lateral setae present. Claw with two basal spines, distal is much longer than proximal.

Distribution : India : West Bengal. First record from Maharashtra State. *Elsewhere* : North and South America, Africa, United Kingdom. Easter China and France.

17. *Chydorus kallipygos* Brehm

1934. *Chydorus kallipygos* Brehm, *Arch Hydrobiol.*, 26 : p. 74-75, figs. 27-29.

Material examined : Nathsagar wetland - 2 exs., Shevta, 17.4.99 (Coll. R. M. Sharma); 1 ex., Dahigaon, 8.12.97, (Coll. S. G. Patil); 1 ex., Dhakephal, 9.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.55 mm. Body almost oval, maximum height around middle posterodorsal corner of valves distinct and projecting; posteroventral corner rounded without spine. Valve with pattern of polygaons. Rostrum short and pointed. Antennules ending far before apex of rostrum. Plate of labrum rounded, with anterior depression. Ocellus situated almost midway between eye and apex of rostrum. Postabdomen with 10 anal spines. Preanal corner strongly projecting. Margin of anus with setae.

Distribution : India : Tamil Nadu, Maharashtra. *Elsewhere* : Ethiopian region.

18. *Chydorus ventricosus* Daday

1898. *Chydorus ventricosus* Daday, *Termis Furetk*, 21 : p. 28-29, figs. 10 a-b.

Material examined : Nathsagar wetland 10 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 4 exs., Lakhaphal, 18.4.99 (Coll. R. M. Sharma).

Diagnostic characters : Length of female - 0.5 mm. Body oval, posteroventral and posterodorsal corners rounded without denticles. Ventral margin strongly bulged in middle with long setae and submarginal setae posterior to bulge. Posterior margin double lined with transverse setae. Valve with faint polygons under wavy margin enclosing dots. Rostrum long, pointed and slightly indented on the anterior marginal tip. Ocellus about half of eye. Postabdomen elongated with preanal corner distinct with 10 marginal spines and lateral groups of setules. Claw with setae on concave margin and slender basal spine.

Distribution : India : Nilgiri Hills, Gujarat, Rajasthan, Maharashtra, Tamil Nadu. *Elsewhere* : Sri Lanka, China, Java, East Africa, South America (Paraguay).

19. *Chydorus sphaericus* (O. F. Muller)

1776. *Lynous sphaericus* O. F. Muller, *Havnae*, p. 119.

1900. *Chydorus sphaericus* Lilljeborg, *Nova. Acta Regiae Societatis Scientiarum. Upsaliensis, Ser. III, 19* : p. 561-567, pl. 77, figs. 8-25.

Material examined : Nathsagar wetland - 4 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Dahigaon, 27.9.77 (Coll. R. M. Sharma); 1 ex., Ramdoh, 14.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.3 mm. Body sphaerical, length slightly more than height. Posterodorsal corner distinct and posteroventral corner without denticles. Valves with reticulated with pentagonal and hexagonal cells without dots and pits. Rostrum pointed. Antennules with sensory seta near middle, anal sensory setae on tips. Plate of labrum with pointed apex. Ocellus is near to eye than apex of rostrum. Postabdomen short, with 7-10 anal denticles. Preanal corner projecting. Lateral setae in several groups and arranged in one row. Claw with two basal spines and setae on concave margin.

Distribution : India : West Bengal, Tripura, Bihar, Kashmir, Ladakh, Nilgiri Hills, Meghalaya, Maharashtra. *Elsewhere* : Cosmopolitan.

20. *Chydorus reticulatus* Daday

1898. *Chydorus reticulatus* Daday. *Termes. Fuzetek*, 21 : p. 27, figs. 9 a-d.

1971. *Chydorus reticulatus* : Smirnov, *Acad. Sci. Zool. Institute Nova Ser.* No. 101, p. 308, fig. 341.

Material examined : Nathsagar wetland 2 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Length of female - 0.3 mm. Posteroventral corner rounded, without denticles. Posterodorsal corner of valve well marked. Valve strongly reticulated with dots inside. Rostrum long, pointed, curved posteriorly. Antennule reaching middle of rostrum. Plate of labrum elongated, differentiated with rounded apex. Postabdomen tapering distally. Anal denticles 8-10. Claws with 2 basal spines with setules on the concave margin. Ocellus half as large as eye. Body somewhat spherical in outline.

Distribution : India : Rajasthan, Kerala, Maharashtra. *Elsewhere* : Sri Lanka, Java, Thailand.

21. *Chydorus eurynotus* Sars, 1901

1901. *Chydorus eurynotus* Sars, *Arch. Math. Nat.*, 23 : p. 70, p. 11, figs. 3, 3 a-c.

Material examined : Nathsagar wetland - 3 exs., Ramdoh, 23.11.98 (Coll. S. G. Patil); 1 ex., Dahigaon, 27.9.97 (Coll. R. M. Sharma).

Diagnostic characters : Length of female 0.3 mm. Posteroventral corner of valve rounded without denticles. Rostrum pointed. Antennules not reaching apex of rostrum. Plate of labrum broadly rounded, slightly depression at anteroventral region. About 10-12 anal denticles and lateral setae present on the postabdomen. Intestine forming loops. Claw with two basal spines. Valve faintly reticulated-honey comb type with pits inside.

Distribution : India : Rajasthan. First record from Maharashtra. *Elsewhere* : Ethiopian, Indo-Malayan, Australian and Neotropical regions, Sri Lanka.

22. *Ephemeroporus barroisi* (Richard)

1894b. *Chydorus barroisi* (Richard), *Revne. Biol. Nord. France.*, 6 : p. 375-373, figs. 9-12.

1982. *Ephemeroporus barroisi* (Richard) = *nomen dubius*, Frey, p. 233-237, pl. 1.

Material examined : Nathsagar wetland 5 exs., Lakhaphal, 18.4.99 (Coll. R. M. Sharma), 4 exs., Saukheda, 12.10.99 (P. P. Kulkarni); 4 exs., Dhakephal, 21.2.99 (Coll. A. Mahabal); 5 exs., Nathsagar dam, 7.2.99 (Coll. S. G. Patil); 20 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Length of female - 0.3 to 0.4 mm. Maximum height in middle of body. Dorsal and ventral margin similarly convex. Valve with straight posterior margin. Posteroventral corner of valve with a denticle. Antennule short, conical, not reaching apex of rostrum. Esthetases almost reaching apex of rostrum. Plate of labrum with produced apex denticulate anterior margin with 3-4 denticles. Claw with setae on the concave margin and with two basal spines. Postabdomen short with a unique anal denticles. Preanal corner projecting. Distal part of anus with 2-4 long denticles. Ocellus smaller than eye and situated halfway between eye and apex of rostrum. Intestine with loops. Anterior part of valves with lines parallel to anterior margin.

Distribution : India : Maharashtra, Tripura, Tamil Nadu, Kerala, West Bengal, Gujarat. *Elsewhere* : Cosmotropical.

23. *Dunhevedia crassa* King

1853. *Dunhevedia crassa* King, *Pap. proc. R. Soc. Van Diemens Land*, 2 : p. 261, pl. VII.

Material examined : Nathsagar wetland - 2 exs., Lakhephal, 9.10.89 (Coll. P. P. Kulkarni); 2 exs., Dhakephal, 21.2.99 (Coll. A. Mahabal); 4 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 3 exs., Sagardarshan, 22.2.99 (Coll. A. Mahabal).

Diagnostic characters : Female length - 0.35 mm. Posteroventral corner with a denticle. Ventral margin of valve with feathered setae which are longest in the middle. Maximum height slightly before middle and posterior margin of valve almost straight. Valve with pattern of hexagones. Antennules thick, slightly tapering distally, ending slightly before the apex of rostrum. Lateral sensory seta situated on a tubercle distal to middle of anterior margin of antennule. Plate of labrum

triangular, with pointed apex; anterior margin slightly concave without denticles. Postabdomen usually oval with 15-18 anal denticles. Number of lateral groups of setae present. Ocellus situated slightly near to eye than apex of rostrum. Claw with a basal spine and setae on the concave margin. Lives in vegetations. 3 muscle lines seen above-behind the eye in generally small specimens.

Distribution : India : Tamil Nadu, Rajasthan, Kerala, Tripura, West Bengal, Gujarat, Maharashtra, Andaman Nicobar Islands. *Elsewhere* : Ethiopian, Indo-Malayan, Australian and southern part of European USSR.

24. *Dunhevedia crassa ciliocaudata* (Sovinski 1891)

1891. *Alona ciliocaudata* Sovinski, *Zapiski, Kievskogo Obschesiva Estestvaispytatelei*, II : p. 159-160, pl. 111, figs. 33-36.

Material examined : Nathsagar wetland 5 exs., Sagardarshan, 23.2.99 (Coll. A. Mahabal); 1 ex., Kaigaon, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 0.5 mm. Posteroventral corner with denticle, sometimes with accessory denticle above it. Anterior region of labral plate with strong convexity and blunt apex. Ocellus smaller than eye and situated halfway between eye and apex of rostrum. Postabdomen with 10-12 anal spines and transverse row of setae almost on whole surface.

Distribution : India : Kashmir, Maharashtra. *Elsewhere* : Poland, USSR.

25. *Pseudochydorus globosus* (Baird, 1843)

1843. *Chydorus globosus* Baird, *Ann. Mag. Nat. Hist.*, 68 : p. 90, pl. III, figs. 1-6.

1968. *Pseudochydorus globosus* Fryer, *Phil. Trans. Roy. Soc.*, 254 : p. 324-328, figs. 92-111.

Material examined : Nathsagar wetland - 2 exs., Sagardarshan, 23.2.99 (Coll. A. Mahabal).

Diagnostic characters : Length of female - 0.55 mm. Body almost oval, slightly longer than high with maximum height in the middle. Posterodorsal corner projecting. Posteroventral corner without denticle. Surface of valve with blue-brown spots seen sometimes. Rostrum pointed, directed ventrally. Valve with hexagonal cells. Antennules not reaching apex of rostrum. Anterior margin of antennule with sensory seta in distal half. Labrum without plate shaped process. Postabdomen narrow, almost uniformly wide. Anal margin with setae and group of lateral setae present. Anal denticles 20-30, decreasing size proximally. Claw with row of setae on the concave margin and with 2 basal denticles. Lives and feed on hydra.

Distribution : India : West Bengal, Maharashtra, Meghalaya. *Elsewhere* : Holarctic, Ethiopian, Indo-Malayan, Australia and European USSR.

26. *Camptocercus rectirostris* Schoedler 1862

1851. *Lynceus macrurus* Fischer, *Mem., Acad. Sci. St. Petersb. Mem. Sav. etrang.*, 7 : p. 188-187, p. 1, viii, figs. 8, pl. IX, figs. 1-2.
1862. *Camptocercus rectirostris* Schoedler, *Berlin, Jahrb. Dorotheenstadt. Realschule, Berlin*, p. 25, pl. 11, fig. 43.

Material examined : Nathsagar wetland - 2 exs., Sagardarshan, 23.2.99 (Coll. A. Mahabal).

Diagnostic characters : Length of female - 0.7 mm. Body oval, maximum height in front of middle. Posterodorsal corner of valve rounded and posteroventral corner with 3-5 denticles. Valver marked with curved stripes. Head keel present. Rostrum pointed, directed anteriorly or ventrally. Antennules not reaching apex of rostrum. Antennules with sensory setae and esthetascs, 2 of them longer than others. Plate of labrum with rounded apex. Postabdomen long, narrow with 11-17 denticles distal to anus. Sides of postabdomen with a row of small setae groups of about 5. Anal margin with setae. Claw with basal spine and a row of about 25 setae on the concave margin which become longer distally and terminal seta larger than others followed by row of hairs. Intestine with long caecum. Ocellus situated near the eye than to apex of rostrum.

Distribution : India : West Bengal, Kashmir, Gujarat, Meghalaya. *Elsewhere* : Holartic, Ethiopian, Indo-Malayan, New Zealand and European USSR.

27. *Alona davidi* Richard

- 1895a. *Alona davidi* Richard, *Me. Soc. Zool. France.*, 7 : p. 192-195.

Material examined : Nathsagar wetland 5 exs., Ramdoh, 23.11.98 (Coll. S. G. Patil); 2 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Length of female 0.35 mm. Maximum height slightly before middle. Dorsal margin of head forming a smooth curve with dorsal margin of valve. Posterodorsal and posteroventral corner rounded. Valve with indistinct pattern of polygons. Inner side of posterior margin of valve with row of setae. Rostrum blunt. Antennules ending a short distance before apex of rostrum. Plate of labrum rounded. Postabdomen widest in the middle, tapering distally; preanal corner projecting. Anal denticles thin in 10-11 groups of 2-4 teeth. Postabdomen with groups of setae laterally, distal seta the longest in each group. Claw with one basal spine and setae at proximal concave margin.

Distribution : India : West Bengal, Andaman & Nicobar Islands, Tripura. First recorded from Maharashtra. *Elsewhere* : Ethiopian region, Haithi.

28. *Alona davidi punctata* Daday

1898. *Alona punctata* Daday, *Termes, Fuzetek*, 21 : p. 39-40, fig. 18, a-c.
1939. *Alona davidi var. punctata* Gauthier, *Bull. Inst. Fr., Afr. noire*, I : p. 176-182, fig. 10.

Material examined : Nathsagar wetland 3 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 1 ex., Nathsagar dam, 7.7.99 (Coll. S. G. Patil); 1 ex., Ramdoh, 14.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 0.65 mm. Valve punctate, sometimes with a pattern of polygons. Rostrum blunt. Antennule ending slightly before apex of rostrum. Postabdomen with 10-12 groups of lateral anal spines and groups of lateral setae. Claws with basal spine and setae on the concave margin.

Distribution : India : West Bengal, Maharashtra. *Elsewhere* : Ethiopian and Australian regions, Argentina.

29. *Alona rectangula richardi* (Stingelin)

1895. *Alona richardi* Stingelin, *Rec. Suisse Zool.*, **3** : p. 250, pl. 7, fig. 37.

1962. *Alona retangula* var. *richardi* Sramck-Husek *et. al.*, *Fauna of USSR, Praba.*, **16** : p. 347, figs. 1-8F.

Material examined : Nathsagar wetland 5 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil); 1 ex., Dahigaon, 8.12.97 (Coll. S. G. Patil); 1 ex., Kaigaon, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 0.35 mm. Posteroventral corner of valve rounded without denticle. Valve with about 12 longitudinal lines. Antennule reaching almost apex of rostrum. Plate of laborum rounded. Ocellus slightly smaller than eye. Postabdomen slightly widening distally with 6-9 lateral groups of setae and 2-3 spines and setae in each group. Claw with basal spine.

Distribution : West Bengal. First record from Maharashtra. *Elsewhere* : Newzealand, USSR.

30. *Alona pulchella* King

1853. *Alona pulchella* King, *Pap. Proc. R. Soc. van. Diemans, land*, **2** : p. 260, pl. VIII B.

Material examined : Nathsagar wetland 2 exs., Dahigaon, 27.9.97 (Coll. R. M. Sharma); 1 ex., Ramdoh, 14.10.99 (Coll. P. P. Kulkarni); 12 exs., Sagardarshan, 3.7.98 (Coll. P. D. Rane); 2 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil).

Diagnostic characters : Length of female 0.5 mm. Body almost oval. Posterodorsal and posteroventral corner of valve rounded. Valves with reticulation. Rostrum blunt. Antennules not reaching apex of rostrum. Plate of labrum with convex anterior margin and slightly pointed apex. Ocellus situated halfway between apex of rostrum and eye. Postabdomen with almost straight dorsal and ventral margin. Preanal corner distinct but not projecting. About 10 anal denticles. Group of lateral setae present, distal seta longest in each groups. Claw with one basal spine.

Distribution : India : Tamil Nadu, West Bengal, Maharashtra. *Elsewhere* : Australia, Ethiopian and Neotropical region.

31. *Alona intermedia* Stingelin

1895. *Alona intermedia* Stingelin, *Rev. Suisse Zool.*, 3 : 248-249, pl. 7, figs. 34-35.

Material examined : Nathsagar wetland 2 exs., Talegaon, 9.2.01 (Coll. P. P. Kulkarni); 1 ex., Dahigaon, 27.9.97 (Coll. R. M. Sharma).

Diagnostic characters : Length of female 0.33 mm. Valve with longitudinal lines; posterodorsal and posteroventral corners rounded. Rostrum blunt, antennules not reaching apex of rostrum. Ocellus smaller than eye and situated halfway between eye and apex of rostrum. Plate of labrum rounded anteriorly with group of setules ventrally. Postabdomen with 8-9 anal denticles and 9-10 lateral setae. Claw with basal spine.

Distribution : India : West Bengal, Tripura. First record of species from Maharashtra State.

32. *Alona archeri* Sars, 1888

1888. *Alona archeri* Sars. *Forth. Uidensk. Selsk. Christiania*, 7 : p. 59, pl. 6, figs. 1-4.

Material examined : Nathsagar wetland - 5 exs., Brahmagan, 10.10.97 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female - 0.3 mm to 0.5 mm. Ventral margin of valve almost straight with rounded posterodorsal and posteroventral corner. Valve pitted. Rostrum pointed. Antennule not reaching apex of rostrum. Postabdomen with parallel margin; preanal corner projecting; distal 3-4 anal denticles with small setae on the inner margin and 6 thin marginal spines. Anal margin with setae. Ocellus much smaller than eye. Claw with a basal spine. Intestine forming loops with caecum.

Distribution : India : First record of species from India. *Elsewhere* : Central Asia, Indo-Malayan and Australian, USSR, Northern Caucasus, Central Asia.

33. *Graptoleberis testudinaria nathsagerensis* sub sp. nov.

(Text Fig. 1 : figs. a-e)

Material examined : 1 ♀ (Holotype), 10 ♀♀ (Paratypes), Nathsagar-Jaikwadi wetland, Paithan, Distt. Aurangabad, Maharashtra State, India; 3.7.98 (Coll. P. D. Rane). Presently types are with collections of Zoological Survey of India, Western Regional Station, Pune will be deposited to National collections of Z.S.I., Kolkata, West Bengal in due course.

Diagnostic characters : Length of female - 0.5 mm. Dorsal margin of valve convex and ventral margin almost straight. Valves are strongly reticulated with pentagonal and hexagonal cells all over, even on the head. Ventral marginal setae are feathered and quite longer than the typical species. They are slightly smaller at starting near anterior side and become larger of same length later on and ends upto slightly after middle of ventral margin. Posteroventral corner with two conical pointed-tipped denticles. Rostrum very wide with double continuous bordered, anterior

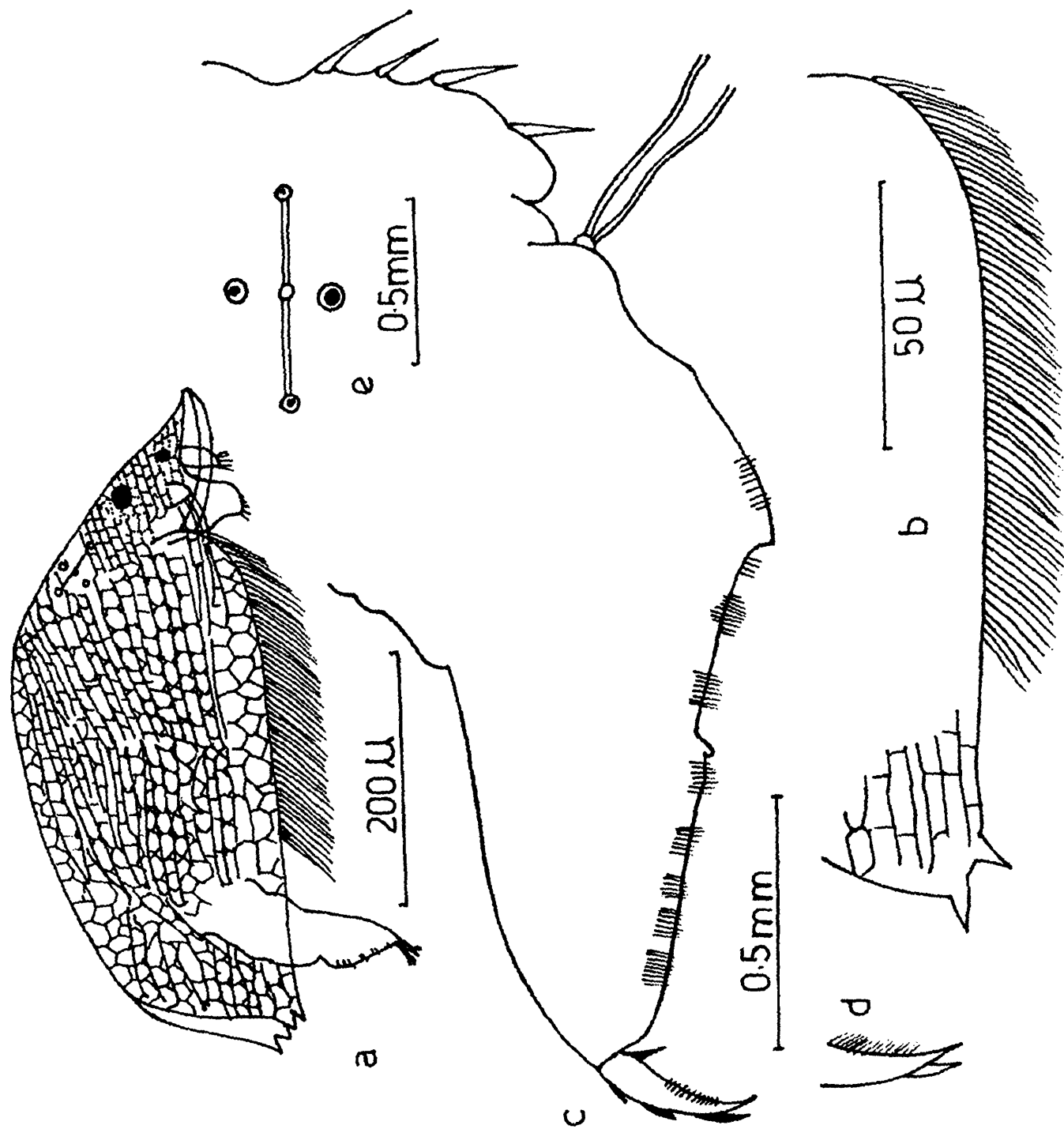


Fig. 1. : *Graptoleberis testudinaria nathsagerensis* ssp. nov. (figs. : a to e)

- (a) Parthenogenic female (lateral view);
- (b) Posteroventral and ventral margin of valve;
- (c) Postabdomen with claw, anal teeth and spines on convex side of postabdominal claw;
- (d) Claw;
- (e) Head pores.

circulate and lateral side. Three connected head pores on the head shield. Antennules thick and a sensory seta at distal-lateral end and distal end with many esthetasces of different length coming out of the rostral margin. Plate of labrum slightly elongated with rounded apex and 5-6 small spinules present at posterior distal curve surface. Ocellus small than eye and situated near to eye than apex of rostrum Postabdomen tapering distally with distinct preanal corner with 7-8 groups of anal spines which are present laterally and in group of 3-5 spinules. Anal region also with row of small spinules. After anal region above at proximal side 3-4 large spines present arise from small elevation. Claw with 2-3 denticles on the convex side of which first is largest almost reaching anterior end of the claw.

Remarks : *Graptoleberis testudinaria nathsagarensis* ssp. nov. shows similarities with Australian subspecies *Graptoleberis testudinaria occidentalis* Sars, 1901 by having 2 spinules on the convex margin of the postabdominal claw but differs in smaller ventral marginal setae and smaller posteroventral denticles than present new subspecies. *G. t. nathsagarensis* also comes close similar with Hungarian subspecies *Graptoleberis testudinaria pannonica* Daday, 1904 by having similar larger ventral marginal feathered setae on the valve but differ in number of spines on the convex margin of postabdominal claw. In present new subspecies the number of is always 2 or rarely 3 but in *G. t. pannonica* the number is always 4. The difference also in the number of posteroventral denticles. In present new subspecies they are always 2 in number while in *G. t. pannonica* they are generally 3 to 5.

34. *Leydigia acanthocercoides* (Fischer, 1854)

1854. *Lynceus acanthocercoides* Fisher, *Bull. Soc. Jap. Nat. Mosc.*, 27 : p. 431-433, pl. 111, figs. 21-22.

1875. *Leydigia acanthocercoides* Kurz, *Sitzber. K. Acad. Wiss. Wein. Math. Nat.*, 70 : p. 59-60.

Material examined : Nathsagar wetland - 1 ex., Sagardarshan, 3.7.98 (Coll. P. P. Kulkarni); 1 ex., Gangapur, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 1.1 mm. Valve with longitudinal lines. Posterior margin of valves without marginal row of spinules on the inner side. Rostrum blunt, short directed anteriorly and slightly ventrally. Plate of labrum with setae on the anterior margin. Postabdomen broadly rounded; anal margin concave. Lateral part of anus with several rows of setae. Lateral setae on the postabdomen in group of 2. Anal denticles very small. Two small terminal groups near the claws. Claws without basal spine. Ocellus larger than eye.

Length of male - 1.00 mm. Valve with longitudinal lines. Antennules reaching to apex of rostrum. Plate of labrum with pubescent anterior margin. Anal margin with setae. Vas difference opening into penis like process. Antennule with thick horn like spine at the anterior end. Ocellus larger than eye.

Distribution : India : West Bengal, Rajasthan, Andaman & Nicobar Islands, Tripura, Gujarat.
Elsewhere : Holartic, Ethiopian, Indo-Malayan, Neotropical and European USSR.

35. *Leydigia australis* Sars, 1885

1805. *Leydigia australis* Sars, *Christiania*, 8 : p. 35-43, pl. 7, 8.

Material examined : Nathsagar wetland 1 ex., Shevta, 17.4.99 (Coll. R. M. Sharma).

Diagnostic characters : Length of female 0.8 mm. Posteroventral corner rounded without denticle. Posterodorsal corner blunt. Antennules almost reaching apex of rostrum. Plate of labrum pubescent anterior margin. Antennules with a sensory seta on the outer side in distal part. First and second antennal exopodite with group of 3 spines. Postabdomen slightly narrowing distally, widest in the middle. Intestine with double loop without caecum. Claw without basal spine. Ocellus much larger than eye. Valve without lines and sculpture. Postabdomen with 20 long lateral setae each with 2-3 smaller setae near the base.

Distribution : India : First record from Maharashtra. *Elsewhere* : Australia.

36. *Biapertura karua* (King 1853)

1853. *Alona karua* King, *Pap. Proc. R. Soc. Van Diemens Land*, 2 : p. 260, pl. VIII.

1971. *Biapertura karua* Smirnov, *USSR, Acad. Sci. Zool. Inst. Nova. Ser. No. 101* : p. 479-481, figs. 600-604.

Material examined : Nathsagar wetland 10 exs., Nathsagar dam, 7.7.99 (Coll. S. G. Patil); 1 ex., Gangapur, 13.10.99 (Coll. P. P. Kulkarni).

Diagnostic characters : Length of female 0.35 mm. Body oval, maximum height slightly before middle. Posteroventral corner of valve with generally 3 denticles one specimen with 4 denticles. Valve striated with polygons. Antennules almost reaching apex of rostrum. Plate of labrum broadly rounded. Ocellus small than eye and situated near to eye than to apex of rostrum. Postabdomen with long preanal margin. Preanal corner not strongly projecting. Anal denticles small about 7, lateral setae in 9 groups distal seta the longest in each group and projecting beyond margin of postabdomen. Claw with basal spine and with setae on the concave margin. Ocellus situated slightly near to eye than apex of rostrum.

Distribution : India : Meghalaya, West Bengal, Maharashtra, Tamil Nadu, Tripura, Andaman and Nicobar Islands. *Elsewhere* : Cosmopolitan.

37. *Biapertura verrucosa* (Sars, 1901)

1901. *Alona verrucosa* Sars, *Arch. Math. Nat.*, 23 : p. 56-57, pl. IX, figs. 7, 1903. 7a.

1979. *Biapertura verrucosa* Swar and Fernando, *Hydrobiologia*, 66 : p-126, figs. 63-65.

Material examined : Nathsagar wetland 5 exs., Dahigaon, 27.9.92 (27.9.97); 1 ex., Sagardarshan, 23.2.97 (A. Mahabal); 2 exs., Ramdoh, 23.11.98 (Coll. S. G. Patil); 3 exs., Lakhephal, 26.9.97; Sagardarshan, 3.7.98 (Coll. P. D. Rane).

Diagnostic characters : Length of female 0.29 mm. Posterodorsal and posteroventral corners of valves rounded. Valves with tubercles. Antennule almost reaching apex of rostrum. Plate of labrum with convex anterior margin with denticle or incisor in the middle anterior margin and deep notch before posterior margin. Ocellus smaller than eye and situated nearer to the eye than to apex of rostrum. Postabdomen short, with curved dorsal margin and rounded distal margin. Anal corner projecting. Postabdomen with 6-8 small anal denticle. Lateral setae in groups first is longest and almost coming out from the margin of postabdomen. Claw with basal spine and setae on the lateral concave margin.

Distribution : India : Maharashtra, Gujarat, Tripura, Tamil Nadu, Kerala, Uttar Pradesh.
Elsewhere : Indo-Malayan, Ethiopian and Neotropical regions.

38. *Kurzia longirostris* (Daday, 1898)

1898. *Alona longirostris* Daday, *Tormes. Fuzetck.*, 21 : p. 34, fig. 14, a-b.

1971. *Kurzia longirostris* : Smirnov, *USSR, Acad. Sci. Zool. Inst. Nova ser.* No. 101 : p. 399-400, figs. 479-482.

Material examined : Nathsagar wetland 20 exs., 7.7.99 (Coll. S. G. Patil).

Diagnostic characters : Length of female - 0.5 mm. Posterodorsal and posteroventral corner round. Rostrum long, pointed, slightly curved posteriorly. Valve with longitudinal lines and fine dots. Antennules reaching middle of rostrum. Antenna not reaching apex of rostrum. Postabdomen long and narrow slightly concave dorsally with deep indentation on the distal side. Preanal corner not projecting. Anal denticles 12-20. Claw with basal spine and row of small setae on concave margin. Intestine has one and half loops. Ocellus smaller than eye, twice as nearer to eye as to the apex of rostrum. Lives in vegetation.

Distribution : India : West Bengal, Tamil Nadu. First record of species from Maharashtra.
Elsewhere : Ethiopian, Indo-Malayan, Neotropical, N/E China, New Guinea.

39. *Indialona ganapati* Petkovski, 1968

1966. *Indialona ganapati* Petkovski, *Fragmenta, Balcanica Musei Macedonici Scientiarum naturalium*, V, 2 : p. 157-165, pl. 1-9.

Material examined : Nathsagar wetland 10 exs., Telegaon, 9.2.01; 5 exs., Dhakaphal, 26.9.97; 20 exs., 9.10.99, Lakhaphal (Coll. P. P. Kulkarni); 5 exs., Lakhaphal 22.2.99; 12 exs., 23.2.99, Sagardarshan, 10 exs., Saukheda, 25.2.99 (Coll. A. Mahabal).

Diagnostic characters : Length of female 0.25 mm. Body almost oval with maximum height anterior to the middle region. Posterodorsal corner of valve distinct and posteroventral corner rounded without spinules. Valve with sparse setae on ventral margin. Valve marked with small polygons. Antennule almost reaching apex of rostrum. Aesthetes of almost uniform length, as long

as the rostrum. Plate of labrum with convex anterior margin and blunt apex. Ocellus smaller than eye and situated halfway between eye and apex of rostrum. Postabdomen narrow and slightly curved; without 20 anal denticles decreasing in size proximally. Claw with basal spine and with setae on proximal half of concave margin.

Distribution : India : Amhadabad-Gujarat, Bhopal-Madhya Pradesh and Ujani wetland-Maharashtra.

SUMMARY

With the completion of this study of Cladocera Fauna of Nathsagar-Jaikwadi wetland, Paithan, India 33 species, 5 subspecies and one new subspecies *Graptoleberis testudinaria nathsagarensis* ssp. nov. have been recorded; cladoceran species from this area represent 6 out of 11 families known from India; species *Alona archeri* Sars, recorded first time from India and 9 species recorded firstly from Maharashtra State. All species and subspecies recorded here are all actually collected from freshwater bodies of Nathsagar wetland. The cladocera fauna of Nathsagar shows many tropical and subtropical elements and only *Pleuroxus denticulatus* and *P. laevis* are palaeartic and holartic species. *Indialona ganapati* Petkovski and *G. t. nathsagarensis* ssp.nov. are endemic forms only found in India.

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FRESHWATER MOLLUSCA

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INTRODUCTION

References on freshwater Mollusca from Maharashtra area are few and scattered. However, there are records of type locality of many species of land and freshwater Mollusca. The important work in this field are of Annandale (1919), Annandale and Prashad (1919) and Hora (1926a) recorded hill streams fauna of Pune district. Tonapi (1971) and Tonapi and Mulherkar (1963) published record of 53 species of Mollusca of only Pune district however, Mollusca of other districts of Maharashtra are not studied in details. Subba Rao and Mitra (1979) also added few species to Pune district. Surya Rao *et. al.*, (2002) studied the freshwater Mollusca of Ujani Wetland and reported 11 species from Maharashtra.

In the present paper an attempt has been made to give an adequate picture of Molluscan fauna of Nathsagar Wetland, dist. Aurangabad. As a result of the three year survey of this Wetland 27 species of freshwater Mollusca have been reported from the present wetland. In the present investigation freshwater Gastropod and Bivalvia have been studied. In all 27 species have been reported from this wetland on the basis of present and past record. The * mark represents not actually collected species in the present collection.

GENERAL ACCOUNT AND DESCRIPTION OF WETLAND

The present wetland is situated 40 kms. south of Aurangabad. This town is situated on the right bank of river Godavari and is in latitude 19°39'19" north and longitude 75°26'2" east. The name itself shows Pratisthan or capital city. Today Paithan attains importance through the important pilgrimage of Sant Eknath Maharaj. In the river Godavari the ashes of dead bodies are brought for ritual performance.

At the base of the dam, 12 megawatt generating capacity hydroelectric plant is set up for various industrial area around Aurangabad.

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Jaikwadi Bird Sanctuary

Back water of Jaikwadi Dam "Nathsagar" has attracted a number of birds both resident and migratory. As per the criteria set in the Ramsar convention this waterbody holds migratory birds from all over the globe and their number exceeds 10000. The Deputy Conservator of Forests and Regional Forest Officer stationed at Aurangabad hold the charge of this wetland. The total area of this bird sanctuary is 314.05 sq. kms. which approximates only to the full reservoir level of the waterbody. The area of the wetland is not completely filled up as there was less rain. Vegetation seem to be scanty in this area during these months.

The water catchment area is 21750 kms. shore line of back water is wavy. It is clear that the dam is constructed by displacing some villages from the nearby submerged area. The main town like Aurgangabad, Paithan and Shevgaon are on the way and near to the dam site.

The detail map is given in the introduction and morphometric features are also given.

Socio-economic significance

Many species like *Bellamya bengalensis*, *Pila globosa*, *Lamelliden marginalis* are proved to be food for many aquatic animals as well as man. Some of the Mollusca such as *Lamellidens marginalis*, *L. corrianus* are reported to produce pearls as in some parts of India. Some shells are used for buttons and also help in the manufacture of poultry food.

Some of them are intermediate host for trematode parasites and spreads several diseases. The list of intermediate host and parasites is also available Subba Rao (1993). Some of them choke the public water distribution system and they are also indicators of pollution.

SYSTEMATIC LIST

Phylum MOLLUSCA

Class GASTROPODA

Subclass PROSOBRANCHIA

Order MESOGASTROPODA

Family VIVIPARIDAE

Subfamily BELLAMYINAE

1. *Bellamya bengalensis f. typica* (Lamarck)
2. *B. bengalensis f. doliaris* (Gould)*
3. *B. bengalensis f. annandalei* (Kobelt)
4. *B. bengalensis f. eburnea* (Annandale)
5. *B. dissimilis* (Mueller)

Family PILIDAE

6. *Pila globosa* (Swainson)
7. *P. virens* (Lamarck)

Family BYTHYNIIDAE

8. *Digoniostoma cerameopoma* (Benson)
9. *Gabbia orcula* (Freuenfeld)

Family THIARIDAE

Subfamily THIARINAE

10. *Thiara (Thiara) scabra* (Mueller)*
11. *Thiara (Tarebia) lineata* (Gray)*
12. *T. (Melanoides) tuberculata* (Mueller)

Order BASOMMATOPHORA

Family LYMNAEIDAE

13. *Lymnaea (Pseudosuccinea) acuminata f. typica* (Lamarck)
14. *Lymnaea (Pseudosuccinea) acuminata f. rufescens* (Gray)
15. *L. (P) luteola f. typica* Lamarck
16. *L. (P) luteola f. australis* Annandale and Rao
17. *L. (P) luteola f. succinea* Deshayes*

Family PLANORBIDAE

18. *Indoplanorbis exustus* (Deshayes)
19. *Gyraulus convexiusculus* (Hutton)

Class BIVALVIA

Order UNIONOIDA

Family UNIONIDAE

Subfamily UNIONINAE

20. *Lamellidens consorbrinus* Lea
21. *L. marginalis* (Lamarck)

Family AMBLEMIDAE

22. *Parreysia (P) anandalaiei* Preston
23. *P. (P) favidens* (Benson)*

24. *P. (P) corrugata* (Mueller)
 25. *P. (P) corrugata laevirostris* Benson*
 26. *P. (Radiatula) caerulea* Lea

Order VENEROIDA

Family CORBICULIDAE

27. *Corbicula striatella* Deshayes

*Not actually collected.

SYSTEMATIC ACCOUNT

Class GASTROPODA

Order MESOGASTROPODA

Family VIVIPARIDAE

Genus *Bellamyia* Jousseaume, 1886

1. *Bellamyia bengalensis f. typica* (Lamarck)

1822. *Paludina bengalensis* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 6, 2 : 174.

1921. *Vivipara bengalensis* Annandale, *Rec. Indian Mus.*, 22 : 267.

1980. *Vivipara bengalensis* forma *typica* (Lamarck) Subba Rao, Das and Mitra, *Rec. zool. Surv. India*, 77 : 225, pl. fig. 5.

Common Name : Banded pond snail.

Material examined : 2 exs., Sagardarshan, Nathsagar, date 23-09-97, Coll. R. M. Sharma.

Distribution : Maharashtra, Nathsagar, Tadoba Andhari Tiger Reserve dist. Chandrapur, Melghat Tiger Reserve, Amaravati, dist., Ujani Wetland, Solapur dist. common through out rest of India.

Elsewhere : Bangladesh, Myanmar, Sri Lanka.

Status : Most common through out.

Remarks : Annandale (1921) recognised 11 forms under this species on difference in shell of which 3 forms found in Maharashtra, Pune dist. This species is used as food in some part of Eastern India.

2. **Bellamyia bengalensis f. doliaris* (Gould)

1843. *Paludina doliaris* Gould, *Proc. Bost. Soc. Nat. Hist.*, 1 : 144.

1921. *Vivipara bengalensis* (Lamarck) race *doliaris*, Annandale and Sewell, *Rec. Indian Mus.*, 22 : 273-274, pl. fig. 9.

Common Name : Banded pond snail.

Distribution : Maharashtra : Nathsagar, Melghat, Amaravati dist., Ujani, Solapur dist., Madhya Pradesh, Orissa. **Elsewhere** : Myanmar.

Status : Common in Pune, Nasik, Maharashtra, Assam and Madhya Pradesh, Parts of West Bengal, Orissa.

Remarks : It can be separated from typica being smaller in size more conical also biangulate at body whorl. It was reported to choke water supply system in Calcutta and Nagpur (Subba Rao, 1993).

3. *Bellamyia bengalensis f. annandalei* (Kobelt)

Vivipara annandalei Kobelt, *Nachr. Malak. Gessell.*, Frankfurt, 60 : 161-162.

1921. *Vivipara bengalensis* phase *annandalai*, Annandale & Sewell, *Rec. Indian Museum*, Calcutta, 22 : 276, P 12, figs. 5-8.

Material examined : 1 ex., Bramhagavan, Nathsagar Wetland, date 24-09-97, Coll. R. M. Sharma; 4 exs., Sagardarshan, Nathsagar, date 3-12-97, Coll. S. G. Patil; 1 ex., Paithen, date 23-02-99, Coll. A. S. Mahabal.

Distribution : Bramhagavan, Sagardarshan, Nathsagar, Aurangabad, Pench National Park, Nagpur, Andhra Pradesh, Bihar, Orissa, Rajasthan, West Bengal, Tamil Nadu.

4. *Bellamyia bengalensis f. eburnea* (Annandale)

1921. *Vivipara bengalensis* race *eburnea* : (Annandale & Swell), *Rec. Indian Mus.*, 22 : 274-275, Pl. 2, fig. 1-2.

Material examined : 1 ex., Sevta Nathsagar, date 17-04-99, Coll. R. M. Sharma.

Distribution : Maharashtra, Nathsagar wetland, Pench National Park, dist. Nagpur. Tadoba Andhari Tiger Reserve, dist. Chandrapur, Andhra Pradesh, Orissa, Madhya Pradesh, West Bengal and Tamil Nadu.

5. *Bellamyia dissimilis* (Mueller)

1974. *Nevita dissimilis* Mueller, *Hist. Verm. Terr. Fluv.*, 2 : 184.

1960. *Viviparus dissimilis* Satyamurti, *Bull. Madras Govt. Mus.*, 6(4) : 33-34.

Material examined : 8 exs., Dahegaon NE date 23-11-98, Coll. S. G. Patil; 7 exs., Lakhephal, date 22-02-99, Coll. A. S. Mahabal; 2 exs., Sawkheda, date 12-10-99, Coll. P. P. Kulkarni; 4 exs., Lakhephal date 05-12-97, Coll. S. G. Patil.

Distribution : Maharashtra, Nathsagar Wetland, Pench National Park; Orissa, West Bengal, Peninsular and Northern India.

Family PILIDAE

Genus *Pila* Roeding, 1978

6. *Pila globosa* (Swainson)

Synonyms

1822. *Ampullaria globosa* Swainson, *Zool Illustrations* vol. 2, pl. CXIX. Type locality : Rivers of India.

Material examined : 2 exs., Sevta, Nathsagar, 12-04-99, Coll. R. M. Sharma.

Distribution : Maharashtra, Nathsagar Wetland, Melghat Tiger Project, dist. Amaravati, Tadoba Andhari Tiger Reserve, dist. Chandrapur; Assam, Bihar, Madhya Pradesh, Uttar Pradesh, Orissa and West Bengal.

Remarks : Many larval trematodes were recorded from this species. These appear to have little less inflated whorl, more conical spire and sub canalculate sutures.

7. *Pila virens* (Lamarck)

1822. *Ampullaria virens* Lamarck, *Hist. nat. anim. Sans. Ver.*, (2) : 179. Type locality : Not mentioned.

1858. *Ampullaria maura* Reeve, *Conch Icon.*, 10 *Ampullaria*, sp. no. 57, pl. xiii, fig. 57.

1925. *Pila virens*, Prashad, *Mem. Indian Mus.*, 8 : 75 pl. XIV, fig. 13.

Material examined : 2 exs., Lakhephal, Nathsagar, Date 5-12-97, Coll. Dr. S. G. Patil.

This species is variable in its colour. The shape of spine also varies and difficult to separate from its closely related species, *P. globosa*.

Distribution : It is common species in South India, also in Maharashtra.

Family BYTHYNNIDAE

Genus *Digoniostoma* Annandale, 1920

8. *Digoniostoma pulchella* (Benson)

1836. *Paludina pulchella* (Benson), *J. Asiatic Soc. Bengal*, 5 : 746. Type locality : Mirzapore U. P. Hanley and Theobald, 1876, *Conch India*. Pl. 38, figs. 5 to 6.

1921. *Digoniostoma pulchella* Annandale, *Rec. Indian Mus.*, 22 : 541.

Material examined : 2 exs., Lakhephal, date 18-04-99, Coll. R. M. Sharma.

Distribution : Maharashtra, Nathsagar, dist. Aurangabad, Pench National Park, Nagpur. Tadoba Andhari Tiger Reserve, Chandrapur. Common throughout Assam and east and Jammu and Kashmir.

Genus *Gabbia* Tryon, 1865

9. *Gabbia orcula* (Franenfeld)

1962. *Bithynia orcula* (Franenfeld), *Verhantle zool. Bot. Geschaft*, p. 1154.

1901. *Annicola (Alocinma) orcula* Annandale, *Rec. Ind. Mus.*, 22 : 540.

Material examined : 2 exs., Lakhephal, Nathsagar, date 18-04-99, Coll. R. M. Sharma.

Distribution : Maharashtra Nathsagar, Orissa, Assam, Punjab, Uttar Pradesh, Rajasthan and West Bengal.

Family THIARIDAE

Subfamily THIARINAE

Genus *Thiara* Roeding, 1798

10. *Thiara (Thiara) scabra* (Mueller)

1774. *Buccinum scabrum* Mueller, *Hist. verm Ten Fluv.*, 2 : 136. Type locality : Tranquebar.

1850. *Melania acanthica* Lea, *Proc. Zool. Soc. Lond.* p. 194.

1973. *Thiara (Thiara) scabra* Pace, *Malac Review suppl*, 1 : 52, pl. 12, figs. 1, 2 pl. 13, fig. 3.

Material examined : 2 exs., Lakhephal, date 18-04-99, Coll. R. M. Sharma; 1 ex., Lakhephal, date 5-12-97, Coll. S. G. Patil.

Status : Common throughout India.

Distribution : Maharashtra, Nathsagar, Pench National Park, Nagpur, Melghat Tiger Reserve, Ujani, Maharashtra. Through out except Kashmir. **Elsewhere** : Coasts of Indo-Pacific, from Zanjibar to New Hebrides, North to the Philippines, various Pacific Islands.

11. *Thiara (Tarebia) lineata* (Gray)

1828. *Helix lineata* Gray, in wood's Index Test supp., p. 24, fig. 68. Type locality : Ganges.

1915. *Tiara (Tarebia) lineata* Preston, Fauna British India. *Mollusca* (Freshwater Gastropoda and Pelecypoda), p. 34.

Material examined : 2 exs., Lakhephal, date 18-04-99, Coll. R. M. Sharma; 1 ex., Nathsagar, date 3-12-98, Coll. D. B. Bastawade; 2 exs., Kaigaon, date 28-09-97, Coll. R. M. Sharma.

Distribution : Maharashtra : Nathsagar Wetland; Aurangabad, Melghat, Amaravati district.; Assam, Bihar, Madhya Pradesh, Uttar Pradesh, West Bengal. *Elsewhere* : Bhutan; Myanmar and Sri Lanka.

Remarks : This species often synonymised with *T. granifera* Lamarck but easily distinguished from the former by the absence of rows of nodules and presence of distinct dark spiral lines.

12. *Thiara (Melanoides) tuberculata* (Mueller)

1874. *Nerita tuberculata* Mueller, *Hist. verm Torr Fluv.*, **2** : 191. Type locality : Coromandel coast.

1836. *Melania pyramis* Benson, *J. Asiat. Soc. Beng.*, **5** : 357, Type locality : Ganges.

1969. *Melanoides (Melanoides) peddamunigalensis* Ray and Ray Chowdhuri, *Proc. Zool. Soc. Calcutta*, **22** : 48, p. 14, fig. 12-17. Type locality : Peddamunigal, Nagarjunakonda, Nalgonda dist. A.P.

1976. *Melanoides (Melanoides) tuberculata* : Starmuehler, *Ann. Natur. Hist. Mus. Wien.*, **80** : 591.

Material examined : 2 exs., Savkheda, Nathsagar, date 24-09-97, Coll. R. M. Sharma.

Distribution : Maharashtra : Nathsagar Wetland, Melghat, Ujani Wetland Solapur, Orissa throughout India except Kashmir. *Elsewhere* : North and South Africa, Eastern Mediterranean countries, South east Asia, Southern China, Malaysia, Malay Archipelago, North Australia, various Pacific Islands and North to Ryukyu Islands of Japan, New Hebrides.

Remarks : Shells are typically narrowly elongate and distinctly sculptured and with rounded whorls vertical ribs and spiral striae and also with dark brown dots or streaks here and there. These shells collected from stagnant ponds slightly differ from those collected from sandy river beds.

Subclass PULMONATA

Order BASOMMATOPHORA

Family LYMNAEIDAE

Genus *Lymnaea* Lamarck, 1799

13. *Lymnaea (P) acuminata f. typica* (Lamarck)

1822. *Lymnaea (P) acuminata* Lamarck, *Hist. Nat. Anim. Sams. vert.*, **6** : Pt. 2, 160.

1925. *Lymnaea (P) acuminata* Annandale & Rao, *Rec. Indian Mus.*, **27** : 177.

Material examined : 2 exs., Dahigaon, 23-11-98, Coll. S. G. Patil; 2 exs., Sagardarshan, 3-12-97, Coll. S. G. Patil.

Distribution : Maharashtra : Nathsagar Wetland, Pench National Park, Nagpur; Common throughout.

14. *Lymnaea pseudosuccinea acuminata f. rufescens* Gray

1820. *Limnaea rufescens* Gray, in Sowerby's Genera of Shells, 1 : 178, fig. 2.

Material examined : 2 exs., Dahigaon, 20-4-99, Coll. R. M. Sharma.

Distribution : Maharashtra : Nathsagar Wetland as above, Ujani, Dist. Solapur, Melghat, Amaravati dist. widely distributed in rest of the India. *Elsewhere* : Pakistan, Bangladesh and Myanmar.

Remarks : Occur in permanent water bodies with abundant vegetations. It is easily recognised by its thin transparent shell, large inflated body whorl with a short, acuminate spine, aperture widely open, columella twisted.

15. *Lymnaea (pseudosuccinea) luteola typica* Lamarck

1822. *Limnaea luteola* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 6 : pt 2, 160.

1925. *Limnaea (Pseudosuccinea) Luteola* : Annandale & Rao, *Rec. Indian Mus.*, 27 : 183.

Common name : Freshwater snail.

Material examined : 2 exs., Bramhagavan, 14-12-99, Coll. P. P. Kulkarni.

Status : Common throughout India.

Distribution : Maharashtra : Nathsagar Wetland as above, Melghat Tiger Reserve, Ujani, Solapur. *Elsewhere* : Sri Lanka and Myanmar.

Remarks : This species is reported to be very particular about its habitat and is often found in temporary waterbodies. They burry themselves in dormant conditions. It is reported to be a pest to paddy and Azole, Intermediate host for many parasites of live stocks. Producers of biofertilizer in some part of West Bengal Subba Rao (1989). This species can be distinguished from its mere ovate shell with narrower aperture and less pointed spine.

16. *Lymnaea (pseudosuccinea) luteola f. australis* Annandale and Rao

1925. *Lymnaea (pseudosuccinea) luteola f. australis* Annandale and Rao, *Rec. Indian Mus.*, 27 : 184, fig. iv, No. 3.

1943. *Lymnaea (pseudosuccinea) luteola australis* Ray, *J. Asiat Soc. Beng.*, 9 : 64.

Material Examined : 3 exs., Brahmagavan, 14-10-99, Coll. P. P. Kulkarni.

Distribution : Maharashtra : Melghat, Amaravati, Pune, Satara, Assam, Bihar, Madhya Pradesh, Karnataka, Kerala, Punjab, Tamil Nadu, Uttar Pradesh. *Elsewhere* : Sri Lanka, Myanmar, Bangladesh and Pakistan.

Remarks : A smaller form, spine comparatively longer body whorl well rounded, sutures rather shallow.

*17. *Lymnaea (P) luteola f. succinea* Deshayes

1834. *Lymnaea (P) luteola f. succinea* Deshayes, *Voy.*, dans *Ind. Belanger zool.* p 418, Pl. ii, fig. 13, 14.

1925. *Lymnaea (P) luteola f. succinea* Annandale & Rao, *Rec. Indian Mus.*, 22 : 185.

Distribution : Maharashtra : Pench National Park, Nagpur, Assam, Andhra Pradesh, Tamil Nadu and West Bengal.

Family PLANORBIDAE

Subfamily BULININAE

Genus *Indoplanorbis* Annandale & Prasad, 192118. *Indoplanorbis exustus* (Deshayes)

1834. *Planorbis exustus* Deshayes, in *Belanger, Voy Indes. orientalis*, p. 417, pl. 1, figs. 11-13. Type locality : Malabar coast.

1956. *Indoplannorbis exustus* Benthem Jutting, *Treubia* 23(2) : 471 Rajgopal and Subba Rao 1968. *Proc. Symposium on Mollusca*, pl. 1, p. 110.

Material examined : 4 exs., Sagardarshan, date 29-09-92, Coll. P. P. Kulkarni; 4 exs., Bramhagavan, Nathsagar, date 14-10-99, Coll. P. P. Kulkarni; 2 exs., Sagardarshan, date 13-12-97, Coll. S. G. Patil.

Distribution : Maharashtra : Melghat, Nathsagar Wetland, Pench National Park, Tadoba Andhari Tiger Reserve, Chandrapur, Throughout the plains of India, Jammu and Kashmir. *Elsewhere* : Pakistan, Persia, Sri Lanka, Myanmar, Malaya, Indo China, Thailand, Sumatra, Java, Celebes.

Remarks : This species is a known vector snail and is implicated as intermediate host for the largest number of parasites.

Genus *Gyraulus* (Clessin)19. *Gyraulus convexiusculus* (Hutton)

1849. *Planorbis convexiusculus* Hutton, *J. Asiat. Soc.*, 18(2) : Type Locality : Afghanistan.

1849. *Planorbis convexiusculus* Hutton, *J. Asiat. Soc. Beng.*, 18(2) : 657.

1956. *Gyraulus convexiusculus* Benthem, *Jutting Treubia*, 23(2) : 463.

Material examined : 3 exs., Lakhephal, Nathsagar, Date 18-04-99, Coll. R. M. Sharma; 2 exs., Sagardarshan, date 13-12-97, coll. S. G. Patil.

Distribution : Common throughout, including Maharashtra. *Elsewhere* : Extends from Iran to Philippines.

Remarks : Maximum diameter, rarely exceeds 5 mm., whorls 4 or 5 rounded, suture well defined peripheri, subangulate, closely and obliquely striate, umbilicus wide, all the whorl distinctly seen above, aperture ovate lunate.

Class BIVALVIA

Order UNIONOIDA

Family UNIONIDAE

Subfamily UNIONINAE

Genus *Lamellidens* Simpson, 1900

20. *Lamellidens consobrinus* (Lea)

1859. *Unio consobrinus* lea, *Proc. Acad. Nat. Sci. Philad.*, 3 : 331, Type locality : China.

1921. *Lamellidens consobrinus* : Prashad, *Rec. Indian Mus.*, 22 : 608.

Material examined : 2 exs., Bramhagavan, Nathsagar, Date 14-10-99, Coll. P. P. Kulkarni; 3 exs., Bramhagavan, Date 16-04-99, Coll. R. M. Sharma.

Distribution : Maharashtra : Nathsagar Wetland, Melghat. *Elsewhere* : Sri Lanka.

Remarks : Shell rhomboidal, thick, umbones more inflated than in *L. marginalis*, dorsal margin curved and obliquely truncate, posterior side obtusely angled, anterior side rounded, left valves with two ragged cardinals.

21. *Lamellidens marginalis* (Lamarck)

1819. *Unio marginalis* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, 4 : 79, Type locality : Bengal.

1900. *Lamellidens marginalis* Simpson, *Proc. U.S. natn. mus.*, 22 : 854 Prashad, 1921, *Rec. Indian Mus.*, 22 : 606, fig. 29A.

Material examined : 2 exs., Bramhagavan, Nathsagar, Date 14-10-99, Coll. P. P. Kulkarni.

Shell oblong, ovate, thin very smooth, Periostracum blackish brown shining, light brown border along the ventral margin, posterior side broad, roundedly angular, two curved lateral teeth.

Distribution : Maharashtra : Pune, Nathsagar Wetland, Melghat, Amaravati dist., Assam, Bihar, Manipur, Uttar Pradesh, Tamil nadu and West Bengal. *Elsewhere* : Myanmar and Pegu.

Family AMBLEMIDAE

Subfamily PARREYSIINAE

Genus *Parreysia* Conrad, 1853

22. *Parreysia (Parreysia) annandalei* Preston

1912. *Parreysia annandalei* Preston, *Rec. Indian Mus.*, 7 : 302. Type locality : Gowhatty.

Material examined : 2 exs., Sagardarshan, Nathsagar, Date 23-9-97, Coll. P. P. Kulkarni.

Shell oval, convex, coarsely and concentrically ribbed, Anterior side sharply rounded and posterior side bluntly subrostrate.

Distribution : Maharashtra : Nathsagar Wetland, Melghat, Assam.

23. **Parreysia (Parreysia) favidens* Benson

1860. *Unio favidens* Benson, *Ann. Mag. nat. Hist.*, 10 : 188.

Thicker larger more inequilateral, both anterior and posterior margins angulate, cardinal teeth strong and broad.

Distribution : India, common throughout including, Orissa. *Elsewhere* : Bangladesh, Myanmar, and Pakistan.

24. *Parreysia (Parreysia) corrugata* (Mueller)

1774. *Mya corrugata* Mueller, *Verm. Terr., et. Fluv.*, Pt. 2, P. 214, No. 398. Type locality : Rivers of Coromandel.

1900. *Parreysia corrugata* Simpson, *Proc. U.S. natn. Mus.*, 22 : 841. Preston, 1912, *Rec. Indian Mus.*, 7 : 297.

Material examined : 5 exs., Dahigaon Nathsagar, date 20-4-99, Coll. R. M. Sharma; 2 exs., Sagardharshan, Nathsagar, Date 23-9-97, Coll. P. P. Kulkarni.

Shell green elliptic to oval scarcely, inequilateral; Ventral margin convex, lunule, well marked, cardinal teeth strong, not lamellar, sculptured somewhat radiating, oblique linear ridges.

Distribution : Common with wide range of distribution, Maharashtra : Nathsagar Wetland; Melghat, Andhra Pradesh, Bihar, Karnataka, Punjab. *Elsewhere* : China, Bangladesh.

25. **Parreysia (Parreysia) corrugata* (Mueller)

sub. sp. *laevirostris* (Benson)

1862. *Unio laevirostris* Benson, *Ann. Mag. nat. Hist.*, (3)10 : 191.

1900. *Parreysia corrugata* (Mueller) var. *laevirostris* : Simpson, *Proc. U.S. natn. Mus.*, 22 : 842, Preston 1912, *Rec. Indian Mus.*, 7 : 297.

Distribution : Maharashtra : Pusad, Melghat, Assam, Andhra Pradesh and Bihar. *Elsewhere* : Bangladesh.

Sub genus *Radiatula* Simpson, 1900

26. *Parreysia (Radiatula) caerulea* Lea

1831. *Unio caeruleus* Lea, *Trans. Am. Phil. Soc.*, 4 : 95, pl. 13, fig. 25. Type locality : Hoogly river, 100 miles above Calcutta.

1915. *Nodularia (N) caerulea* Preston, *Fauna British India*, Mollusca (Freshwater Gastropoda and Pelecypoda). p. 136.

Material examined : 3 exs, Esarwadi, date 28-7-97, Coll. D. B. Bastawade.

Variable in grown up valves sculpture restricted to umbonal region, posterior umbonal carina very distinct.

Distribution : Maharashtra : Nathsagar Wetland: Melghat, dist. Amaravati, Assam, Bihar, Orissa, Punjab Sind, Uttar Pradesh, West Bengal. *Elsewhere* : Myanmar.

Order VENEROIDA

Family CORBICULIDAE

Genus *Corbicula* Megerie Von Muehlfeld

27. *Corbicula striatella* Deshayes

1854. *Corbicula striatella* Deshayes, *Proc. Zool. Soc. Lond.*, **22** : 344. Type locality : Pondicherry, Prashad, 1928, *Mem. Indian Mus.*, **9** : 18, Pl. iii, fig. 9-11.

1861. *Corbicula subradiata*, Prime, *Proc. Acad. Nat. Sci. Philad.* : P. 128, Prashad, 1921, *Rec. Indian Mus.*, **22** : 613.

Material examined : 2 exs., Savkheda Nathsagar, date 22-04-98, Coll. S. G. Patil.

Shell thick, large, tumid, triangular ovate to ovate, dorsal margin arched, more on the anterior side than on the posterior, umbones prominent, Periostracum shining lemon yellow in young, darker and often brownish in full grown specimens, striae regular, concentric and raised into ridges, pallial line with trace of sinus; muscle scars fairly deeply developed.

Distributions : Commonest Indian species and occurs throughout India, Maharashtra, Melghat. *Elsewhere* : Pakistan, Peshawar, Sindh and Myanmar.

SUMMARY

In all 27 species of freshwater Mollusca have been recorded from Nathsagar Wetland, dist. Aurangabad and Ahmadnagar. All these 27 species under 11 genera 9 families are of freshwater habitats. The total 23 species are actually collected in the area and four species were taken from the earlier published record. The present wetland exhibits quite a large number of Molluscan fauna and all the 23 species are recorded for the first time from this wetland.

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INSECTA : ODONATA

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INTRODUCTION

Insects of the Order Odonata can easily be distinguished from other groups by presence of four membranous wings, which are finely netted by veins. The mouth parts are formed for chewing. Both, the dragon flies and damsel flies, as they are generally known, are very common insects in the vicinity of water.

Order Odonata is divided into two Sub orders, 1. Zygoptera and 2. Anisoptera. Zygoptera are damsel flies, possess both the pair of wings similar in appearance, head transverse, eyes being borne by lateral projection of head. They bring wings together and place vertically on abdomen, while at rest. Insects of this Sub order are relatively tender, narrow and small.

Anisoptera are dragon flies, relatively robust built and large. Their hind wings are larger than fore wings, with difference in shape. The wings are expanded horizontally, while at rest. The head is large, broad, semi globose, and concave behind. Eyes are large, prominent and occupy considerable portion of head.

Monographs on the external anatomy of the genera *Sympatrum* (Winkelmann, 1973); *Onychogomphus* (Chao, 1953); and *Epiophlebia* (Asahina, 1954) etc. are available. Oviposition in Odonata may be either endophytic or exophytic. Biology and development of instars has been studied in several genera like, *Coenagrion* (Balfour-Browne, 1909); *Sympatrum* (Gardner, 1951), *Anax* (Corbet, 1956) etc.

Checklist of Indian Odonata, including data on larval studies is available (Prasad & Varshney 1995), which includes 499 species. In Maharashtra state, a total of 85 species of Odonata are known to occur (Prasad, 1996; Kulkarni *et al.*, 2002b). Account of Odonate species associated with wetlands and freshwater pools is also available from different localities in India; (Ramakrishna 2002), Kabar lake, Bihar (6 species); (Arun Kumar, 2000), Renuka lake, Himachal Pradesh, (37 species); (Arun Kumar 1995), Fresh water lakes of Western Himalayas (21 Genera and species); (Anil Kumar, 1990), Vedanthangal Water bird sanctuary, Tamilnadu, (21 species); (Kulkarni and

Prasad, 2002a), Ujani wetland, Maharashtra (16 species). However, there is no earlier record of Odonata from Nathsagar wetland of Maharashtra state. Faunistic surveys of this wetland were conducted by the Western Regional Station of Zoological Survey of India, Pune from 1997 to 2000. A total of 267 examples were collected and identified, which belonged to 13 species, distributed amongst 11 genera in 8 subfamilies representing 3 families. Details on collection data, important diagnostic characters and notes on distribution of all these species are presented here. Measurements for one specimen : Length from vertex to the tip of abdomen and length of both the fore-wings together, across the body, (Fig. 1) are also provided.

SYSTEMATIC LIST

Order ODONATA

Suborder ZYGOPTERA

Superfamily COENAGRIONOIDEA

Family COENAGRIONIDAE

Subfamily PSEUDAGRIONINAE

Genus *Pseudagrion* Selys, 1876

1. *Pseudagrion decorum* (Rambur)
2. *Pseudagrion rubriceps rubriceps* Selys

Subfamily ISCHNURINAE

Genus *Ischnura* Charp, 1840

3. *Ischnura aurora aurora* (Brauer)
4. *Ischnura senegalensis* (Rambur)

Suborder ANISOPTERA

Superfamily AESHNOIDEA

Family GOMPHIDAE

Subfamily ONYCHOGOMPHINAE

Genus *Paragomphus* Cowley, 1934

5. *Paragomphus lineatus* (Selys)

Subfamily LINDENIINAE

Genus *Ictinogomphus* Cowley, 1934

6. *Ictinogomphus rapax* (Rambur)

Superfamily LIBELLULOIDEA

Family LIBELLULIDAE

Subfamily LIBELLULINAE

Genus *Orthetrum* Newman, 1833

7. *Orthetrum sabina sabina* (Drury)

Subfamily SYMPETRINAE

Genus *Brachythemis* Brauer, 1868

8. *Brachythemis contaminata* (Fabr.)

Genus *Crocothemis* Brauer, 1868

9. *Crocothemis servilia servilia* (Drury)

Genus *Diplacodes* Kirby, 1889

10. *Diplacodes trivialis* (Rambur)

Subfamily TRITHEMISTINAE

Genus *Trithemis* Brauer, 1868

11. *Trithemis pallidinervis* (Kirby)

Subfamily TRAMEINAE

Genus *Pantala* Hagen, 1861

12. *Pantala flavescens* (Fabr.)

Genus *Tramea* Hagen, 1861

13. *Tramea basilaris burmeisteri* Kirby

SYSTEMATIC ACCOUNT

Order ODONATA

Suborder ZYGOPTERA

Superfamily COENAGRIONOIDEA

Family COENAGRIONIDAE

Subfamily PSEUDAGRIONINAE

Genus *Pseudagrion* Selys, 1876

1. *Pseudagrion decorum* (Rambur)

1842. *Agrion decorum* Rambur, *Ins. Neurop.*, : 258.

1933. *Pseudagrion decorum*, Fraser, *Fauna Brit India, Odon.*, 1 : 286-289.

Diagnostic characters : Measurements of one specimen : Length 39 mm., wings : 41 mm. This species has white labrum with rest of the head up to posterior ocelli pale bluish green. Light blue ground colour, thorax pale blue, pterostigma diamond shaped with fine black lines, mid dorsal carinal ridge and a thick black humeral strip. Beautifully bluish green colour distinguishes this species from other species of the genus. Anal appendages narrowly bifid at the apex. Inferior anal appendages short and half of the length of superior.

Material examined and locality : Sagar Darshan Rest house, Paithan, 23.9.1997, 3 ♂♂; Shewata, 25.9.1997, 1 ♂, 1 ♀; Lakhephal, 26.9.1997, 3 ♂♂; Ramdoh, 1 ♂, all Coll. R. M. Sharma; Bramhagavan, 10.10.1999, 1 ♀, Coll. P. P. Kulkarni.

Distribution : Throughout continental India, Myanmar, Nepal and Sri Lanka.

Remarks : Common species in India, found on permanent and temporary water bodies. Rare in hill streams.

2. *Pseudagrion rubriceps rubriceps* Selys

1876. *Pseudagrion rubriceps* Selys, *Bull. Acad. Belg.*, (2)42 : 510.

1933. *Pseudagrion rubriceps* Fraser, *Fauna Brit. India*, 1 : 296-299.

1988. *Pseudagrion rubriceps* Prasad and Ghosh, *Rec. Zool. Surv India*, 85(2) : 201.

1995. *Pseudagrion rubriceps rubriceps*, Prasad and Varshney, *Oriental Ins.*, 29 : 389.

Diagnostic characters : Measurements of one specimen : Length, 27 mm., Wings : 41 mm. Head : Labium citron yellow; labrum, bases of mandibles, genae, clypeus and frons bright orange; vertex and occiput dark olivaceous but posterior occiput changing to blue. Prothorax black, marked with pale blue stripes. Thorax olivaceous green, with a golden tinge and the sides azure blue. Legs yellow, femora black on the outer and posterior surface. Abdomen marked broadly with black on dorsum. Female differs in colour and markings from male in Labium, face, vertex and the occiput uniform dark olivaceous. Prothorax and thorax similar to as in male. Abdomen with dorsal markings broad.

Material examined and locality : Sagar Darshan Rest house, Paithan, 23.9.1997, 2 ♀♀; Shevata, 25.9.1997, 3 ♀♀, Lakhephal, 26.9.1997, 1 ♀, Kaigaon, 28.9.1997, 1 ♂, 1 ♀, all Coll. R. M. Sharma; Dahigaon NE, 27.2.1999, 2 ♂♂, 1 ♀, Coll. A. S. Mahabal; Dahigaon NE, 10.7.1999, 1 ♂, Coll. S. G. Patil; Dhakephal, 9.10.1999, 2 ♀♀, Coll. P. P. Kulkarni.

Distribution : Throughout India; Nepal, Malaysia, Myanmar, Formosa, Taiwan.

Subfamily ISCHNURINAE

Genus *Ischnura* Charp, 1840

3. *Ischnura aurora aurora* (Brauer)

1858. *Agrion delicatum*, Hagen, *Verh. Zool-bot. Ges. Wien.*, 8 : 479.

1865. *Ischnura aurora*, Brauer, *Verh. Zool. bot. Ges. Wien.*, 15 : 509.

1954. *Ischnura aurora*, Lieftinck, *Treubia*, 22 : 74.

1995. *Ischnura aurora aurora*, Prasad and Varshney, *Oriental Ins.*, 29 : 390.

Diagnostic characters : Measurements of one specimen : Length : 23 mm., Wings : 24 mm. Head : Labium white; Labrum citron yellow; vertex bronzed black; eyes beautifully olive green, with semi lunar spot bordering it. Prothorax bronzed black on dorsum, sides and anterior lobe blue. Thorax black on dorsum, Legs pale citron-yellow, wings : pterostigma differs in fore & hind wings, in fore wings kite shaped, broader than long, rose red for proximal half; in the hind wing much smaller about half the size. Abdomen citron yellow except segments 8 to 10 which are azure blue.

Material examined and locality : Kaigaon, 28.9.1997, 1♂, Coll. R. M. Sharma.

Distribution : Throughout India, in Maharashtra Khed, Pune, Buldhana, Aurangabad, Melghat tiger reserve, Amravati; Australia; Indonesia; Malaysia; Myanmar; Nepal; New Guinea; Papua; Philippines; Sri Lanka and Sondaic Archipelago.

Remarks : Widely distributed, found in grasses & marshy places around water bodies.

4. *Ischnura senegalensis* (Rambur)

1842. *Agrion senegalensis* Rambur, *Ins. Neurop.*, 276.

1933. *Ischnura senegalensis* Fraser, *Fauna Brit. India*, 1 : 348-351.

1988. *Ischnura senegalensis* Prasad & Ghosh, 85(2) : 202.

Diagnostic characters : Measurements of one specimen : Length 28 mm., wings : 31 mm. Head : Labium pale yellow, labrum pale blue, narrowly black along the base. Prothorax black, the anterior collar pale blue, sides pale green; thorax bronzed black on dorsum. Legs black, exterior surfaces of tibiae and tarsi yellow. Wings hyaline, pterostigma of fore-wings very oblique, diamond shaped, black. Abdomen black, marked with yellow and blue. Anal appendages black and yellow. Female : Fraser (1933) described three forms of females with difference in colouration of head, prothorax, thorax and abdomen. All forms having similar wings and pterostigma.

Material examined and locality : Sagardarshan, 3.12.1997, 1♂, Coll. S. G. Patil; Kaigaon, 28.9.1997, 1♂, Dhakephal, 18.4.1999, 4♂♂, 3♀♀, Coll. R. M. Sharma; Ramdoh, 11.7.1999, 1♂, Coll. S. G. Patil; Dhakephal, 9.10.1999, 1♂, Coll. P. P. Kulkarni, Dhakephal. 28.3.2000, 3♂♂; Savkheda, 31.3.2000, 1♂, 2♀♀, Coll. R. H. Kamble.

Suborder ANISOPTERA
Superfamily AESHNOIDEA
Family GOMPHIDAE
Subfamily ONYCHOGOMPHINAE

Genus *Paragomphus* Cowley, 19345. *Paragomphus lineatus* (Selys)

1850. *Gomphus lineatus* Selys, *Rev. Odon.*, : 386.
 1854. *Onychogomphus lineatus*, Selys, *Bull. Acad. Belg.*, Xxi (2) : 36.
 1924. *Mesogomphus lineatus*, Fraser, *Rec. Indian. Mus.*, 26 : 424, 477.
 1995. *Paragomphus lineatus*, Prasad & Varshney, *Oriental Ins.*, 29 : 402.

Diagnostic characters : Measurements of one specimen, Length 41 mm, wings : 53 mm. Head : Labium, labrum, face & frons sandy yellow, vesicle and occiput yellow, separated by narrow, transverse dark brown streak. Prothorax blackish brown, thorax sandy yellow, legs yellow, marked with black, tarsi black, femora with two rows of spines. Abdomen black marked with yellow, anal appendages yellow. Females closely resemble males, much paler than males.

Material examined and locality : Bramhagavan, 7.7.1999, 1 ♂; Dahigaon NE, 10.7.1999, 1 ♂, Coll. S. G. Patil.

Distribution : India : West Bengal, Dehra Dun (Uttaranchal), Poona, Khandala, Melghat Tiger Reserve, Amravati (Maharashtra), Madras, Palaghat, Trichinopally, Coorg and the Nilgiris.

Remarks : Breeds both in still and running waters, camouflages with surroundings and a bit difficult to catch. Pale and dark forms are recorded in summer & monsoon.

Subfamily LINDENIINAE

Genus *Ictinogomphus* Cowley, 19346. *Ictinogomphus rapax* (Rambur)

1842. *Diastatomma rapax* Rambur, *Ins. Neurop.*, : 169.
 1933. *Ictinus rapax* Feaser, *Fauna Brit. India*, 2 : 373-376.
 1988. *Ictinogomphus rapax*, Prasad & Ghosh, *Rec. Zool. Surv. India*, 85(2) : 204.
 1995. *Ictinogomphus rapax* Prasad & Varshney, *Oriental Ins.*, 29 : 403.

Diagnostic characters : Measurements of one specimen, Length 70 mm., wings : 82 mm. Head : Labium yellow, bordered with brownish; labrum yellow, with heavy black border, face and frons greenish-yellow, ante-clypeus yellow, post-clypeus black. Thorax black, marked with yellow or greenish yellow, laterally yellowish green. Wings clear, slightly enfumed in the mature specimens. Pterostigma long, covering 5–6 cells, black. Legs black, coxae and trochanter yellow and a yellow stripe on the flexar surface of anterior femora. Abdomen black, marked with bright yellow. Anal appendages black. Female very similar to male.

Material examined : Kaigaon, 8.7.1999, 1 ♂; Dahigaon NE, 10.7.1999, 2 ♂ ♂; Ramdoh, 11.7.1999, 2 ♀ ♀; all Coll. S. G. Patil.

Distribution : Throughout India, Mynamar, Sri Lanka and Malaysia except in desert area.

Remarks : Prasad (1995) recorded this species from Pune and Prasad & Kulkarni (2002) record this species from Ujani Wetland Dist. Solapur, Maharashtra.

Superfamily LIBELLULOIDEA

Family LIBELLULIDAE

Subfamily LIBELLULINAE

Genus *Orthetrum* Newman, 1833

7. *Orthetrum sabina sabina* (Drury)

1770. *Libellula sabina*, Drury, *Ill. Exot. Int.*, 1 : 114.

1936. *Orthetrum sabina*, Fraser, *Fauna Brit. India*, 3 : 300-302.

1995. *Orthetrum sabina sabina*, Prasad and Varshney, *Oriental Ins.*, 409.

Diagnostic characters : Measurements of one specimen, length 47 mm., wings 68 mm. Head : Labium yellow, middle lobe brownish to black; labrum face and frons yellowish, variably marked on anterior surface with black; frons very deeply notched so as to form two triangular facets in front. Prothorax bright yellow, thorax greenish yellow, legs black. Abdomen greenish yellow with very broad apical black rings on segments 4 to 5, narrow ring on segments 6; segments 7 to 9 and base of 10 black. Segments 1 and 3 enormously swollen dorso-ventrally as well as laterally; 4 to 6 narrow, cylindrical, 7 to 9 dilated but compressed laterally; 10th very small. Anal appendages as long as segment 9. Females exactly like males.

Material examined and locality : Sagardarshan, 3.12.1997, 1♂, Coll. S. G. Patil; Kaigaon, 19.4.1999, 1♂, Coll. R. M. Sharma; Kaigaon, 13.10.1999, 1♂, Coll. P. P. Kulkarni; Dhakephal, 28.3.2000, 1♀, Coll. R. H. Kamble.

Distribution : India : Bilaspur, Kangra, Sirmaur, Solan, Una (Himachal Pradesh); Dehra Dun, Nainital, Pauri Garhwal (Uttaranchal); Singhbhum, Dhanbad (Bihar); Melghat Tiger Reserve, Amravati (Maharashtra); Somalia (Somali Land); Iraq; Iran; Nepal; Sri Lanka; Myanmar; Thailand; Micronesia (Ocenia); Samoa Island (Pacific Ocean) Indonesia (Java, Sumba, Timor); Papua (New Guinea); Australia; Egypt; Angola and most of African continent.

Remarks : Found in all parts of India, up to 7000' (Nilgiri's), most predaceous; cannibalism is also recorded and preys on other dragonflies also.

Subfamily SYMPETRINAE

Genus *Brachythemis* Brauer, 1868

8. *Brachythemis contaminata* (Fabr.)

1793. *Libellula contaminata*, Fabricius, *Ent. Syst.*, 2 : 382.

1936. *Brachythemis contaminata*, Fraser, *Fauna Brit. India*, 3 : 365-366.

Diagnostic characters : Measurements of one specimen, length 30 mm., wings : 47 mm. Head : Labium pale orchreous; labrum reddish; face frons and vesicle olivaceous or pale green yellow, eyes broadly contiguous; prothorax with dark reddish brown stripes traversing anterior and posterior borders of middle lobe, thorax with obscure brownish stripes, wings hyaline, reticulation reddish, with a broad bright orange fascia extending from base within 2–3 cells of pterostigma in fore wing and as far as that organ in the hind; pterostigma rust red. Abdomen reddish-orchreous, marked with obscure dorsal and sub dorsal brown stripes. Females differ in colour, with hind wings very palely tinted with yellow at extreme base without orange fascia seen in the males, pterostigma bright ochreous. Abdomen pale olivaceous brown, with narrow black stripe on mid dorsal carina from segment 2 to end. Anal appendages yellow.

Material examined and locality : Sagardarshan, 23.9.1997, 5♂♂, 4♀♀; Bramhagavan, 24.9.1997, 1♂; Shevata, 25.9.1997, 2♂♂, 1♀; Lakhephal, 26.9.1997, 1♂, 1♀; Ramdoh, 27.9.1997, 7♂♂, 4♀♀, Coll. R. M. Sharma; Sagardarshan, 3.12.1997, 1♀; Savkheda, 22.11.1998, 5♀♀, 7♂; Dahegaon NE, 23.11.1998, 3♂♂, 2♀♀; Ramdoh, 1♂♂, Coll. S. G. Patil; Bramhagavan, 20.2.1999, 1♂, 1♀; Dahigaon NE, 23.2.1999, 6♂♂, 6♀♀; Ramdoh, 24.2.1999, 2♂♂, 1♀; Savkheda, 25.2.1999, 1♂, 2♀♀, Coll. A. S. Mahabal; Shevata, 16.4.1999, 1♂, 1♀; Sagardarshan, 17.4.1999, 1♂; Lakhephal, 18.4.1999, 1♂; Kaigaon, 19.4.1999, 1♂; Dahigaon NE, 20.4.1999, 2♂♂, 1♀, Coll. R. M. Sharma; Sagardarshan, 6.7.1999, 2♂♂; Bramhagavan, 7.7.1999, 1♂, 2♀♀; Shevata, 7.7.1999, 2♂♂; Kaigaon, 8.7.1999, 1♂, 1♀; Savkheda, 8.7.1999, 1♂, 2♀♀; Lakhephal, 9.7.1999, 2♂♂, 3♀♀; Dahigaon NE, 10.7.1999, 4♂♂, 2♀♀; Ramdoh, 11.7.1999, 2♂♂, 3♀♀; Coll. S. G. Patil; Dhakephal, 9.10.1999, 5♂♂, 5♀♀; Lakhephal, 9.10.1999, 3♂♂, 3♀♀; Bramhagavan, 10.10.1999, 1♂; Kaigaon, 13.10.1999, 6♂♂, 5♀♀; Dahigaon NE, 14.10.1999, 5♂♂, 2♀♀, Coll. P. P. Kulkarni; Bramhagavan, 28.3.2000, 5♂♂, 7♀♀; Dhakephal, 28.3.2000, 1♂; Sagardarshan, 29.3.2000, 1♂, 4♀♀; Ramdoh, 30.3.2000, 1♂, 1♀; Savkheda, 31.3.2000, 1♂, Coll. R. H. Kamble.

Distribution : India : Himachal Pradesh : Bilaspur, Kangra, Sirmaur, Una, Uttaranchal : Dehradun, Nainital, Parui, Garhwal; Madhya Pradesh; Bihar : Dhanbad; West Bengal and East Himalaya, Maharashtra : Melghat Tiger Reserve, Amravati, Osmanabad and Pune. (Khandala, Khed and Lonavala); China; Indonesia; Malaysia; Myanmar; Nepal; Philippines; Singapore; Sri Lanka Taiwan and Thailand.

Remarks : It is common species in India and found in large numbers. Seen flying over water surface throughout year and recorded to undergo three generations annually.

Genus *Crocothemis* Brauer, 1868

9. *Crocothemis servilia servilia* (Drury)

1770. *Libellula servilia*, Drury, *Ill. Ex. Ins.*, 1 : 112-113.

1936. *Cocothemis servilia servilia*, Fraser, *Fauna Brit. India*, 3 : 345-347.

Diagnostic characters : Measurements of one specimen, length 40 mm., wings : 86 mm. Head : Labium ferruginous; labrum blood red, anteclypeus pale red, rest of face and frons bright blood

red; eyes during life blood red above, purple laterally. Prothorax and thorax ferruginous, often blood red on dorsum during life, legs ochreous, Wings, hyaline, bases of all wings marked with rich amber yellow up to cubital nervure in forewing and to first antenodal nervure nearly to arc; apices of wings lined narrowly with pale brown in old specimens.

Females differ widely in colouration from the males. Labium pale yellow; labrum, face, frons and vesicle olivaceous; prothorax and thorax olivaceous brown. Wings similar to males but markings paler, abdomen ochreous, segments 8 & 9 blackish along mid dorsal carina.

Material examined and locality : Savkheda, 22.11.1998, 1♂, 1♀; Ramdoh, 11.7.1999, 1♀, Coll. S. G. Patil; Bramhagavan, 10.10.1999, 1♀; Sawakheda, 12.10.1999, 3♂♂, 3♀♀; Coll. P. P. Kulkarni; Bramhagavan, 1♀, 28.3.2000, Coll. R. H. Kamble.

Distribution : India : Himachal Pradesh : Kangra, Uttar Pradesh : Chamoli, Dehra Dun, Nainital, Pauri Garhwal, Madhya Pradesh, Bihar : Singhbhum, Dhanbad, West Bengal; Maharashtra : Buldana (Gondhonkher), Colaba (Matheran), Osmanabad (Upla), Pune (Khed and Lone), Melghat Tiger Reserve, Amravati and Satara (Lingmal Falls); Iraq; Nepal; Myanmar, Sri Lanka, Philippines; Indonesia (Sumba); Australia, Sundaic Archipelago and Japan.

Remarks : Common species in India. Adults are seen throughout the year on wing. Teneral males and females are similar in colour, pale straw-yellow, differ from mature males, may confuse identity of the species.

Genus *Diplacodes* Kirby, 1889

10. *Diplacodes trivialis* (Rambur)

1842. *Libellula trivialis*, Rambur, *Ins. Neurop.*; 115.

1936. *Diplacodes trivialis*, Fraser, *Fauna Brit. India*, 3 : 336-338.

Diagnostic characters : Measurements of one specimen, Length : 31 mm., wings : 52 mm. Head : Labium, labrum and bases of mandibles creamy yellow; face, frons, and vesicle palest azure blue with fine black line at the base of frons; Prothorax pale brown to black; thorax greenish yellow with sutures finely black; the area between mid dorsal carina and humeral sutures olivaceous brown speckled with minute dots, colouration darkens with age. Legs greenish yellow, marked with black in subadults; wings hyaline with a minute yellow point in cubital space of hind wings; abdomen with segments 1 to 3 greenish yellow; remaining segments black with sub dorsal yellow stripes on segments 4–7. Females : Similar to subadult males, abdominal markings broader on segments 8 to 10.

Material examined and locality : Sagardarshan, 3.12.1997, 1♂; Savkheda, 22.11.1998, 1♀, Coll. S. G. Patil.

Distribution : Throughout India; Nepal; Myanmar; Sri Lanka; Thailand; W. Malaysia (Malacca) and Indonesia (Sumatra).

Remarks : Common species found throughout the year near water bodies. Also found in grassy vegetation & agricultural fields.

Subfamily TRITHEMISTINAE

Genus *Trithemis* Brauer, 1868

11. *Trithemis pallidinervis* (Kirby)

1889. *Sympetrum pallidinervis* Kirby, *Trans. zool. Soc. India.*, **12** : 327.

1934. *Triathemis pallidinervis* Fraser, *Fauna Brit. India*, **3** : 389-391.

1985. *Triathemis pallidinervis* Prasad & Ghosh, *Rec. Zool. Surv. India*, **85(2)** : 209.

Diagnostic characters : Measurements of one specimen, Length, 42 mm., wings : 68 mm. Head : Labium pale yellow, labrum black, with two large basal yellow spots; clypeus and front of frons yellow, upper surface of frons and vesicle metallic purple. Prothorax dull brown or black, with the anterior border yellow and a large medial and lateral spot on middle lobe. Thorax olivaceous brown on dorsum and upper parts of sides, dorsum thickly coated with grayish hairs. Legs black, anterior pair of femora bright yellow on basal half. Wings hyaline, with reddish reticulation and a bright amber yellow basal marking at extreme base in the forewing. Abdomen long slender, black, marked with bright yellow. Anal appendages yellow at base, black for apical half, superiors with a row of robust spines on ventral border. Female resembles male in most particulars.

Material examined and locality : Sagardarshan, 23.9.1997, 1♂, 1♀; Savkheda, 1♂, 1♀; Ramdoh, 27.9.1997, 2♂♂, 1♀; Sagardarshan, 3.12.1997, 1♂, 1♀, Coll. S. G. Patil; Savkheda, 22.11.1998, 4♂♂; Dahigaon NE, 23.11.1998, 2♂♂, 1♀, Ramdoh, 23.11.1998, 1♂, Coll. S. G. Patil; Bramhagavan, 20.2.1999, 1♀; Savakheda, 25.2.1999, 2♀♀, Coll. A. S. Mahabal; Savkheda, 16.4.1999, 2♂♂; Bramhagavan, 16.4.1999, 2♂♂, 2♀♀; Sagardarshan, 17.4.1999, 1♂; Shevata, 17.4.1999, 1♂; Lakhephal, 18.4.1999, 1♂, 1♀; Kaygaon, 19.4.1999, 2♂♂, Coll. R. M. Sharma; Sagardarshan, 6.7.1999, 2♂♂; Shevata, 7.7.1999, 1♂, 1♀; Ramdoh, 11.7.1999, 1♂, 1♀, Coll. S. G. Patil; Lakhephal, 9.10.1999, 1♂, Coll. P. P. Kulkarni; Dhakephal, 28.3.2000, 1♂, 3♀♀, Coll. R. H. Kamble.

Distribution : India : Assam, Bihar, Himachal Pradesh, Punjab, Uttar Pradesh, West Bengal; Myanmar, Sri Lanka, Formosa and Philippines.

Remarks : A Common species along stagnant water, some times observed near sea shore either on wings or resting on twigs.

Subfamily TRAMEINAE

Genus *Pantala* Hagen, 186112. *Pantala flavescens* (Fabr.)1798. *Libellula flavescens*, Fabricius, *Ent. Syst. Suppl.*, 285.1861. *Pantala flavescens*, Hagen, *Syn. Neur N. Amer* : 142.1936. *Pantala flavescens*, Fraser, *Fauna Brit. India*, 3 : 414-416.

Diagnostic characters : Measurements of one specimen, length 43 mm., wings : 86 mm. Rather large sized and robust built dragonfly coloured ochreous or reddish and with uncoloured wings. Head large; eyes broadly contiguous; labium pale brown with borders dark brown, anteclypeus pale brown, postclypeus & frons bright golden yellow; eyes reddish brown above, lilaceous or bluish laterally and beneath; prothorax rich ochreous, bluish laterally and beneath; thorax olivaceous, coated thickly with yellowish downy hairs; legs black, bases & exterior of femora yellowish; wings hyaline, with base of hind wing pale golden yellow upto anal loop and with narrow apical brown spot limited to posterior border of wing. Abdomen bright ochreous, sides of segments 1-4 pale yellow, 8-10 with sharply defined black mid dorsal pyriform spots with narrow end of them at bases of segments. Anal appendages ochreous, changing black towards apex. Females similar to males, with eyes olivaceous brown above; face vivid cream yellow; wings often evenly and deeply enfumed and always without the brown spot. Abdomen more stout and robust.

Material examined and locality : Dhakephal, 9.10.1999, 1 ♂; Lakhephal, 9.10.1999, 1 ♀ Coll. P. P. Kulkarni.

Distribution : Circumtropical and subtropical in distribution; (Throughout India, China, Indonesia, Malaysia, Micronesia, Morocco, Myanmar, Sri Lanka and Thailand).

Remarks : Common species, breeds in marshes in foot hills, streams in agricultural fields. Large number of specimens emerge out and take to swarming from September to November/December.

Genus *Tramea* Hagen, 186113. *Tramea basilaris burmeisteri* Kirby1889. *Tramea burmeisteri* Kirby, *Trans. zool. Soc. Lond.*, 12 : 316.1936. *Tramea basilaris burmeisteri*, Fraser, *Fauna Brit. India*, : 432-434.

Diagnostic characters : Measurements of one specimen, length 44 mm., wings : 86 mm. Head : Labium bright yellow, missile lobe black; labrum reddish brown, very broadly bordered black, anteclypeus and sides of postclypeus olivaceous yellow; postclypeus and frons bright vermilion red. Prothorax yellowish; thorax olivaceous, with a reddish tinge on dorsum and a bluish tinge laterally. Legs black; coxae, trochanters and anterior pair of femora on inner side and at base

olivaceous. Wings hyaline, hind wing with dark reddish brown markings at the base, usually limited to the cubital space, base of discoidal cell and hyper trigone, extreme base of anal loop and anal area adjoining cubital space. Venation in this dark area bright yellow. Membrane pure white, pterostigma bright ochreous, short, even shorter in hind wings. Abdomen bright brick red, marked with black. Anal appendages very long, nearly as long as last three segments of abdomen, dark reddish to black. Female resembles males except minor details in colouration.

Material examined and locality : Dhakephal, 9.10.1999, 1 ♂, Coll. P. P. Kulkarni.

Distribution : India : Himachal Pradesh, Punjab, Rajasthan, Uttar Pradesh, West Bengal; Myanmar, Sri Lanka and Malaysia.

Summary : During the faunistic surveys conducted by Western Regional Station of Zoological Survey of India, approximately 267 specimens of Odonates were collected from Nathsagar Wetland, Aurangabad and Ahmednagar, Districts Maharashtra State. Altogether thirteen species were identified. The species were found to be distributed amongst 2 suborders, 3 families, 8 subfamilies and 11 genera. All these species are recorded for the first time from here.

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AQUATIC AND SEMIAQUATIC HEMIPTERA (INSECTA)

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INTRODUCTION

Wetlands are economic reserves and great natural productive ecosystems. They support a variety of invertebrates especially insects. The sizable and diverse insect population of a given water body serves as a potential source of food for fishes and other animals living in it. The aquatic and Semi-aquatic groups of insects represent a significant level of diversity. They are over all indicators of long-term environmental conditions and Zoogeographic distribution. Inventorisation of this group helps in understanding the functional aspects of community structure, provides the baseline data required for developing a strategy for the effective conservation and management.

Previous studies on this group from the state of Maharashtra dates back to Annandale (1919) and Paiva (1919). Thereafter, Tonapi (1959) made collections from the tributaries of River Bhima. Recently, Thirumalai & Sharma (2002), Thirumalai & Sharma (in press), Thirumalai *et. al.*, (2004) studied this group from Ujani Wetland and conservation areas like Melghat Tiger Reserve and Pench National Park (all in the state of Maharashtra) respectively. In India, Maharashtra ranks 5th in the wetland area and total species known is 50. The present study is based on a small collection of aquatic and Semi aquatic hemipterans collected from Nath Sagar Wetland comprising of 9 species belonging to 6 genera spread over 4 families. However, this list is not exhaustive as the species diversity existing in the water body could certainly be much higher than that recorded here. More intensive explorations might result in the true picture of the diversity.

SYSTEMATIC LIST OF AQUATIC AND SEMIAQUATIC HEMIPTERA

Infraorder GERROMORPHA

Superfamily GERROIDEA

Family GERRIDAE

Subfamily GERRINAE

Genus *Aquarius* Schellenberg

1. *Aquarius adelaidis* (Dohrn)

**Zoological Survey of India, High Altitude Zoology Field Station, Solan, Himachal Pradesh*

Infraorder NEPOMORPHA Popov
 Family NOTONECTIDAE Latreille
 Subfamily ANISOPINAE Hutchinson
 Genus *Anisops* Spinola

2. *Anisops cavifrons* Brooks
3. *Anisops sardeus* Herrich-Shaffer

Family NEPIDAE Latreille
 Subfamily RANATRINAE Douglas & Scott
 Tribe RANATRINI Douglas & Scott
 Genus *Ranatra* Fabricius

4. *Ranatra filiformis* Fabricius
5. *Ranatra varipes varipes* Stål

Subfamily NEPINAE Latreille
 Tribe NEPINI Latreille
 Genus *Laccotrephes* Stal

6. *Laccotrephes griseus* (Guerin-Meneville)
7. *Laccotrephes ruber* (Linnaeus)

Family BELOSTOMATIDAE Leach
 Subfamily BELOSTOMATINAE Leach
 Genus *Diplonychus* Laporte

8. *Diplonychus rusticus* (Fabricius)

Subfamily LETHOCERINAE Lauck & Menke
 Genus *Lethocerus* Mayr
 Subgenus *Lethocerus* Mayr

9. *Lethocerus indicus* (Lepeletier & Serville)

SYSTEMATIC ACCOUNT

Infraorder GERROMORPHA Popov
 Superfamily GERROIDEA Reuter
 Family GERRIDAE Leach
 Subfamily GERRINAE Bianchi

Genus *Aquarius* Schellenberg1. *Aquarius adelaidis* (Dohrn)

1860. *Aquarius adelaidis* Dohrn, *Stettin. ent. Ztg.*, **21** : 408.
 1896. *Gerris spinolae* Leth. & Ser., *Cat. gen. Hemiptera*, **3** : 63.
 1903a. *Gerris spinolae* (Leth. & Ser.) : Distant, *Fauna British India*, **2** : 180.
 1990. *Aquarius adelaidis* (Dohrn) : Andersen, *Steenstrupia*, **16**(4) : 61.
 2002. *Aquarius adelaidis* (Dohrn) : Thirumalai, *Rec. zool. Surv. India*, **100**(1-2) : 60.

Diagnosis : The first antennal segment is the longest, the head, rostrum, pronotum and forelegs are black. The hind margin of pronotum is brownish yellow; forewing dark brown in macropterous forms with dark brownish veins; the hind margin of the 7th sternum with a large triangular impression in middle. This is one of the very common species inhabiting the permanent waterbodies in India, with both macropterous and brachypterous forms. This species is found in all lentic habitats and also recorded from deep wells in Southern India.

Material examined : 1♂(Br) from Lakephal, 26.IX.1997; 1♂, 2♀(M), 2♂, 5♀(Br) and 39 immature from Ramdoha, 27.IX.1997; 3♂, 3♀(M), 5, 20, (Br), 7 immature from Bahegaon Ne, 27.IX.1997; 11 immature from Kaigaon Mandir, 28.IX.1997, all Coll. R. M. Sharma; 1♂, 1♀, 1 immature from Lakephal and around, 5.XII.1997, Coll. S. G. Patil; 1♂, 1♀ from Paithan and around Near Dam site, 28.VII.1998; 11 immature from Paithan & around, 28.IX.1998, Coll. D. B. Bastawade; 5♂, 2♀, 1 immature, 1 male (Beyond recognition – no genitalia) from Nath Sagar reservoir near R.H, 20.XI.1998, Coll. S. G. Patil.

Distribution : India. *Elsewhere* : Bangladesh; China; Indonesia; Myanmar; Nepal; Philippines; SriLanka; Thailand; Vietnam.

Infraorder NEPOMORPHA

Family NOTONECTIDAE

Subfamily ANISOPINAE

Genus *Anisops* Spinola2. *Anisops cavifrons* Brooks

1951. *Anisops cavifrons* Brooks, *Kans. Univ. Sci. Bull.*, **34** : 418.
 1994. *Anisops cavifrons* Brooks : Thirumalai, *Misc. Occ. Pap. Rec. Zool. Surv. India*, **165** : 16.
 2004. *Anisops cavifrons* Brooks : Thirumalai, *Rec. zool. Surv. India*, **102**(1-2) : 65.

Diagnosis : *A. cavifrons* can be distinguished by the presence of a procumbent spine on the fore tibia of male. In males the left paramere is moderately excavate and there are three closely

arranged small setae near the base of tarsus. This species has been reported from both Western Ghats and Eastern Ghats and interestingly recorded from Cochin backwaters in Kerala.

Material examined : 4♂, 2♀ from Sagar Darshan, 3.XII.1997, Coll. S. G. Patil.

Distribution : India; Pakistan.

3. *Anisops sardeus sardeus* Herrich-Shaffer

1849. *Anisops sardeus* Herrich-Shaffer, *Die wanzenartigen Insecten*, **9** : 41.

1906. *Anisops sardeus* Herrich-Shaffer : Distant, *Fauna British India*, **3** : 45.

1918. *Anisops sardeus* Herrich-Shaffer : Paiva, *Rec. Indian Mus.*, **14** : 28.

1951. *Anisops sardeus* Herrich-Shaffer : Brooks, *Univ. Kansas Sci. Bull.*, **34** : 423.

1989. *Anisops sardeus* Herrich-Shaffer : Thirumalai, *Misc. Occ. Pap. Rec. zool. Surv. India*, **118** : 26.

2004. *Anisops sardeus* Herrich-Shaffer : Thirumalai, *Rec. zool. Surv. India*, **102**(1-2) : 65.

Diagnosis : This is a moderately larger species (more than 7.3 mm) with the male having a cephalic projection; base of labrum bearing a tuft of curved erect hairs, meeting one another, forming a loop.

Material examined : 5♂, 3♀ and 1 immature from Sagar Darshan, 3.XII.1997, Coll. S. G. Patil.

Distribution : India. *Elsewhere* : Afghanistan; Africa; Albania; Canary Islands; Myanmar; Syria; Turkey.

Family NEPIDAE

Subfamily RANATRINAE

Tribe RANATRINI

Genus *Ranatra* Fabricius

4. *Ranatra filiformis* Fabricius

1790. *Ranatra filiformis* Fabricius, *Skrif. Nat. Selsk.*, **1** : 228.

1994. *Ranatra filiformis* Fabricius : Thirumalai, *Misc. Occ. Pap. Rec. zool. Surv. India*, **165** : 22.

1997. *Ranatra filiformis* Fabricius : Bal & Basu, *Zool. Surv. India, State Fauna*, **6** : 266.

2001. *Ranatra filiformis* Fabricius : Thirumalai, *Fauna of Conservation Area*, **11** : 118.

2004. *Ranatra filiformis* Fabricius : Thirumalai, *Rec. zool. Surv. India*, **102**(1-2) : 65.

Diagnosis : The males of this species can be identified by the absence of a tooth and presence of several small spines on the inner margins of distally hook shaped paramere and presence of wide interocular space. This species is smaller in size (20–30 mm) than *R. elongata*. This species is mostly found among vegetation, fringing the shallower parts of water, clinging to submerged vegetation and feeds on nymphs of dragonflies and mosquito pupae.

Material examined : 1♂, 1♀ from Lakhepal, 26.IX.1997, Coll. R. M. Sharma; 1♂, 1♀ and 1immature from Kaigaon Phata, 07.XII.1997, Coll. S. G. Patil; 1♀, 4 immature from Lakhepal, 18.IV.1998, Coll. R. M. Sharma; 1♂ from Sagar Darshan and around, 31.VII.1998, Coll. D. B. Bastawade; 5♂, 3♀ and 14 immature and 2 adults damaged from Lakhepal, 20.XI.1998, Coll. Patil; 1♂, 2♀ from Bramhagavan, 20.II.1999, Coll. A. S. Mahabal; 6♂, 8♀ and 1immature from Bramhagavan, 16.IV.1999, Coll. R. M. Sharma; 8♂, 9♀ from Savkheda, 8.VII.1999; 8♂, 7♀, and 1 adult damaged from Kaigaon, 8.VII.1999; 1♂ from Ramdoh, 11.VII.1999, all Coll. S. G. Patil; 4♂ (2 without head), 1♀ and 1immature from Dhakhepal, Paithan, 09.X.1999; 2♂ from Bramhagavan Tal, Paithan, 10.X.1999; 3♂, 3♀ and 14 immature from Kaigaon Tal-Gangapur, 13.X.1999, all Coll. P. P. Kulkarni.

Distribution : India (Widely distributed); Nepal; Pakistan; Philippines; Sri Lanka.

5. *Ranatra varipes varipes* Stål

1861. *Ranatra varipes* Stål, *Ofvers. K. Vetensk. Akad. Forh.*, **18** : 203.

1972. *Ranatra varipes* Stål, Lansbury, *Trans. R. Ent. Soc. Lond.*, **124** : 316.

1998. *Ranatra varipes varipes* Stål : Nieser & Polhemus, *Amemboa*, **2** : 22.

Diagnosis : Small, body size 20–33 mm.; respiratory siphon shorter than body; fore femora are broad with irregular brown markings. However, the most reliable diagnostic characters are the parameres which is hatchet shaped distally.

Material examined : 4♂, 7♀ from Bramhagavan, Tal. Paithan, 10.X.1999, Coll. P. P. Kulkarni.

Distribution : India. *Elsewhere* : Australia; Indonesia; Malaysia; Myanmar; Taiwan.

Subfamily NEPINAЕ

Tribe NEPINI

Genus *Laccotrephes* Stål

6. *Laccotrephes griseus* (Guerin-Meneville)

1844. *Nepa griseus* Guerin, *Iconogr. Regne. Anim.*, 352.

1910. *Laccotrephus griseus* (Guerin) : Distant, *Fauna British India*, **5** : 314.

1994. *Laccotrephus griseus* (Guerin) : Thirumalai, *Misc. Occ. Pap. Rec. zool. Surv. India*, **16** : 21.

2004. *Laccotrephus griseus* (Guerin) : Thirumalai, *Rec. zool. Surv. India*, **102**(1-2) : 66.

Diagnosis : This species can be identified by the presence of slightly hooked and symmetrical parameres, abdominal appendages shorter than the body, presence of an obtusely rounded tooth at the base of the anterior femora. This species is commonly found in Peninsular India. It is a very sluggish species often found under weeds or at the bottom of slow or stagnant waters.

Material examined : 1 ♀ and 1 immature from Shewata, 25.IX.1997, Coll. R. M. Sharma; 1 ♂, 1 ♀ and 1 immature from Shewata, 4.XII.1997; 2 ♂ from Savkheda, 22.XI.1998; Coll. S. G. Patil; 1 ♂ from Paithan, 10.X.1999, Coll. P. P. Kulkarni; 1 ♀ from Dahegaon NE-Tal Shevgaon, Ahmed Nagar, 14.X.1999; 1 ♂ from Lakhepal, 20.XI.1999, all Coll. S. G. Patil.

Distribution : India; Malaysia; Myanmar; Seychelles; Sri Lanka; Thailand.

7. *Laccotrephes ruber* (Linnaeus)

1764. *Nepa ruber*, Linnaeus, *Mus. Lud. Ulr.*, 165.

1906. *Laccotrephes ruber* (Linn.) : Distant, *Fauna British India*, 3 : 18.

1994. *Laccotrephes ruber* (Linn.) : Thirumalai, *Misc. Occ. Paper. Rec. zool. Surv. India*, 165 : 22.

2001. *Laccotrephes ruber* (Linn.) : Thirumalai, *Fauna conservation area*, 11 : 118.

2004. *Laccotrephes ruber* (Linn.) : Thirumalai, *Rec. zool. Surv. India*, 102(1-2) : 66.

Diagnosis : The abdominal appendices are distinctly longer than the body, the prosternum is convex in the middle and has a curved and hook shaped male paramere. This is a common species with wide distribution in the Indo-Australian region and is largely found in habitats like rivers, streams, tanks, etc.

Material examined : 1 ♂ from Savkheda, 22.XI.1998; 1 ♀ from Kaigaon, 22.XI.1998, 1 ♂, 1 ♀ and 3 immature from Ramdoh, 23.XI.1998, all Coll. S. G. Patil.

Distribution : India. *Elsewhere* : China; Japan; Nepal; Pakistan; Taiwan.

Family BELOSTOMATIDAE

Subfamily BELOSTOMATINAE

Genus *Diplonychus* Laporte

8. *Diplonychus rusticus* (Fabricius)

1781. *Nepa rustica* Fabricius, *Ent. Sept.*, 4 : 62.

1906. *Sphaerodema rusticum* (Fab.) : Distant, *Fauna British India*, 3 : 36.

1961. *Diplonychus rusticus* (Fab.) : Lauck & Menke, *Ann. Entomol. Soc. Amer.*, 54 : 649.

1980. *Diplonychus indicus* Venkatesan & Rao, *J. Bombay nat. Hist. Soc.*, 88 : 299.

1994. *Diplonychus rusticus* (Fab.) : Thirumalai, *Misc. Occ. Pap. Rec. zool. Surv. India*, 165 : 25.

2004. *Diplonychus rusticus* (Fab.) : Thirumalai, *Rec. zool. Surv. India*, 102(1-2) : 67.

Diagnosis : *D. rusticus* can easily be identified by the smaller size (Less than 20 mm), pale lateral basal margins of pronotum, head length is shorter than the width between the eyes, single segmented fore tarsus and a smaller claw. This species commonly found in fishponds and is a voracious feeder on fish larvae. It is also known to feed on a wide variety of aquatic organisms including mosquito larvae.

Material examined : 1♂, 4♀ from Shevta, 7.VII.1997, Coll. S. G. Patil; 1♀ from Lakhepal, 26.IX.1997, 1♂ and 3 immature from Ramdoh, 27.IX.1997, 12 immature from Kaigaon Mandir, 28.IX.1997, all Coll. R. M. Sharma; 2♀ from Kaigaon Phata, 7.XII.1997; Coll. S. G. Patil; 2♂ and 8 immature from Lakhepal, 18.IV.1998; 1♂ from Tejanapur Nr. Sheogaon, 31.VII.1998, 1♂, 5♀ and 3 immature from Sagar Darshan and around Paithan, 31.VII.1998, Coll. D. B. Bastawade; 2♂, 5♀ and 3 adults from Nath Sagar reservoir near R.H., 20.XI.1998, 1♂, 5♀ and 14 immature from Lakhepal, 20.XI.1998; 7♂, 13♀ and 7 immature from Ramdoh, 23.XI.1998; 1♂ from Dahegaon, 23.XI.1998, all Coll. S. G. Patil; 4♂ and 4♀ from Bramhagavan, 16.IV.1999, 7♂, 3♀ from Sav Kheda, 16.IV.1999; 1♂ from Sagar Darshan, 17.IV.1999, all Coll. R. M. Sharma; 4♂, 5♀ and 6 immature from Ramdoh, 21.IV.1999; 1♀ and 3 immature from Bramhagavan, 7.VII.1999; 1♂, 5♀ from Kaigaon, 8.VII.1999; 3♀ from Savkheda, 8.VII.1999; 2♂, 1♀ and 7 immature from Lakhepal, 9.VII.1999; 1♂, 2♀ and 1 immature from Ramdoh, 11.VII.1999, all Coll. S. G. Patil; 2♂ and 5♀ from Dhakaphal, Paithan, 09.X.1999; 8♂, 12♀ and 3 immature from Bramhagavan Tal. Paithan, 10.X.1999; 1♀ from Kaigaon Tal-Gangapur, 13.X.1999; 12♀ from Dahegaon NE Shevgaon, Ahmed Nagar, 14.X.1999, all Coll. P. P. Kulkarni; 11♀ from Lakhepal, 29.III.2000; 1♂, 1♀ from Ramdoh Tal. Shevgaon Dist Ahmed Nagar; 5 immature from Ramdoh, 30.III.2000; 1♂, 2♀ and 5 immature from Sarkheda, 31.III.2000; all Coll. R. H. Kamble.

Distribution : India. *Elsewhere* : Australia; China; Indonesia; Japan; Malaysia; Myanmar; New Guinea; New Zealand; Sri Lanka; Thailand.

Subfamily LETHOCERINAE

Genus *Lethocerus* Mayr

Subgenus *Lethocerus* Mayr

9. *Lethocerus indicus* (Lepeletier & Serville)

1775. *Belostoma indica* Lepeletier & Serville, *Encycl. Meth.*, X : 272.
 1871. *Belostoma indicum* Lepeletier & Serville, Mayr, *Verh. zool. - bot. Ges. Wien*, 12 : 426.
 1906. *Belostoma indicum* (Lepeletier & Serville) : Distant, *Fauna British India*, 3 : 38.
 1927. *Lethocerus indicus* (Lep. & Serv.) : Buneo, *Bull. Brooklyn Entomol. Soc.*, 12 : 30.
 1933. *Lethocerus indicus* (Lep. & Serv.) : Lundblad, *Arch. Hydrobiol. Suppl.*, 12 : 52.
 1995. *Lethocerus indicus* (Lep. & Serv.) : Polhemus, *Cat. Het. Palaerctic region*, 1 : 23.
 2004. *Lethocerus indicus* (Lep. & Serv.) : Thirumalai, *Rec. zool. Surv. India*, 102(1-2) : 67.

Diagnosis : The 'giant Indian water bug'; large, elongate, dorsoventrally flattened brown aquatic bug; divergent yellow line on anterior lobe of pronotum broad; eyes twice as long as wide and elongate. Members of this genus are found in deeper water bodies such as pond, lakes, flooded paddy fields etc.

Material examined : 1 ♀ from Sagar darshan, Paithan, 11.X.1999, Coll. P. P. Kulkarni; 1 immature from Shevta Village near backwater, 19.XI.1998, Coll. S. G. Patil.

Distribution : India. *Elsewhere* : China; Indonesia; Malaysia; Myanmar; Pakistan; Sri Lanka.

SUMMARY

The present study though based on a small collection from Nath Sagar Wetland may serve as base line data for comparison with other water bodies. The study resulted in the enumeration of 9 species belonging to 6 genera spread over 4 families.

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PISCES

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INTRODUCTION

Nathsagar wetland is situated 40 kms south of Aurangabad, which is on the right bank of Godavari river. A good number of fish life is sustained by this wetland.

There is very scanty information on the ichthyofauna of this region except by Kamble (pers. communication) in relation to Jaikwadi Bird Sanctuary, where 25 fish species have been recorded. David (1963) studied fishes of Godavari and Krishna rivers and documented 43 species of fishes from Godavari river.

The present study includes fish material collected through 7 surveys from 1998 to 2000, representing 33 species, 22 genera, 12 families, 5 subfamilies under 7 orders. Fish collection was made at Sagardarshan, backwater and various other 14 localities around the dam.

Information on common name, status, locality, distribution, range and remarks have been presented in tabular form. For identification of fishes, Day's Fauna (1889) and books like Jayaram (1981), (1991), Talwar & Jhingran (1991), Menon (1987, 1999) and Yazdani (1999) were referred.

SUMMARY

The ichthyofauna of Nathsagar wetland constitutes 33 species, 22 genera, 12 families under 7 orders which are foodfishes, gamefishes, aquarium fishes and larvivorous fishes. It resembles to that of Krishna and Godavari river systems. The fishes found here are clear water inhabitants. Surface feeder cyprinids on plains are more (17 spp.) while bottom dwellers, fishes occurring in muddy water as well as hillstream dwellers are less in number (hardly 3-4 species).

The Catfishes (Order : Siluriformes), Perches (Order : Perciformes) are very few in number. Among cyprinids *Tor* spp., *Osteocheilus* spp. and *Glyptothorax* spp. could not be collected.

The present paper accounts for some new records like *Channa micropletes* Kuhl & Van Hesse, *C. stewartii* (Playfair), *Puntius melanostigma* (Day), *Pseudambassis baculis* (Ham-Buch.) and *Puntius conchoni* (Ham-Buch.).

Out of 33 species of fishes 27 species are found common while 6 are uncommon. David (1963) recorded 43 species of fishes from Godavari river basin. After 30 years the number of fish catch (species-wise) is reduced to 33, thus indicating decline in fishcatch because of water pollution, sewage and anthropogenic activities. The marvellous ichthyofauna of Nathsagar wetland must be conserved.

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FAUNA OF NATHSAGAR WETLAND – PISCES

Sl. No.	Name of species	Common name	Status	Locality within Nathsagar	Distribution	Range	Remarks
	Order OSTEOGLOSSIFORMES						
	Family NOTOPTERIDAE						
1.	<i>Notopterus notopterus</i> (Pallas)	Feather back	UN	Kaigaon	All over India	190 mm	It is also called as poplet
	Order CYPRINIFORMES						
	Family CYPRINIDAE						
	Subfamily CULTRINAE						
2.	<i>Chela cachius</i> (Ham-Buch.)	Sand, palai	UN	Kaigaon	Throughout India	33 mm	It is a surface feeder
3.	<i>Salmostoma acinaces</i> (Val.)	—	C	Sagardarshan, reservoir nr. R. H.	Peninsular India	55 to 75 mm	Mouth obliquely directed upwards
4.	<i>Salmostoma boopis</i> (Day)	—	C	Sagardarshan Savkheda, reservoir nr. R. H.	Peninsular India	54 to 67 mm	Mouth obliquely directed upwards
	Subfamily RASBORINAE						
5.	<i>Danio aequipinnatus</i> (McClelland)	Balooki	C	Tejanpar nr. Shevgaon	Throughout India	38 mm	It is a larvivorous fish
6.	<i>Rasbora daniconius</i> (Ham-Buch.)	Danda, Gaimasa	C	Lakhepal, Kaigaon, Ramdoh, Savkheda Sagardarshan, Dahegaon NE, Shevgaon	Throughout India	12 to 85 mm	It moves in shoal
7.	<i>Rasbora rasbora</i> (Ham-Buch.)	Gangetic scissor tailed rasbora	UN	Lakhepal	India : West Bengal, Assam, Maharashtra	30 mm	It is a aquarium fish

Cont'd.

Sl. No.	Name of species	Common name	Status	Locality within Nathsagar	Distribution	Range	Remarks
	Subfamily CYPRININAE						
8.	<i>Cirrhinus reba</i> (Ham-Buch.)	Reba carp.	C	Savkheda, Shindewadi, Kaigaon	Throughout India	70 to 165 mm	Clear water inhabitant
9.	<i>Cirrhinus mrigala</i> (Ham-Buch.)	Mrigal, Kandai	C	Kaigaon Talav, Gangapur	Northern India	115 mm	It is a major carp
10.	<i>Labeo boggut</i> (Sykes)	Ramya, Black rohu	UN	Kaigaon Talav, Gangapur	Northern India upto Cauvery river system	115 mm	Important food fish
11.	<i>Osteobrama c. cotio</i> (Ham-Buch.)	Cotio	C	Ramdoh, Sagardarshan, Dahegaon NE	Northern India	52 to 60 mm	It is useful larvicide
12.	<i>Osteobrama vigorsii</i> (Sykes)	Chikoli	C	Savkheda, Brahma gaon, Shindewadi, Kaigaon	India: Godavari, Krishna and Mahanadi river systems, S. India	95 to 145 mm	It is common in South India
13.	<i>Puntius ticto</i> (Ham-Buch.)	Khavali	C	Dahigaon NE, Kaigaon, Lakhepal, Savkheda; Ramdoh, Sagardarshan, Brahmagaon, Dam site, Paithan, Shevgaon	Throughout India except Kerala and South Tamil Nadu	10 to 50 mm	Surface Feeder
14.	<i>Puntius conchoni</i> (Ham-Buch.)	Rosy barb.	C	Bramhagaon	India : Assam, N. E. Bengal, Bihar, U.P., Punjab	48 to 63 mm	Lateral line complete

Cont'd.

Sl. No.	Name of species	Common name	Status	Locality within Nathsagar	Distribution	Range	Remarks
15.	<i>Puntius sophore</i> (Ham-Buch.)	Spot fin swamp barb.	C	Lakhepal, Ramdoh Sagardarshan, Brahamgaon, Kaigaon, Damsite, Paithan, Reservoir nr. R. H., Tejanpar, Shevgaon	Throughout India	15 to 60 mm	It finds in plains and sub-montane regions
16.	<i>Puntius melanostigma</i> (Day)	Kaloshi	UN	Dahigaon NE	Southern India	75 mm	It is a larvivorous fish
Subfamily GARRINAE							
17.	<i>Garra mullya</i> (Sykes)	Mallya	C	Ramdoh;	Throughout India except Assam and Himalayas	27 to 38 mm	It is Bottom dweller fish
Family HOMALOPTERIDAE Subfamily NOEMACHEILINAE							
18.	<i>Noemacheilus botia</i> (Ham-Buch.)	Loach	C	Savkheda, Brahamgaon, Kaigaon, Sagardarshan, Damsite, Paithan	Northern India	21 to 52 mm	It is an indicator of clear water
Subfamily COBITINAE							
19.	<i>Lepidocephalus thermalis</i> (Val.)	Stone loach	C	Lakhepal	India : Kerala, Karnataka, M.S.	40 mm	Hill stream fish
Order SILURIFORMES Family BAGRIDAE							
20.	<i>Mystus bleekeri</i> (Day)	Singhala	C	Shevta	Northern India	145 mm	Longitudinal bands and shoulder spot present
21.	<i>Mystus oculatus</i> (Val.)	Malbar mystus	C	Kaigaon	India : Kerala	130 mm	—

Cont'd.

Sl. No.	Name of species	Common name	Status	Locality within Nathasagar	Distribution	Range	Remarks
	Family SILURIDAE						
22.	<i>Ompok bimaculatus</i> (Bloch)	Butter Cat fish	C	Savkheda, Old Esarwadi, Dahigaon NE	Throughout India	165 to 222 mm	It is a tasty food fish
	Family HETEROPNEUSTIDAE						
23.	<i>Heteropneustes fossilis</i> (Bloch)	Stinging cat fish Bicchu ka kata	C	Kaigaon talav, Gangapur	Throughout India	200 mm	It is of a high economic importance
	Order ATHERINIFORMES Family BELONIDAE						
24.	<i>Xenentodon cancila</i> (Ham-Buch.)	Freshwater gar fish, choch masa	C	Dahigaon NE	Throughout India	225 mm	It is surface living fish
	Series PERCOMORPHA Order PERCIFORMES Suborder PERCOIDEI Family AMBASSIDAE						
25.	<i>Pseudambassis ranga</i> (Ham-Buch.)	Glassy fish	C	Dam site, Paithan, Dahigaon NE	Throughout India	26 to 45 mm	Transparent fish
26.	<i>Pseudambasis baculis</i> (Ham-Buch.)	Himalayan glassy perchlet	C	Ramdoh	Northern India; Wardha river; Western Ghats	20 to 30 mm	Transparent fish
	Family CHANDIDAE						
27.	<i>Chanda nama</i> (Ham-Buch.)	Glassy perch	C	Sagardarshan, Ramdoh, Dahigaon NE Reservoir nr. R.H.	Throughout India	32 to 50 mm	Useful in guinea worm and mosquito control

Cont'd.

Sl. No.	Name of species	Common name	Status	Locality within Nathsagar	Distribution	Range	Remarks
	Family CICHLIDAE						
28.	<i>Oreochromis mossambica</i> (Peters)	Tilapia	Ex, C	Kaigaon Talav, Gangapur	Throughout India	52 to 125 mm	Harmful to native stock
	Superorder GOBIOIDEI Family GOBIIDAE						
29.	<i>Glossogobius giuris</i> (Ham.-Buch.)	Tank goby	C	Ramdoh, Dahigaon NE Brahmgaon, Lakhepal, Savkheda, Kaigaon, Reservoir nr. R.H.; Sagardarshan	Throughout India	10 to 135 mm	It forms minor fishery
	Order CHANNIFORMES Family CHANNIDAE						
30.	<i>Channa micropeltes</i> Kuhl & Van Hesse	Malabar Snakehead	UN	Kaigaon	India : Kerala	240 mm	It is a game fish
31.	<i>Channa stewartii</i> (Playfair)	Banded Snakehead	C	Kaigaon talav, Gangapur	Eastern Himalaya	57 mm	Found in muddy water
32.	<i>Channa striatus</i> (Bloch)	Striped Snakehead	C	Lakhepal,	Throughout India	325 mm	It is a food fish
	Order SYNBRANCHIFORMES Family MASTACEMBELIDAE						
33.	<i>Mastacembelus punctatus</i> (Ham.-Buch.)	Striped spiny eel, Muri vam	C	Kaigaon, Sagardarshan, Lakhepal, Brahmgaon, Savkheda, Reservoir nr. R.H., Dahegaon NE	Throughout India	20 to 170 mm	Inhabits plains

C = Common,

UN = Uncommon

Ex = Exotic

REPTILIA

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INTRODUCTION

Nathsagar (Jaikwadi) Wetland is a permanent artificial freshwater reservoir formed due to the construction of a 10.2 Km long earthen dam across Godavari River at Jaikwadi Village in Paithan Taluka of Aurangabad Dist. in Maharashtra State. The huge water body with a shallow basin came into existence in 1976. The backwater spread is about 40 Km with its depth varying between 1–30 meters only.

The reservoir shows perfect characters of a wetland that provides a favourable niche to the aquatic and semi-aquatic faunal elements. It exhibits rich faunal diversity. Therefore inventorization of the biotic communities of such a reservoir is essential to monitor the changes occurring in the communities and also to adopt proper conservation measures for their protection. Considering the importance of the reservoir, Govt. of Maharashtra has issued a notification in Nov. 1986 and declared Nathsagar (Jaikwadi) Reservoir and its surrounding environs as a bird sanctuary. Aquatic bird and fish species of this huge, but not so deep, reservoir have attracted attention of many, though it does support a variety of other interesting faunal groups such as reptiles also. Since no consolidated account on the reptilian diversity from this region is available, it has been decided to record the updated information in the present article on reptilian species/subspecies only.

Present account is based on the material collected & species sighted during the project period between 1997-2000 and also on the bibliographic records (Smith, 1931, 1943; Daniel, 1983; Murthy, 1985; Tikader and Sharma, 1985; Indraneil Das, 1995; Gayen, 1999; Sharma, 1998; Pradhan, 1997, 2002 and many others which have been mentioned at relevant places).

Species collected and/or sighted have been marked with asterisk (*), while those with doubtful status of occurrence have been marked with question mark (?) in the list as well as in the systematic account.

**SYSTEMATIC LIST OF REPTILIAN SPECIES REPORTED FROM
NATHSAGAR (JAIKWADI) WETLAND AND ITS SURROUNDING AREAS**

Phylum CHORDATA

Class REPTILIA

Order LORICATA (CROCODILIA)

Family CROCODILIDAE

- *1. Indian Marsh Crocodile : *Crocodylus palustris* Lesson

Order TESTUDINES (CHELONIA)

Suborder CRYPTODIRA

Family EMYDIDAE

- *2. Deccan Saw-back Terrapin : *Kachuga tentoria* (Gray)
3. Indian Pond Terrapin : *Melanochelys trijuga trijuga* (Schweigger)

Family TRIONYCHIDAE

- *4. Indian Mud Turtle : *Lissemys punctata granosa* (Schoepff)
5. Deccan Soft-shelled Turtle : *Trionyx leithi* Gray

Order SQUAMATA

Suborder SAURIA (LACERTILIA)

Family VARANIDAE

- *6. Indian Monitor Lizard : *Varanus bengalensis* (Daudin)

Suborder SERPENTES (OPHIDIA)

Family TYPHLOPIDAE

- *7. Common Blind snake : *Ramphotyphlops braminus* (Daudin)

Family BOIDAE

- ?8. Indian Rock Python : *Python molurus molurus* (Linnaeus)

Family COLUBRIDAE

- *9. Rat Snake or Dhaman : *Ptyas mucosus* (Linnaeus)
*10. Checkered Keel-back snake : *Xenochrophis piscator* (Schneider)

Family ELAPIDAE

- *11. Common Indian Krait : *Bungarus caeruleus* (Schneider)
- *12. Indian Cobra : *Naja naja naja* (Linnaeus)

Family VIPERIDAE

- *13. Russell's Viper : *Vipera russelli* (Shaw)

SYSTEMATIC ACCOUNT

Phylum CHORDATA

Class REPTILIA

Order LORICATA (CROCODYLIA)

Family CROCODYLIDAE

*1. *Crocodylus palustris* Lesson

1763. *Crocodylus palustris* Lesson, in *Belong. Voy. Ind. or., zool.*, : 305.

2000. *Crocodylus palustris* Lesson, Sharma, In : *Fauna of Gujarat, State Fauna Series, 8* (Part I) (*Vertebrates*): 257.

Common name : English : Indian Marsh Crocodile, Marathi : Mugger; **Locality** : As per the local unconfirmed reports crocodile was introduced in Nathsagar waters about 15 years back in past. Efforts made during last 5–10 years by ZSI survey teams, Forests Dept. authorities, local NGOs and villagers living around the reservoir could not succeed in sighting the crocodile and/or recording its presence, directly or indirectly, in Nathsagar Wetland area. However, recently Shri. Dilip Yardi, a well-known Environmentalist, and his team have reported sighting and capture of one live juvenile of *Crocodylus palustris* from Nathsagar waterbody on 24th Oct. 2004. The juvenile crocodile was, later, released in the same waterbody with the help of Forest Dept. authorities.

Distribution : Elsewhere : Practically throughout India; **Status** : IUCN : Vulnerable (CAMP Report, 1998), *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule : I Part : II; *CITES Appendix* : Appendix : I; *Red Data Book (1994)* : Endangered.

Remarks : The species is known to be hunted for trade for skin and body parts in domestic as well as international markets (Pradhan, 1997). Sometimes even the live specimens are traded illegally.

Order TESTUDINES (CHELONIA)

Suborder CRYPTODIRA

Family EMYDIDAE

***2. *Kachuga tentoria* (Gray)**

1834. *Emys.tentoria* Gray, *Proc. Zool. Soc.* : 54.

1997. *Kachuga tentoria* (Gray) : Tikader and Sharma : *Handbook Indian Testudines* : 74-77. Publ : Director, ZSI, Kolkata.

Common name : English : Deccan saw-back terrapin, South Indian Roofed turtle; Marathi : Kasav; *Locality* : One specimen was collected from Nathsagar Wetland in 1996 by local NGO from Aurangabad.

Distribution : Elsewhere : Tikader and Sharma (1997) and Das (1995) have recorded the distribution of this species from Mahanadi, Krishna and Godavari river systems of Peninsular India; *Status* : Das (1995) reports its status as very common, while CAMP Report (1998) records its status as Lower risk-least concern.

Remarks : Das (1995) reports that large specimens are occasionally exploited for flesh.

3. *Melanochelys trijuga trijuga* (Schweigger)

1814. *Emys. trijuga* Schweigger, *Prodr. Mong. Chel.* 41.

2000. *Melanochelys trijuga trijuga* (Schweigger) : Sharma In *Fauna of Gujarat (Part-I) Vertebrate* : 251.

Common name : English : Indian Pond Terrapin, Indian snail eating turtle, Marathi : Kasav; *Locality* : Daniel (1983) and Tikader and Sharma (1997) reported its distribution in central India which includes Nathsagar Wetland in Aurangabad Dist. in peninsular India.

Distribution : Elsewhere : Tikader and Sharma (1997) and Sharma (2000) have recorded the distribution of the subspecies from Goa, Karnataka, Kerala, Maharashtra and Tamil Nadu; *Status* : The subspecies is endemic within Indian limits. Sharma (2000) reports its status as Indeterminate or possibly vulnerable, while CAMP Report (1998) records its status as Lower risk-least concern.

Remarks : Though Gayen (1999) has reported the species under Family *Bataguridae*, *Melanochelys trijuga trijuga* (Schweigger) has been retained in Family *Emydidae* in this article following Sharma (2000). Main threat to the survival of the subspecies is due to large-scale exploitation of eggs and adults for food.

Family TRIONYCHIDAE

***4. *Lissemys punctata granosa* (Schoepff)**

1792. *Testudo granosa* Schoepff, *Hist. Tes.* p. 127, pl. xxx A & B.

2000. *Lissemys punctata granosa* (Schoepff), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8 (Part I) Vertebrate* : 255.

Common name : English : Southern flap-shelled turtle, Indian Mud Turtle, Marathi : Kasav; **Locality** : Two specimens seized from the illegal traders by the Forest Dept. authorities were collected alive from Nathsagar Wetland waters in 1994-95.

Distribution : Elsewhere : Peninsular India; **Status** : Daniel (1983) and Das (1995) reports status of southern flap-shelled turtle as common, while Sharma (2000) states that its status is suspected to be threatened on account of large scale killing for flesh and eggs and also due to habitat destructions. *Indian Wildlife (Protection) Act, 1972 (as amended up to 2002), Schedule* : Schedule : I Part II (*Lissemys punctata*).

Remarks : Sharma (2000) suspects threat to the survival of the species due to urbanization on nesting sites also. Though Das (1995) has considered *L. punctata punctata* (Lacep.) as a subspecies from southern peninsular India, the southern Indian flap-shelled turtle has been retained here as *L. punctata granosa* (Schoepff) following Tikader and Sharma (1985) and Sharma (2000).

5. *Trionyx leithi* Gray

1872. *Trionyx leithi*, Gray, *Ann. Mag. Nat. Hist.*, (4)X : 334.

2000. *Trionyx leithi* Gray, Sharma, In : *Fauna of Gujarat, State Fauna Series, 8* (Part I) *Vertebrate* : 256-257.

Common name : English : Peninsular or Deccan Soft-shelled turtle, Marathi : Kasav; **Locality** : Sharma (2000) has reported the distribution of the species from Ganga and all other river systems of peninsular India up to Chennai. Therefore its occurrence in Nathsagar Wetland has been assumed here since it is situated in the Central part of the peninsular India.

Distribution : Elsewhere : Sharma (2000) has recorded the species from southeastern districts of Gujarat also; **Status** : The species is endemic within Indian limits. Sharma (2000) suspects the status of *Trionyx leithi* as endangered on account of excessive killings of adult specimens for flesh and eggs for food. *Indian Wildlife (Protection) Act, 1972 (as amended up to 2002) Schedule* : Schedule : IV, *IUCN Category as per CAMP Report (1998)* : Vulnerable (for *Aspideretes leithii* (= *Trionyx leithii*)).

Remarks : Though Das (1995) and Gayen (1999) have reported merger of *Trionyx* in Genus *Aspideretes*, Genus *Trionyx* has been retained in the present communication following Tikader and Sharma (1985) and Sharma (2000).

Order SQUAMATA

Suborder SAURIA (LACERTILIA)

Family VARANIDAE

*6. *Varanus bengalensis* (Daudin)

1801. *Tupinambis bengalensis* Daudin, *Hist. nat. Rept.*, 3 : 67.

1999. *Varanus bengalensis* (Daudin), Gayen, *Hamadryad* : 24(1) : 12-13.

Common name : English : Common Indian monitor, Monitor lizard, Indian monitor; Marathi name : Ghorpad; **Locality** : Sighting of live specimens in areas like Savkheda and Brahma Gavhan has been reported by Forest Dept. authorities and local NGOs.

Distribution : *Elsewhere* : Whole of India; **Status** : The population is alarmingly dwindling throughout the country due to excessive exploitation of the adults for meat and skin (Tikader and Sharma, 1992); *Indian Wildlife (Protection) Act 1972 (as amended up to 2002) Schedule* : Schedule II Part II; *CITES Appendix* : Appendix I; *Red Data Book (1994)* : Endangered; *IUCN category as per CAMP Report (1998)* : Vulnerable.

Remarks : As per Central Zoo Authority records live specimens of this species are present in 26 Indian zoos. Pradhan (1997) has reported illegal trade of this species at national as well as at international level.

Suborder SERPENTES (OPHIDIA)

Family TYPHLOPIDAE

*7. *Ramphotyphlops braminus* (Daudin)

1803. *Eryx braminus* Daudin, *Hist. nat. Rept.*, 7 : 279.

1999. *Ramphotyphlops braminus* (Daudin), Gayen, *Hamadryad* : 24(1) : 13.

Common name : English : Common Blind snake, Worm snake Marathi name : Vala; **Locality** : Forest Dept. authorities and local NGOs reported number of sightings in the areas near Nathsagar wetland waterbody.

Distribution : *Elsewhere* : Whole of India; **Status** : Abundant in the distributional range (Sharma, 2000 for *Typhlops braminus* = *Ramphotyphlops braminus*). *Indian Wildlife (Protection) Act 1972 (as amended up to 2002), Schedule* : Schedule IV, *IUCN category as per CAMP Report (1998)* : Lower risk-near threatened.

Remarks : Though Sharma (2000) retained this species in *Typhlops braminus* (Daudin), it has been considered here as *Ramphotyphlops braminus* (Daudin) following keys and observations made by Murthy (1985), Ahmed and Dasgupta (1992) and Gayen (1999).

Family BOIDAE

?8. *Python molurus* (Linnaeus)

1758. *Coluber molurus* Linnaeus, *Syst. Nat.* 10th Ed. : 225.

2000. *Python molurus* (Linnaeus), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8 (Part I) Vertebrate* : 272-273.

Common name : English : Indian rock python; Marathi name : Ajgar; **Locality** : As per unauthentic sources a live specimen of python was introduced in Nathsagar (Jaikwadi) waters about fifteen years back. However there are no reports of sighting, accidental kills, attacks etc. by

python in recent years. Hence, present occurrence status of python in Nathsagar (Jaikwadi) waters is doubtful and needs to be verified.

Distribution : Elsewhere : Peninsular India; **Status :** Vulnerable (Sharma, 2000) and not uncommon (Daniel, 1983). **IUCN category as per CAMP Report (1998) :** Lower risk-near threatened, **Indian Wildlife (Protection) Act (1972) (as amended up to 2002) Schedule :** Schedule : I Part : II, **Red Data Book (1994) :** Endangered.

Remarks : Survival of the species is in danger due to illegal trade for skin, body parts and live animals at national and international level (Pradhan, 1997).

Family COLUBRIDAE

*9. *Ptyas mucosus* (Linnaeus)

1758. *Coluber mucosus* Linnaeus, *Mus. Ad. Frid.*, 1 : 37.

2000. *Ptyas mucosus* (Linnaeus), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8* (Part I) *Vertebrate :* 276.

Common name : English : Indian rat Snake, Dhaman; Marathi name : Dhaman; **Locality :** Sighted live specimens in Dhakephal, Dahegaon, Ramdoh and Lakhephal areas of Nathsagar Wetland (Jaikwadi) by ZSI survey parties and Forest Dept. authorities during the project period; **Status :** Though common in its range of distribution, the rat snake is subjected to the commercial exploitation on account of its large scale killing for skin and meat (Daniel, 1983 and Sharma, 2000). **Indian Wildlife (Protection) Act (1972 as emended up to 2002) Schedule :** Schedule II (Part II); **CITES Appendix :** Appendix II; **IUCN category as per CAMP Report (1998) :** Lower risk-near threatened.

Remarks : Killing of rat snakes on large scales for its skin is a real threat to the survival of the species. Rat snake skin is involved in illegal local, domestic and international trade (Pradhan, 1997).

*10. *Xenochrophis piscator* (Schneider)

1799. *Hydrus piscator* Schneider, *Hist. Amph.* : 247.

2000. *Xenochrophis piscator* (Schneider) Sharma, In : *Fauna of Gujarat, State Fauna Series, 8* (Part I) *Vertebrate :* 281.

Common name : English : Checkered keelback snake; Marathi name : Virula, Pan chidda, Dhiwad; **Locality :** Specimens were sighted in Lakhephal and Dahegaon areas of Nathsagar Wetland (Jaikwadi) by ZSI survey parties and Forest Dept. authorities during the project period.

Distribution : Elsewhere : Throughout India; **Status :** Commonest snake of India (Daniel, 1983 and Sharma, 2000). **Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule :** Schedule II Part II; **CITES Appendix :** Appendix III; **IUCN category as per CAMP Report (1998) :** Lower risk-least concern.

Remarks : Most active and vicious amongst Indian snakes.

Family ELAPIDAE

***11. *Bungarus caeruleus* (Schneider)**

1801. *Pseudoboa caerulea* Schneider, *Hist. Amphib.*, ii : 284.

2000. *Bungarus caeruleus* (Schneider), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8 (Part I) Vertebrate* : 287.

Common Name : English : Common Indian Krait, Marathi : Manyar, Kander; **Locality** : One dead specimen was sighted on a road to Dahegaon Pump House near Nathsagar Wetland (Jaikwadi) water body by ZSI survey party during project period.

Distribution : Elsewhere : Peninsular India; **Status** : Common in the range (Daniel, 1983); Becoming rare on account of habitat loss (Sharma, 2000); **Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule** : Schedule IV; **IUCN category as per CAMP Report (1998)** : Lower risk-near threatened.

Remarks : Kraits are killed for skins for illegal trade.

***12. *Naja naja naja* (Linnaeus)**

1758. *Coluber naja* Linnaeus *Syst. Nat.* 10th ed : 221.

2000. *Naja naja naja* (Linnaeus), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8 (Part I) Vertebrate* : 288.

Common Name : English : Indian Cobra; Marathi name : Naag; **Locality** : Two cases of cobra bites in Savkheda and Lakhephal villages were reported by the local doctors to the ZSI survey parties during project period.

Distribution : Elsewhere : Peninsular India; **Status** : The population has been reduced drastically on account of habitat destructions, killings and trade (Daniel, 1983 and Sharma, 2000); **Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule** : Schedule II Part II; **CITES Appendix** : Appendix : II; **IUCN Category as per CAMP Report** : Lower risk near threatened.

Remarks : Cobras are killed indiscriminately on a very large scale for illegal trade of their skins.

Family VIPERIDAE

***13. *Vipera russelli* (Shaw)**

1797. *Coluber russelli* Shaw, *Nat. Misc.* : viii : 291.

2000. *Coluber russelli* (Shaw), Sharma, In : *Fauna of Gujarat, State Fauna Series, 8 (Part I) Vertebrate* : 294.

Common Name : English : Russell's viper; Marathi name : Ghonas; **Locality** : A live specimen was sighted in Ramdoh area of Nathsagar Wetland (Jaikwadi) water body by Forest Dept. authorities during the project period.

Distribution : Elsewhere : Whole of India; *Status* : The species is abundant in some areas, uncommon or rare or even missing in other areas (Daniel, 1983 and Sharma, 2000); *Indian Wildlife (Protection) Act (1972 as amended up to 2002) Schedule* : Schedule II, Part II; *IUCN Category as per CAMP Report (1998)* : Lower risk-near threatened.

Remarks : Gayen (1999) considered Russell's viper as a species under another genus *Daboia*. The species has been treated here as *Vipera russeli* (Shaw) following Sharma (2000). Russell's viper is being killed indiscriminately on a very large scale for their skins for illegal trade in local, domestic and international market.

SUMMARY

Systematic list given above reports occurrence of 13 reptilian aquatic and semiaquatic species/subspecies in Nathsagar (Jaikwadi) wetland area and its environs. As stated earlier the inventory is based on collection, sighting and bibliographic records. The 13 reptilian species/subspecies belong to one crocodile family, two freshwater turtle families, one monitor lizard family and five snake families. The inventory lists one species of crocodile, two species of freshwater turtles, one species of monitor lizard and seven species of snakes (including three species of poisonous snakes). This includes one introduced python species also. However its present status of occurrence needs to be varified.

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AMPHIBIA

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INTRODUCTION

Nathsagar wetland is formed by the dam on the river Godavari at Jaikwadi Paithan Taluka of Aurangabad District. The water from this dam is used for irrigation and drinking purposes for the city of Aurangabad. The depth of water in the dam is in between 1 to 30 meters and the area of the reservoir is 35,000 hectares. The backwaters are spread for about 40 km in Aurangabad and Ahmednagar Districts. The wetland is known for its Jaikwadi Bird Sanctuary where about 150 species of local and migratory birds can be seen. Aurangabad receives an annual rainfall of 725 mm and the area is generally dry.

In India the work on amphibians has been started by Boulenger (1890), thereafter a number of workers studied the amphibians in the Indian region viz. Inger & Dutta (1986), Chanda (1994), and Dutta 1997. Daniel (1963 a,b), 1975 and Daniel & Sekar 1989, in their field guide to the Amphibians of Western India, have listed 29 species of amphibians from the western ghat section of the Maharashtra state. Yazdani and Mahabal 1976, Paranjape and Mulherkar (1979) have listed the amphibians from Pune. Ravichandran and Pillay (1990) have recorded the occurrence of 16 species of amphibians from Maharashtra including 1 new species. Sekar (1999) has enlisted 34 species of amphibians from Maharashtra. Kamble (2002) has given the occurrence of 11 species of Amphibians from Ujani Wetland, part of which falls in Ahmednagar District near to Nathsagar Wetland. Padhye and Ghate (2002) have given 43 species of amphibia from Maharashtra.

SYSTEMATIC LIST

Phylum **CHORDATA**

Class **AMPHIBIA**

Order **ANURA**

Family **BUFONIDAE**

1. *Bufo melanostictus* Schn.
2. *Bufo stomaticus* Lutken

Family MICROHYLIDAE

3. *Microhyla ornata* Dumeril & Bibr.

Family RANIDAE

4. *Hoplobatrachus tigerinus* (Daudin)
5. *Euphlyctis cyanophlyctis* (Schn.)
6. *Limnonectes limnocharis* (Gravenhorst.)
7. *Sphaerotheca breviceps* (Schn.)

SYSTEMATIC ACCOUNT

Family BUFONIDAE

1. *Bufo melanostictus* Schn.
(Common Indian Toad)

Diagnosis : Head, upper lip, tips of fingers, toes and metatarsal tubercles with prominent bony ridges. Tympanum $\frac{2}{3}$ diameter of the eye. First finger usually longer than the second. Skin with spine tipped warts. Colour of the dorsal side varying from greyish to brownish. Venter whitish with black striplings on the chin. Toes about $\frac{1}{2}$ webbed with small subarticular tubercles. Inner metatarsal tubercle large and elliptical, outer metatarsal tubercle small.

Materials examined : Kayagaon Phata, 7.12.97, 1 ex.; Sawkheda, 22.11.98, 1 ex.; Sagardarshan, 11.10.99, 2 ex.

Distribution : Throughout the Indian subcontinent and Malaysia.

2. *Bufo stomaticus* Lutken
(Marbled Toad)

Diagnosis : Head without bony ridges, first finger longer than second, Toes $\frac{2}{3}$ webbed, two metatarsal tubercles. Skin smooth above with a few tubercles, dorsum greyish brown in colour. Skin Ventrally granular on the belly, chin smooth, and dull white in colour.

Materials examined : Ramdoh, 21.4.99, 1 ex.

Distribution : Assam, Bihar, Himachal Pradesh, Karnataka, Jammu and Kashmir, Maharashtra, Orissa, and West Bengal.

Family MICROHYLIDAE

3. *Microhyla ornata* Dumeril and Bibron
(Ornate Microhylid)

Diagnosis : Small frogs of about 23 mm snout to vent length. Mouth narrow, Toes with two metatarsal tubercles. Heels meet when the legs are held at right angle to the body. Coloured

characteristically with peculiar shapes on the back giving it an ornate look, belly and underparts white.

Materials examined : Lakhepal, 26.9.97, 1 ex., 20.11.97, 1 ex.

Distribution : Throughout Southeast Asia.

Family RANIDAE

4. *Hoplobatrachus tigerinus* (Daudin) (Indian Bull Frog)

Diagnosis : Large sized amphibians. Skin with longitudinal folds dorsally, ventrally smooth. Tympanum equal to the eye in diameter, toes fully webbed, colour Olive green above with a vertebral streak, limbs spotted, ventrally white.

Materials examined : None, only from records.

Distribution : Throughout India, China and Sri Lanka.

5. *Euphlyctis cyanophlyctis* Schnieder (Skipper Frog)

Diagnosis : Medium sized frogs of 45 to 55 mm snout to vent length. First and second fingers equal. Tympanum about two-thirds the diameter of the eye. Tibiotarsal articulation reaches between the eye and the nostril. Toe tips swollen and rounded, toes fully webbed, a line of porous warts on the flanks. Inner metatarsal tubercle finger like, outer metatarsal tubercle absent. Skin warty dorsally, a 'U' shaped line of warts around anus, ventrally smooth. Colour olive green above with darker marblings, ventrally white. Some specimens show dark marblings on the underside.

Materials examined : Shewata 25.9.97, 8 ex.; 4.12.97, 1 ex.; Tejanapur 31.7.98, 2 ex.; Sawkheda 16.4.99, 3 ex.; 13.1.00, 1 ex.; Bramhagav 16.4.99, 1 ex.; 7.7.99, 1 ex.; Lakhepal 18.4.99, 1 ex.; Dahegaon 14.10.99, 2 ex.; Dhakepal 28.3.00, 2 ex.; Ramdoh 30.3.00, 3 ex.

Distribution : Throughout India, Sri Lanka and Nepal.

6. *Limnonectes limnocharis* (Gravenhorst.) (Indian Cricket Frog)

Diagnosis : Small to medium sized frogs. Toes are only half webbed. First finger longer than the second. Tympanum distinct and nearly half the diameter of the eye. Tibiotarsal articulation reaches the nostril when the legs are held alongside of the body. Subarticular tubercles small, both inner and outer metatarsal tubercles present. Skin warty above, grayish or brownish coloured with darker markings and a dorsal vertebral band, the vertebral band is much broader in some specimens.

Materials examined : Shevata 4.12.98, 1 ex.; Bramhagav 16.4.00, 1 ex.; Dhakepal 28.3.01, 1 ex.

Distribution : Throughout the Indian Union.

7. *Sphaerotheca breviceps* (Schnieder)
(Indian Burrowing Frog)

Diagnosis : Medium sized Frogs. Snout short and rounded, tympanum $\frac{3}{5}$ the diameter of the eye, first finger longer than the second, tibiotarsal articulation reaches shoulder, toes $\frac{3}{4}$ webbed, inner metatarsal tubercle large, crescent shaped and equal in length to the inner toe. Skin smooth or finely granular on the back, coarsely granular on the belly and thighs. Colour grayish above with white marblings. Thighs marbled with yellow ventrally, throat sometimes brownish, rest of the venter white.

Materials examined : None, only from records.

Distribution : Throughout the Indian Peninsula, Nepal, Myanmar, Sri Lanka.

SUMMARY

There are about 7 different species of amphibians present in the wetland area. *Euphlyctis cyanophlyctis* is more predominant than the other forms. *Hoplobatrachus tigerinus*, *Sphaerotheca breviceps* may also be present in the wetland areas as these are common species throughout the state of Maharashtra.

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AVES

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INTRODUCTION

Birds are found in various environmental ecosystems and habitats such as terrestrial and aquatic ecosystems from warm to cold arid zones, from sea shores to high mountains, tropics to the poles, from streams to lakes and rivers (wetlands). Birds which are ecologically dependent on wetlands are known as waterbirds (Arun Kumar *et al.*, 2003). This includes birds like waterfowls, ducks, active swimmers, sea birds and shore birds or waders. Besides water birds there are number of other birds such as raptors, kingfishers, swallows, pipits and some other passerines which are dependent on wetlands.

Wetland areas having sufficient water, are long enough to support growth of hydrophytic vegetation (Vijayan, 1986) which ultimately helps to increase the aquatic faunal diversity. This eventually affects an increase in the population and species diversity of waterbirds and wetland dependent avifauna of that particular wetland area. Further, avifauna as a whole derives benefits from the wetland in the form of food, shelter, rest, foraging and breeding grounds, roosting sites and also the migration route land mark. Waterbirds play a significant role in food chain and in controlling agricultural pests. They are also of great importance for their aesthetic sporting and economic values. In short, in the complex bio-pyramid structure, supported by wetland ecosystem, the avifauna holds an important place.

Birds are probably the most significant group which has attracted many scientific workers for their study at wetland areas and wetland ecosystems spreaded all over the Indian Subcontinent. Hence, there are many scientific publications on wetland avifauna, but in recent years avifaunal studies were undertaken on : birds from Jaikawadi Dam Area-Paithan (Vyawahare & Kulkarni, 1986; bird fauna of Indian Wetlands (Vijayan, 1986); Kanwar Lake, Bihar (Singh & Roy, 1989); Sukhna Wetland, Chandigarh (Jindal *et al.*, 1989, Jindal & Ghezta 1991 and Tak *et al.*, in Press); Ramsar Sites of India-Sambhar Lake (Rajasthan), Loktak Lake (Manipur), Harike Lake (Punjab), Chilka Lake (Orissa) and Wular Lake (J & K) (World Wide Fund For Nature-India, Anon, 1994); Chilka Lake, Orissa (Chattopadhyay, 1995); Renuka Wetland, H.P. (Mahabal, 2000); Waterbirds

of Northern India (Alfred *et al.*, 2001); Freshwater Wetlands (Alfred & Nandi, 2002); Brackishwater Wetlands (Nandi, 2002); Ropar Wetland, Punjab (Mehta *et al.*, 2002); Ujani Lake, Maharashtra (Pradhan, 2002); Kabar Lake Wetland, Bihar (Ramakrishna *et al.*, 2002) and Checklist of Indian Waterbirds (Arun Kumar *et al.*, 2003).

This communication is also an avifaunal studies of Nathsagar Wetland, Maharashtra. It includes systematic lists of waterbirds, wetland dependant birds and birds observed in the close vicinity of this wetland alongwith their residential status, abundance, distribution in wetland area; and ecological categories and conservation status if any.

STUDY AREA AND METHODS

Nathsagar wetland (also called Jaikwadi wetland) is situated 19°39'19" N latitude and 75°26'2" E longitude near Paithan in district Aurangabad, Maharashtra. This man-made wetland has been created due to the construction of dam at Paithan on river Godavari. It can be classified as a 'permanent artificial freshwater body' It has about 40 kms backwater spread in districts Aurangabad and Ahmadnagar. This wetland is declared under "Ramser Convention-1971", and has also been notified as 'Jaikwadi Bird Sanctuary' by Govt. of Maharashtra in 1986. The forest around this wetland is of southern tropical dry deciduous type with aquatic weeds and vegetation growing on both the banks.

To undertake the faunal surveys alongwith observation on avifauna the following eight sites (see common map) were fixed on the left and right banks of the river-wetland such as :

1. **Brahmagavhan** : There is a small pump house for lift irrigation and a hutments of fishermen. Water is little deep for fishing. Aquatic weeds are less at banks. Bank is sandy.
2. **Dhakephal** : A small villege surrounded by irrigated field. A lift irrigation project by farmers. Aquatic weeds are less but there are enough shrubs and trees. Bank is muddy.
3. **Lakhephal** : A small villege surrounded by irrigated field. Along the bank shrubs, grasses and small trees can be seen. Bank is of muddy type.
4. **Dahegaon (N)** : A lagoon has been formed, in which small islands are seen. Aquatic weeds and macrophytes are well grown up all along the banks of lagoon. *Ipomea* growth is much more in this area.
5. **Sagardarshan** : The place is very closed to dam. Pools and islands in shallow water are formed with aquatic weeds. A large number of trees are present in the area.
6. **Ramdoh** : Agricultural fields along the bank can be seen at some places whereas some areas are open wasteland. At few places bank is muddy and has *Ipomea* growth.

7. **Kaigaon** : The water is polluted at one place. A lift irrigation project where water is little deep. On other side shallow water is seen with number of ditches and pools where grass, aquatic weeds and *Ipomea* growth can be observed.
8. **Savkheda** : All along the side is agricultural land with Sugarcane fields. Bank is sandy with almost negligible amount of aquatic weeds.

The avifaunal surveys were undertaken in February and October, 1999 at above sites. Birds were observed with the help of 7 × 50 pair of binoculars. The field identification of birds and its species account in tabular forms is based on Ali & Ripley (1968-1974 and 1995-96), Grimmett *et. al.*, (1999) and Arun Kumar *et al.*, (2003). The standardised common and scientific names of the birds of Indian subcontinent by Manakadan and Pittie (2001) have been followed in the preparation of systematic checklists.

Numbers following the serial numbers are those given in the Handbook of the birds of India and Pakistan (Ali & Ripley, 1968-1974). Categories have been made as per the residential status of the birds such as : resident with local movements (R/LM), resident with summer movements (R/SM), resident with winter influx (R/WM), winter migrants (WM) and winter migrants as well as passage migrant (WM/PM).

The abundance of birds was assessed on their actual counting (population) during the study period and on an arbitrary frequency scale as follows :

- (VC) Very common-population more than 200 birds and sightings 5 to 8 times,
- (C) Common-population 21 to 200 birds and sighting 3 to 4 times,
- (UnC) Uncommon-population upto 20 birds and sightings 1 or 2 times and
- (Ab) Absent or not observed.

The distribution (occurrence) of birds at various eight observation sites is given by (+) : present and (–) : absent or not observed.

OBSERVATION AND RESULTS

Avian Diversity

A total of 81 species of waterbirds (66) and wetland dependant birds (15) have been recorded in the Nathsagar Wetland (Table 1) by considering both the surveys undertaken during February and October, 1999. These birds are belonging to 56 genera and 20 families grouped into 9 avian orders. Table also shows their residential status, abundance and distribution in wetland area. Further, 61 bird species observed in the close vicinity of this wetland have also been compiled in tabular form alongwith their residential status and abundance (Table 2). These birds are grouped into 28 families and 47 genera. This gives a total of 142 bird species occurring in the area of Nathsagar Wetland.

Out of the 81 waterbird and wetland dependent bird species 33 (40.7%) were observed to be resident birds showing some local movements, 26 (32.1%) bird species were recorded as winter migrants whereas 19 (23.5%) bird species were found to have residential as well as winter migrant and or passage migrant status. Remaining 3 (3.7%) species were noticed as resident in nature showing summer movements (Table 1). Further, it shows that Nathsagar Wetland attracts quite a substantial number of winter migratory birds from temperate region of Northern Hemisphere during winter months.

Further, out of 61 bird species recorded from close vicinity of wetland 52 (85.3%) species were noticed to have residential status and or resident with local movements. Only 6 (9.8%) bird species were found to be winter migrants; whereas 2 (3.3%) species were having residential as well as winter migrant status and only 1 (1.6%) species was recorded as resident showing summer movements (Table 2).

Abundance : In this Nathsagar Wetland out of the eight observation sites, areas like Brahmagavhan, Dahegaon (N), Sagardarshan and Kaigaon were found to be good spots for waterbird and wetland dependent bird community. At all these places more than 30 species of birds were noticed at a time with a maximum of 47 species at Kaigaon during the survey undertaken in February, 1999 (Table 1). Palaearctic winter migrants like Northern Shoveller (476), Northern Pintail (3313), Mallard (2018), Coot (384) were noticed in very high numbers by considering all the above sites. A substantial population of winter migrants like Gargeny (55), Common Teal (152), Common Pochard (78), Black-winged Stilt (112), Brown-headed (68) and Black-headed Gulls (36) and some species of sandpipers, swallows and wagtails was recorded at various sites of observation.

Besides this, a party of 350 Coots, a flock containing 210 White-necked Storks, and single flock of Eurasian Spoonbill having 14 birds were noticed only at Brahmagavhan site. Similarly, a single flock containing 32 Greater Flamingos was seen only at Lakhephal site and more than 60 Little Cormorants were found resting at islands formed in the lake near Sagardarshan in the evening. Further, a communal roost of these Little Cormorants was noticed at this site. About 328 Little Cormorants were counted, while they were arriving at this roost on the consecutive evenings from 9 to 11 October, 1999. Resident waterbirds like egrets, herons, ibis, ducks and River Terns were also found in substantial numbers at various observational sites. Further, wetland dependent raptors and kingfishers were seen uncommonly in Nathsagar Wetland.

In general, bird species observed in close vicinity of wetland such as Rose-ringed Parakeet, Bee-eater, Coppersmith Barbet, Ashy-crowned Sparrow-Lark and Common Myna were found in high numbers and many other bird species in substantial numbers (Table 2). Further, it is interesting to note that a single party of 30 male and female Purple Sunbirds was noticed at Ramdoh; whereas, a loose flock of 50 and 80 Ashy-crowned Sparrow-Larks was observed at Dhakephal and Dahegaon (N) respectively in February, 1999.

Avifaunal survey undertaken during October, 1999 shows that winter migrant waterbirds and wetland dependent birds were not noticed at all. However, resident population of migrant bird species like Common Coot, Black-winged Stilt, Whiskered Tern and Grey Wagtail was observed in moderate number at few observational sites (Table 1).

Based on the habits, habitats, characteristics and diagnostic appearance all these 66 waterbird species recorded from this wetland are grouped into 7 categories (Table 3). It shows that Shore Birds (small and medium-sized waders) predominate (25), followed by Medium and Large-sized Waders (16), Dabbling Ducks (10), Aerial Waterbirds (8), Diving Ducks (5) and Active Swimmer and Larger Ducks (1 each). Menon (1992) and Mehta *et al.*, (2002) have also grouped waterbirds into 20 and 13 ecological categories (some of which are made by giving only the names of those birds) respectively. In this communication all species of waders have been grouped into two categories as per their size, hence less number of categories in total.

Further, Table 3 also indicate the total population of each waterbird species recorded at all the observation sites during the study period of February, 1999. During this winter month the combined population of these 66 waterbird species observed was around 7808.

Comparison with other Wetland

A family-wise distribution of number of waterbird and wetland dependent bird species of Nathsagar and its comparison with the another wetland in Maharashtra-Ujani Lake and that of India has been given in Table 4. In India, altogether 47 families have been represented for both the above categories of bird species (Kumar *et al.*, 2003). In this context, bird species of these categories belonging to those particular families occurring in both these wetlands have been considered for comparison. The table shows that number of waterbird species recorded in Ujani Lake (Pradhan, 2002) are much more than in Nathsagar whereas wetland dependent bird species are little less in Ujani Lake as compared to that of Nathsagar Wetland. Further, representation of number of families is also more in Ujani Lake.

Conservation Status

Habitat loss and illegal shooting is major cause of endangerment in waterbirds as well as wetland dependent birds in Indian subcontinent. Table 5 indicates the conservation status of the above categories of birds of Nathsagar Wetland. The bird species like Darter, Asian Openbill Stork, Oriental White Ibis and Black Ibis have status of Near Threatened, whereas Osprey is Vulnerable, as per Birdlife International 2001 as given by Kumar *et al.*, (2003). Further, the Eurasian Spoonbill is included in the Appendix II of the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), 2002 and also included in the Schedule I, Part III : Aves, of the Wildlife (Protection) Act, 1972 (as amended upto 1993). Four wetland dependent raptor species (Table 5) are again included in this above Schedule I, Part III of the Act.

Except these 5 species included in Schedule I, Part III of the Act (as per Table 5), all other waterbirds, wetland dependent birds (as per Table 1) are included in Schedule IV of the Wildlife (Protection) Act, 1972.

Further, Table 5 shows that Black Ibis and Yellow-wattled Lapwing are restricted species to Indo-Malayan Tropical Dry Zone (Biome 11) and Brown-headed Gull restricted to Eurasian High Montane (Biome 05) as per Bird Life International, Red Data Book (2001) as given by Kumar *et al.* (2003).

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Table 1: Systematic list of Water Birds and Wetland dependent birds of Nathsagar Wetland (Jaikwadi) with their status, abundance and distribution.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)							
					Feb.	Oct.	1	2	3	4	5	6	7	8
I. WATER BIRDS :														
		Class AVES Order PODICIPEDIFORMES Family PODICIPEDIDAE												
1.	5	<i>Tachybaptus ruficollis</i> (Pallas)	Little Grebe	R/LM	UnC	UnC	-	-	-	-	+	-	+	-
		Order PELECANIFORMES Family PHALACROCORACIDAE												
2.	28	<i>Phalacrocorax niger</i> (Vieillot)	Little Cormorant	R/LM	C	VC	+	-	-	+	+	-	+	-
3.	26	<i>Phalacrocorax carbo</i> (Linnaeus)	Great Cormorant	R/WM	UnC	UnC	-	-	-	-	+	-	+	-
		Family ANHINGIDAE												
4.	29	<i>Anhinga melanogaster</i> Pennant	Darter	R/LM	UnC	UnC	-	+	-	-	-	-	-	-
		Order CICONIIFORMES Family ARDEIDAE												
5.	49	<i>Egretta garzetta</i> (Linnaeus)	Little Egret	R/LM	UnC	UnC	+	+	-	-	-	-	+	-
6.	36	<i>Ardea cinerea</i> Linnaeus	Grey Heron	R/LM	UnC	UnC	+	+	-	-	-	-	+	-
7.	37	<i>Ardea purpurea</i> Linnaeus	Purple Heron	R/LM	UnC	Ab	-	-	-	-	-	+	-	-
8.	46	<i>Casmerodius albus</i> (Linnaeus)	Large Egret	R/LM	UnC	UnC	+	-	+	+	+	-	+	+
9.	49, 48	<i>Mesophoyx intermedia</i> (Wagler)	Median Egret	R/LM	C	C	+	-	+	+	+	+	+	-
10.	44	<i>Bubulcus ibis</i> (Linnaeus)	Cattle Egret	R/LM	C	VC	+	+	-	+	+	-	+	-
11.	42	<i>Ardeola grayii</i> (Sykes)	Indian Pond Heron	R/LM	C	UnC	-	-	-	+	+	-	+	+
12.	52	<i>Nycticorax nycticorax</i> (Linnaeus)	Black-crowned Night Heron	R/LM	UnC	Ab	-	-	-	-	+	-	-	-
13.	55	<i>Ixobrychus minutus</i> (Linnaeus)	Little Bittern	R/LM	UnC	Ab	+	+	-	-	-	-	-	-

Cont'd.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)											
					Feb.	Oct.	1	2	3	4	5	6	7	8				
		Family CICONIIDAE																
14.	61	<i>Anastomus oscitans</i> (Boddaert)	Asian Openbill-Stork	R/LM	C	Ab	+	-	+	-	-	+	-	-				
15.	62	<i>Ciconia episcopus</i> (Boddaert)	White-necked Stork	R/LM	VC	UnC	+	-	+	-	-	-	+	-				
		Family THRESKIORNITHIDAE																
16.	71	<i>Plegadis falcinellus</i> (Linnaeus)	Glossy Ibis	R/LM/WM	UnC	Ab	-	-	-	-	+	+	+	-				
17.	69	<i>Threskiornis melanocephalus</i> (Latham)	Oriental White Ibis	R/LM	C	UnC	-	-	+	+	+	-	-	-				
18.	70	<i>Pseudibis papillosa</i> (Temminck)	Black Ibis	R/LM	UnC	Ab	-	-	+	+	+	-	-	-				
19.	72	<i>Platalea leucorodia</i> Linnaeus	Eurasian Spoonbill	R/LM	UnC	Ab	+	-	-	-	-	-	-	-				
		Family PHOENICOPTERIDAE																
20.	73	<i>Phoenicopterus ruber</i> Linnaeus	Greater Flamingo	R/LM/WM	C	Ab	-	-	+	-	-	-	-	-				
		Order ANSERIFORMES Family ANATIDAE																
21.	88	<i>Dendrocygna javanica</i> (Horsfield)	Lesser Whistling Duck	R/LM	C	UnC	-	-	-	+	+	-	-	-				
22.	82	<i>Anser indicus</i> (Latham)	Bar-headed Goose	R/WM	UnC	Ab	+	-	-	-	-	-	+	-				
23.	90	<i>Tadorna ferruginea</i> (Pallas)	Brahminy Shelduck	R/WM/PM	UnC	Ab	+	-	-	-	-	+	-	-				
24.	115	<i>Sarkisiornis melanotus</i> (Pennant)	Comb Duck	R/LM	UnC	Ab	-	-	-	+	+	-	-	-				
25.	114	<i>Nettapus coromandelianus</i> (Gmelin)	Cotton Teal	R/LM	UnC	Ab	+	-	-	-	-	-	+	-				
26.	101	<i>Anas strepera</i> Linnaeus	Gadwall	WM	UnC	Ab	-	+	-	-	-	+	+	-				
27.	103	<i>Anas penelope</i> Linnaeus	Eurasian Wigeon	WM	UnC	Ab	-	+	-	-	-	+	-	-				
28.	100	<i>Anas platyrhynchos</i> Linnaeus	Mallard	R/WM	VC	Ab	-	+	+	+	+	+	+	+				
29.	97	<i>Anas poecilorhyncha</i> J. R. Forester	Spot-billed Duck	R/LM	C	UnC	+	-	-	+	+	+	+	-				
30.	105	<i>Anas clypeata</i> Linnaeus	Northern Shoveller	WM	VC	Ab	+	-	+	+	+	+	+	+				

Cont'd.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)								
					Feb.	Oct.	1	2	3	4	5	6	7	8	
31.	93	<i>Anas acuta</i> Linnaeus	Northern Pintail	WM	VC	Ab	+	-	+	+	+	+	+	+	+
32.	104	<i>Anas querquedula</i> Linnaeus	Garganey	WM	C	Ab	+	-	-	+	-	+	+	-	-
33.	94	<i>Anas crecca</i> Linnaeus	Common Teal	WM	C	Ab	+	-	-	-	-	+	+	-	-
34.	107	<i>Rhodonessa rufina</i>	Red-crested Pochard	WM	UnC	Ab	-	-	-	-	-	+	+	-	-
35.	108	<i>Aythya ferina</i> (Linnaeus)	Common Pochard	WM	C	Ab	+	-	-	-	+	+	-	-	-
36.	111	<i>Aythya fuligula</i> (Linnaeus)	Tufted Duck	WM	UnC	Ab	-	+	-	-	-	-	+	-	-
		Order GRUIFORMES Family RALLIDAE													
37.	332	<i>Rallina eurizonoides</i> (Lafresnaye)	Slaty-legged Crake	R/LM	UnC	Ab	-	-	+	-	-	-	+	-	-
38.	344	<i>Amauromis phoenicurus</i> (Pennant)	White-breasted Waterhen	R/LM	UnC	UnC	-	+	+	-	-	-	+	-	-
39.	349	<i>Porphyrio porphyrio</i> (Linnaeus)	Purple Moorhen	R/LM	UnC	UnC	-	-	-	-	-	+	+	-	-
40.	347	<i>Gallinula chloropus</i> (Linnaeus)	Common Moorhen	R/WM	UnC	Ab	-	-	-	-	-	+	+	-	-
41.	350	<i>Fulica atra</i> Linnaeus	Coot	R/WM	VC	UnC	+	-	+	-	+	+	+	-	-
		Order CHARADRIIFORMES Family JACANIDAE													
42.	358	<i>Hydrophasianus chirurgus</i> (Scopoli)	Pheasant-tailed Jacana	R/LM/SM	UnC	UnC	-	+	-	-	-	-	+	-	-
43.	359	<i>Metopidius indicus</i> (Latham)	Bronze-winged Jacana	R/LM	UnC	Ab	-	+	-	-	-	-	-	-	-
		Family ROSTRATULIDAE													
44.	429	<i>Rostratula benghalensis</i> (Linnaeus)	Greater Painted-Snipe	R/LM	UnC	Ab	+	-	-	+	-	-	-	-	-

Cont'd.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)										
					Feb.	Oct.	1	2	3	4	5	6	7	8			
		Family CHARADRIIDAE															
45.	379	<i>Charadrius dubius</i>	Little Ringed-Plover	R/WM	C	Ab	+	-	-	-	+	-	+	-			
46.	370	<i>Vanellus malabaricus</i> (Boddaert)	Yellow-wattled Lapwing	R/LM	UnC	UnC	-	-	+	-	-	-	-	-			
47.	366	<i>Vanellus indicus</i> (Boddaert)	Red-wattled Lapwing	R/LM	C	UnC	-	+	+	+	+	+	-	+			
		Family SCOLOPACIDAE															
48.	406	<i>Gallinago stenura</i> (Bonaparte)	Pintail Snipe	WM	UnC	Ab	-	-	+	+	-	-	-	-			
49.	409	<i>Gallinago gallinago</i> (Linnaeus)	Common Snipe	WM	UnC	Ab	-	+	-	-	-	-	-	-			
50.	389	<i>Limosa limosa</i> (Linnaeus)	Black-tailed Godwit	WM	UnC	Ab	+	-	-	+	-	-	-	-			
51.	394	<i>Tringa totanus</i> (Linnaeus)	Common Redshank	WM	UnC	Ab	+	-	-	+	+	-	-	-			
52.	392	<i>Tringa erythropus</i> (Pallas)	Spotted Redshank	WM	UnC	Ab	-	-	-	-	+	-	+	-			
53.	395	<i>Tringa stagnatilis</i> (Bachstein)	Marsh Sandpiper	WM`	UnC	Ab	+	-	-	-	-	-	-	+	-		
54.	396	<i>Tringa nebularia</i> (Gunner)	Common Green-shank	WM	C	Ab	+	+	-	-	-	-	-	+	+		
55.	397	<i>Tringa ochropus</i> Linnaeus	Green Sandpiper	WM	C	Ab	+	+	-	+	-	-	-	+	-		
56.	398	<i>Tringa glareola</i> Linnaeus	Wood Sandpiper	WM	C	Ab	+	-	-	-	-	-	+	-	-		
57.	401	<i>Actitis hypoleucos</i> Linnaeus	Common Sandpiper	WM	C	Ab	+	+	-	+	-	-	-	+	-		
58.	416	<i>Calidris minuta</i> (Leisler)	Little Stinct	WM	UnC	Ab	-	-	-	+	-	+	-	-			
59.	426	<i>Philomachus pugnax</i> (Linnaeus)	Ruff	WM	UnC	Ab	-	+	-	-	-	-	-	-			
		Family RECURVIROSTRIDAE															
60.	430	<i>Himantopus himantopus</i>	Back-winged Stilt (Linnaeus)	R/WM	VC	UnC	+	+	+	+	+	+	+	+	-		
61.	432	<i>Recurvirostra avosetta</i> Linnaeus	Pied Avocet	WM/R	UnC	Ab	-	-	+	-	-	-	-	-			

Cont'd.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)										
					Feb.	Oct.	1	2	3	4	5	6	7	8			
		Family LARIDAE															
62.	453	<i>Larus ichthyaetus</i> Pallas	Palla's Gull	WM	UnC	Ab	-	-	-	-	+	-	+	-			
63.	454	<i>Larus brunnicephalus</i> Jerdon	Brown-headed Gull	WM	C	Ab	-	-	-	+	+	+	+	+			
64.	455	<i>Larus ridibundus</i> Linnaeus	Black-headed Gull	WM	C	UnC	-	-	-	+	+	+	+	+			
65.	463	<i>Sterna aurantia</i> J. E. Gray	River Tern	R/LM	C	C	+	+	+	+	+	+	+	+			
66.	458	<i>Chlidonias hybridus</i> (Pallas)	Whiskered Tern	R/WM/PM	UnC	UnC	-	-	-	-	+	-	+	-			
II. Wetland Dependent Birds :																	
		Order FACONIFORMES Family ACCIPITRIDAE															
67.	135	<i>Haliastur indus</i> (Boddaert)	Brahminy Kite	R/LM	UnC	UnC	+	-	-	-	-	-	-	-	+		
68.	193	<i>Circus aeruginosus</i> (Linnaeus)	Western Marsh-Harrier	WM	UnC	Ab	-	-	-	+	-	-	+	-			
69.	169	<i>Aquila nipalensis</i> Hodgson	Steepe Eagle	WM	UnC	Ab	-	-	+	-	-	-	+	-			
		Family PANDIONIDAE															
70.	203	<i>Pandion haliaetus</i> (Linnaeus)	Osprey	R/WM	Ab	UnC	-	-	-	-	-	-	-	-			
		Order CORACIIFORMES Family ALCEDINIDAE															
71.	723	<i>Alcedo atthis</i> (Linnaeus)	Small Blue Kingfisher	R/SM	UnC	UnC	-	-	-	-	-	-	+	+			
72.	736	<i>Halcyon smyrnensis</i> (Linnaeus)	White-breasted Kingfisher	R/LM	UnC	UnC	-	-	-	-	-	+	+	-			
73.	719	<i>Ceryle rudis</i> (Linnaeus)	Lesser Pied Kingfisher	R/LM	UnC	Ab	+	-	-	-	-	+	-	+			

Cont'd.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Status	Abundance in 1999		Distribution in wetland area (Feb., 1999)										
					Feb.	Oct.	1	2	3	4	5	6	7	8			
		Order PASSERIFORMES Family HIRUNDINIDAE															
74.	916	<i>Hirundo rustica</i> Linnaeus	Common Swallow	R/WM	C	UnC	-	-	+	-	+	-	-	-	+		
75.	921	<i>Hirundo smithii</i> Leach	Wire-tailed Swallow	R/SM	UnC	Ab	-	+	+	-	-	-	+	-			
76.	925	<i>Hirundo daurica</i> Linnaeus	Red-rumped Swallow	R/LM/WM	UnC	UnC	-	+	+	-	-	-	-	-			
		Family MOTACILLIDAE															
77.	1885	<i>Motacilla alba</i> Linnaeus	White Wagtail	R/WM/PM	UnC	Ab	-	-	-	-	-	-	+	+			
78.	1891	<i>Motacilla maderaspatensis</i> Gmelin	Large Pied Wagtail	R/LM	UnC	UnC	-	-	-	-	-	-	+	-			
79.	1883	<i>Motacilla citreola</i> Pallas	Citrine Wagtail	R/WM	C	UnC	-	-	-	+	+	-	+	+			
80.	1876	<i>Motacilla flava</i> Linnaeus	Yellow Wagtail	R/WM/PM	C	Ab	+	+	+	+	+	-	+	+			
81.	1884	<i>Motacilla cinerea</i> Tunstall	Grey Wagtail	R/WM	C	UnC	-	-	+	+	-	+	-	-			
							35	23	25	30	32	28	47	16			

ABBREVIATIONS :

Hand Book No. : As given in Ali & Ripley (1968-1974)

Status :
 (R/LM) : Resident with Local Movements
 (R/SM) : Resident with Summer Movements
 (R/WM) : Resident with Winter Migrants
 (WM) : Winter Migrant
 (WM/PM) : Winter Migrant as well as Passage Migrant

Abundance :
 (VC) : Very Common
 (C) : Common
 (UnC) : Un Common
 (Ab) : Absent/Not Observed

Distribution :
 (1) : Brahmagavhan (5) : Sagardarshan (+) : Present
 (2) : Sagardarshan (6) : Ramdoh (-) : Absent/Not Observed
 (3) : Lakhephal (7) : Kaigaon
 (4) : Dahegaon (N) (8) : Savkheda

Table 2. : Systematic list of Birds observed In close-vicinity of Nathsagar wetland with their status and abundance.

Sr. No.	Hand Book No.	Scientific Name	Common Name	Status	Abundance in 1999	
					Feb.	Oct.
		Family ACCIPITRIDAE				
1.	124	<i>Elanus caeruleus</i> (Desfontaines)	Black-shouldered Kite	R/LM	UnC	UnC
2.	133	<i>Milvus migrans</i> (Boddaert)	Black Kite	R/LM	C	UnC
3.	138	<i>Accipiter badius</i> (Gmelin)	Shikra	R/LM	UnC	UnC
		Family PHASIANIDAE				
4.	245	<i>Francolinus pondicerlanus</i> (Gmelin)	Grey Francolin	R	UnC	UnC
		Family COLUMBIDAE				
5.	517	<i>Columba livia</i> Gmelin	Blue Rock Pigeon	R	C	C
6.	541	<i>Streptopelia senegalensis</i> (Linnaeus)	Little Brown Dove	R	UnC	UnC
7.	537	<i>Streptopelia chinensis</i> (Scopoli)	Spotted Dove	R	C	C
8.	534	<i>Streptopelia decaocto</i> (Frisvaldszky)	Eurasian Collared Dove	R	C	UnC
		Family PSITTACIDAE				
9.	550	<i>Psittacula krameri</i> (Scopoli)	Rose-ringed Parakeet	R/LM	VC	VC
10.	558	<i>Psittacula cyanocephala</i> (Linnaeus)	Plum-headed Parakeet	R/LM	UnC	UnC
		Family CUCULIDAE				
11.	573	<i>Hierococcyx varius</i> (Vahl)	Brainfever Bird	R/LM	UnC	Ab
12.	590	<i>Eudynamys scolopacea</i> (Linnaeus)	Asian Koel	R/LM	UnC	UnC
13.	602	<i>Centropus sinensis</i> (Stephens)	Greater Coucal	R/LM	UnC	UnC
		Family TYTONIDAE				
14.	606	<i>Tyto alba</i> (Scopoli)	Barn Owl	R	UnC	Ab
		Family STRIGIDAE				
15.	650	<i>Athene brama</i> (Temminck)	Spotted Owlet	R	UnC	Ab
		Family APODIDIE				
16.	703	<i>Apus affinis</i> (J. E. Gray)	House Swift	R	C	UnC
		Family MEROPIDIE				
17.	750	<i>Merops orientalis</i> Latham	Small Bee-eater	R	VC	VC
		Family CORACIIDAE				
18.	755	<i>Coracias benghalensis</i> (Linnaeus)	Indian Roller	R/LM	UnC	UnC

Cont'd.

Sr. No.	Hand Book No.	Scientific Name	Common Name	Status	Abundance in 1999	
					Feb.	Oct.
		Family UPUIDAE				
19.	765	<i>Upupa epops</i> Linnaeus	Common Hoopoe	R/WM	C	UnC
		Family BUCEROTIDAE				
20.	767	<i>Ocyrceros birostris</i> (Scopoli)	Indian Grey Hornbill	R/LM	UnC	Ab
		Family CAPITONIDAE				
21.	785	<i>Megaliama viridis</i> (Boddaert)	White-cheeked Barbet	R	Ab	UnC
22.	792	<i>Megaliama haemacephala</i> (P. L. S. Muller)	Coppersmith Barbet	R	VC	UnC
		Family ALAUDIDAE				
23.	878	<i>Eremopterix grisea</i> (Scopoli)	Ashy-crowned Sparrow-Lark	R/LM	VC	UnC
24.	883	<i>Ammomanes phoenicurus</i> (Franklin)	Rufous-tailed Finch-Lark	R/LM	C	UnC
		Family MOTACILLIDAE				
25.	1859	<i>Anthus rufulus</i> Vieillot	Paddyfield Pipit	R	UnC	Ab
26.	1861	<i>Anthus campestris</i> (Linnaeus)	Twany Pipit	WM	UnC	Ab
27.	1852	<i>Anthus hodgsoni</i> Richmond	Oriental Tree Pipit	WM	C	Ab
		Family PYCNONOTIDAE				
28.	1120	<i>Pycnonotus jocosus</i> (Linnaeus)	Red-whiskered Bulbul	R/LM	UnC	Ab
29.	1128	<i>Pycnonotus cafer</i> (Linnaeus)	Red-vented Bulbul	R	C	C
		Family IRENIDAE				
30.	1099	<i>Aegithina tiphia</i> (Linnaeus)	Common Iora	R	UnC	Ab
		Family LANIIDAE				
31.	946	<i>Lanius schach</i> Linnaeus	Rufous-backed Shrike	WM	C	UnC
32.	933	<i>Lanius excubitor</i> Linnaeus	Great Grey Shrike	R	UnC	UnC
		Family MUSCICAPIDAE Subfamily TURDINAE				
33.	1661	<i>Copsychus saularis</i> (Linnaeus)	Oriental Magpie-Robin	R	C	UnC
34.	1719	<i>Saxicoloides fulicata</i> (Linnaeus)	Indian Robin	R	C	C
35.	1672	<i>Phoenicurus ochruros</i> (Gmelin)	Black Redstart	R/WM	UnC	Ab
36.	1701	<i>Saxicola caprata</i> (Linnaeus)	Pied Bushchat	R	C	UnC

Cont'd.

Sr. No.	Hand Book No.	Scientific Name	Common Name	Status	Abundance in 1999	
					Feb.	Oct.
		Subfamily TIMALIINAE				
37.	1231	<i>Chrysomma sinense</i> (Gmelin)	Yellow-eyed Babbler	R	UnC	UnC
38.	1258	<i>Turdoides malcolmi</i> (Sykes)	Large Grey Babbler	R	C	C
39.	1262	<i>Turdoides striatus</i> (Dumont)	Jungle Babbler	R	C	UnC
		Subfamily SYLVIINAE				
40.	1511	<i>Prinia inornata</i> Sykes	Plain Prinia	R	UnC	UnC
41.	1545	<i>Locustella naevia</i> (Boddaert)	Pale Grasshopper-Warbler	WM	UnC	Ab
42.	1535	<i>Orthotomus sutorius</i> (Pennant)	Common Tailorbird	R	C	UnC
43.	1575	<i>Phylloscopus collybita</i> (Vieillot)	Common Chiffchaff	WM	UnC	Ab
		Subfamily RHIPIDURINAE				
44.	1451	<i>Rhipidura aureola</i> Lesson	White-browed Fantail-Flycatcher	R	UnC	UnC
		Family PARIDAE				
45.	1794	<i>Parus major</i> Linnaeus	Great Tit	R	C	UnC
		Family DICAIEIDAE				
46.	1892	<i>Dicaeum agile</i> (Tickell)	Thick-billed Flowerpecker	R	UnC	UnC
47.	1899	<i>Dicaeum erythrorhynchos</i> (Latham)	Tickell's Flowerpecker	R	UnC	UnC
		Family NECTARINIDAE				
48.	1907	<i>Nectarina zeylonica</i> (Linnaeus)	Purple-rumped Sunbird	R	UnC	UnC
49.	1917	<i>Nectarina asiatica</i> (Latham)	Purple Sunbird	R	C	UnC
		Family ESTRILDIDAE				
50.	1974	<i>Lonchura punctulata</i> (Linnaeus)	Spotted Munia	R	C	UnC
		Family PASSERIDAE				
		Subfamily PASSERINAE				
51.	1938	<i>Passer domesticus</i> (Linnaeus)	House Sparrow	R	C	C
		Subfamily PLOCEINAE				
52.	1957	<i>Ploceus philippinus</i> (Linnaeus)	Baya Weaver	R	C	C

Cont'd.

Sr. No.	Hand Book No.	Scientific Name	Common Name	Status	Abundance in 1999	
					Feb.	Oct.
		Family STURNIDAE				
53.	994	<i>Sturnus pagodarum</i> (Gmelin)	Brahminy Starling	R	UnC	UnC
54.	996	<i>Sturnus roseus</i> (Linnaeus)	Rosy Starling	WM	C	Ab
55.	1006	<i>Aoridothores tristis</i> (Linnaeus)	Common Myna	R	VC	VC
56.	1008	<i>Acridotheres fuscus</i> (Wagler)	Jungle Myna	R	UnC	UnC
		Family ORIOLIDAE				
57.	953	<i>Oriolus oriolus</i> (Linnaeus)	Eurasian Golden Oriole	R/SM	C	UnC
		Family DICRURIDAE				
58.	963	<i>Dicrurus macrocercus</i> Vieillot	Black Drongo	R	C	C
		Family CORVIDAE				
59.	1031	<i>Dendrocitta vagabunda</i> (Latham)	Indian Treepie	R	UnC	UnC
60.	1049	<i>Corvus splendens</i> Vieillot	House Crow	R	C	C
61.	1056	<i>Corvus macrorhynchos</i> Wagler	Jungle Crow	R	C	C

ABBREVIATIONS :**Hand Book No. :** As given in Ali & Ripley (1968-1974)

Status :

(R/LM) : Resident with Local Movements

(R/SM) : Resident with Summer Movements

(R/WM) : Resident with Winter Migrants

(WM) : Winter Migrant

Abundance :

(VC) : Very Common

(C) : Common

(UnC) : Un Common

(Ab) : Absent/Not Observed.

Table 3. : Ecological categories and number of each waterbird species recorded at Nathsagar wetland.

Category	No. of Species	Sl. No.	Common Name	Total No. of Birds recorded (Feb., 1999)
I. ACTIVE SWIMMER	1	1	Little Grebe	4
II. AERIAL WATERBIRDS (Cormorant swims with most of the body underwater, terns flying above waterbodies & diving vertically into water and Gulls swoopdown to water surface without entering into water)	8	2	Little Cormorant	60
		3	Great Cormorant	4
		4	Darter	2
		5	Palla's Gull	2
		6	Brown-headed Gull	68
		7	Black-headed Gull	36
		8	River Tern	70
		9	Whiskered Tern	4
III. DABBLING DUCKS (Surface feeders as well as in the shallows; vertical take off)	10	10	Lesser Whistling Duck	43
		11	Brahminy Shelduck	8
		12	Gadwall	14
		13	Eurasian Wigeon	10
		14	Mallard	2018
		15	Spot-billed Duck	52
		16	Northern Shoveller	476
		17	Northern Pintail	3313
		18	Garganey	55
		19	Common Teal	152
IV. DIVING DUCKS (Feed in deep waters, take off with a long run on the surface by paddling and flapping)	5	20	Comb Duck	6
		21	Cotton Teal	10
		22	Red-crested Pochard	12
		23	Common Pochard	78
		24	Tufted Duck	14
V. LARGER DUCKS (Feed in mud-spits, wet meadows in water by submerging head)	1	25	Bar-headed Goose	6
VI. SHORE BIRDS OR SMALL & MEDIUM-SIZED WADERS (Feeding in shallows: Snipe, Redshank & Sandpipers; margins of ponds and jheels: Moorhen & Coots; floating	25	26	Pintail Snipe	4
		27	Common Snipe	4
		28	Black-tailed Godwit	4
		29	Common Redshank	12
		30	Spotted Redshank	10
		31	Common Greenshank	32
		32	Marsh Sandpiper	14

Cont'd.

Category	No. of Species	Sl. No.	Common Name	Total No. of Birds recorded (Feb., 1999)
vegetation: Jacanas; waterbeds: Stilts; dry edges of water: Lapwings)		33	Green Sandpiper	21
		34	Wood Sandpiper	22
		35	Common Sandpiper	24
		36	Little Stint	6
		37	Ruff	4
		38	Black-winged Stilt	112
		39	Pied Avocet	4
		40	Slaty-legged Crake	2
		41	White-breasted Waterhen	6
		42	Purple Moohren	10
		43	Common Moohren	4
		44	Coot	384
		45	Pheasant-tailed Jacana	2
		46	Bronze-winged Jacana	2
		47	Greater Painted-Snipe	4
		48	Little Ringed-Plover	92
		49	Yellow-wattled Lapwing	2
		50	Red-wattled Lapwing	30
VII. MEDIUM AND LARGE-SIZED LANKY WADERS OR MARSH BIRDS (In irrigated, cultivated areas, reed-beds, marshy places, edges of water, in shallow water, in rock pools, in puddles)	16	51	Pond Heron	34
		52	Grey Heron	16
		53	Purple Heron	4
		54	Large Egret	10
		55	Medium Egret	23
		56	Little Egret	10
		57	Cattle Egret	36
		58	Black-crowned Night Heron	6
		59	Little Bittern	6
		60	Asian Open-bill Stork	22
		61	White-necked Stork	224
		62	Glossy Ibis	18
		63	Oriental White Ibis	24
		64	Black Ibis	5
		65	Eurasian Spoonbill	14
		66	Greater Flamingo	32
Combined Total Population :				7808

Table 4. : Distribution of water birds & wetland dependent birds of Nathsagar wetland In comparison with Ujani Lake and India.

Family	No of Species		
	*India	**Ujani Lake	Nathsagar
I. Water Birds :			
Podicipedidae	5	1	1
Phalacrocoracidae	3	3	2
Anhingidae	1	1	1
Ardeidae	20	8	9
Ciconiidae	9	6	2
Threskiornithidae	4	4	4
Phoenicopteridae	2	2	1
Anatidae	42	16	16
Gruidae	6	2	0
Rallidae	17	4	5
Jacaniidae	2	1	2
Rostratulidae	2	2	1
Charadriidae	19	7	3
Scolopacidae	37	13	12
Recurvirostridae	3	1	2
Burhinidae	2	1	0
Glareolidae	3	2	0
Laridae	23	9	5
II. Wetland Dependent Birds :			
Accipitridae	11	4	3
Pandionidae	1	1	1
Alcedinidae	12	3	3
Hirundinidae	7	—	3
Motacillidae	9	4	5
Total Number of Bird Species	240	95	81

*Compiled from Kumar *et al.*, (2003)

**Compiled from Pradhan (2002)

Table 5. : Conservation status of water birds and wetland dependant birds of Nathsagar wetland.

Sl. No.	Common & Species Name	*Bird Life International Red Data Book (2001)	**CITES (2002)	Wildlife (Protection) Act, 1972 (amended upto 1993)
I. Water Birds :				
	Family ANHIGINIDAE			
1.	Darter, <i>Anhinga melanogaster</i>	Near Threatened	-	Schedule IV
	Family CICONIIDAE			
2.	Asian Openbill Stork, <i>Anastomus oscitans</i>	-do-	-	-do-
	Family THRESKIORNITHIDAE			
3.	Oriental White Ibis, <i>Threskiornis melanocephalus</i>	-do-	-	-do-
4.	Black Ibis, <i>Pseudibis papillosa</i>	-do- & Biome 11 : Restricted Species (Indo-Malayan Tropical Dry Zone)	-	-do-
5.	Eurasian Spoonbill, <i>Platalea leucorodia</i>	-	Appendix II	Schedule I, Part III
	Family CHARADRIIDAE			
6.	Yellow-wattled Lapwing, <i>Vanellus malabaricus</i>	Endemic & Biome 11 : (Indo-Malayan Tropical Dry Zone)	-	Schedule IV
	Family LARIDAE			
7.	Brown-headed Gull, <i>Larus brunnicephalus</i>	Biome 05 : (Eurasian High Montane)	-	-do-
II. Wetland Dependent Birds :				
	Family ACCIPITRIDAE			
8.	Brahminy Kite, <i>Haliastur indus</i>	-	-	Schedule I, Part III
9.	Western Marsh Harrier, <i>Circus aeruginosus</i>	-	-	-do-
10.	Steppe Eagle, <i>Aquila nipalensis</i>	-	-	-do-
	Family PANDIONIDAE			
11.	Osprey, <i>Pandion haliactus</i>	Vulnerable	-	Schedule I, Part III

*As Mentioned in Arum Kumar *et. al.*, (2003).

** Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2002).

MAMMALIA

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INTRODUCTION

Nathsagar (Jaikawadi) wetland reservoir shows perfect characters of a wetland that provides a favourable niche to the aquatic, semi-aquatic as well as water body dependant terrestrial faunal elements. It exhibits rich faunal diversity. Therefore inventorization of the biotic communities of such a reservoir is essential to monitor the changes occurring in the communities and also to adopt proper conservation measures for their protection. Aquatic bird and fish species of this huge, but not so deep, reservoir have attracted attention of many, though it does support a variety of other interesting faunal groups also. Since no consolidated account on the Nathsagar reservoir dependent mammalian diversity is available, it has been decided to record the updated information in the present article on mammalian species/subspecies only.

Present account is based on the species sighted during the project period between 1997–2000 and also on the bibliographic records (Prater, 1980; Corbet and Hill, 1992; Tikader, 1983; Menon, 2003; Pradhan, 1996, 1997, 2002) and some others which have been mentioned at the relevant places).

Species sighted have been marked with asterisk (*), while those with doubtful status of occurrence have been marked with question mark (?) in the list as well as in the systematic account.

SYSTEMATIC LIST OF RESERVOIR DEPENDENT MAMMALIAN SPECIES REPORTED FROM NATHSAGAR (JAIKWADI) WETLAND AND ITS SURROUNDING AREAS

Class MAMMALIA

Order CARNIVORA

Family CANIDAE

- *1. Indian Wolf : *Canis lupus pallipes* Sykes
- *2. Jackal : *Canis aureus* Linn.

Family MUSTELIDAE

Subfamily LUTRINAE

- *3. Smooth Coated Otter : *Lutragale perspicillata* (Geoffroy)

Family VIVERRIDAE

Subfamily VIVERRINAE

- *4. Small Indian or Palm Civet : *Viverricula indica indica* (Desmarest)

Subfamily PARADOXURINAE

- *5. Toddy or Civet Cat : *Paradoxurus h. hermaphroditus* (Pallas)

Family HERPESTIDAE

Subfamily HERPESTINAE

- *6. Common Mongoose : *Herpestes edwardsii edwardsii* (Geoffroy)

Family HYAENIDAE

Subfamily HYAENINAE

- *7. Indian Hyaena : *Hyaena hyaena hyaena* (Linn.)

Family FELIDAE

Subfamily FELINAE

- ?8. Indian Fishing Cat : *Prionailurus viverrinus* (Bennett)

Order ARTIODACTYLA

Family BOVIDAE

Subfamily ANTILOPINAE

- *9. Indian Blackbuck : *Antelope cervicapra cervicapra* (Linn.)

Order RODENTIA

Suborder SCIUROGNATHI

Family SCIURIDAE

Subfamily FUNAMBULINAE

- *10. Indian Five striped Squirrel : *Funambulus pennanti* Wroughton

SYSTEMATIC ACCOUNT

Phylum CHORDATA

Class MAMMALIA

Order CARNIVORA

Family CANIDAE

***1. *Canis lupus pallipes* Sykes**1827. *Canis lupus pallipes* Sykes, *Proc. Zool. Soc. Lond* : 101.1992. *Canis lupus pallipes* Sykes, Corbet and Hill, *The Mammals of the Indomalayan region* : 186-188.

Common name : English : Indian Wolf; Marathi : Landga; **Locality** : Lakhephal, Dahegaon and Ramdoh areas of Nathsagar Wetland (Jaikwadi) water body; **Material Examined/Sightings** : Indian wolf was sighted in Lakhephal, Dahegaon and Ramdoh areas by ZSI Survey parties during the project period; **External Distribution** : South of Himalayas through the desert zone to the dry open country in peninsular India; **Status** : CAMP Report (1998) has reported that though number of wolf populations have been reported from many localities, there is a general decline in its actual population in the country. Agrawal *et. al.*, (1992) have reported the status of the species as rare in peninsular India; **Conservation Status** : *Red Data Book (National, 1994)* : Vulnerable, *IUCN* : Lower risk-near threatened (Nationally) and Data Deficient (Globally) (CAMP Report, 1998), *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : I Part I, *CITES Appendix* : Appendix : I.

Remarks : The species is known to be hunted for trade of fur and body parts in domestic as well as international markets. The farmers to protect their livestock from predation are also killing it.

***2. *Canis aureus* Linn.**1758. *Canis aureus* Linnaeus, *Systema naturae* Vol. 1 st, 10th ed. Holmia : 40.1992. *Canis aureus* Linnaeus, Corbet and Hill, *The Mammals of the Indomalayan region* : 188.

Common name : English : Asiatic Jackal, Golden Jackal, Jackal; Marathi : Kolha; **Locality** : Lakhephal and Dahegaon areas of Nathsagar Wetland (Jaikwadi) water body; **Material Examined/Sightings** : Jackal and its pugmarks were sighted in Lakhephal and Dahegaon areas by ZSI Survey parties during the project period; **External Distribution** : Practically whole of India; **Status** : CAMP Report (1998) has reported that though number of jackal populations has been reported from many localities, there is a general decline in its actual population in the country due to threat from hunting, poisoning and trade for parts; **Conservation Status** : *IUCN* : Lower risk-least concern (Nationally) and Data Deficient (Globally) (CAMP Report, 1998), *Indian Wildlife*

(Protection) Act (1972, as amended up to 2002) Schedule : Schedule : II Part : II, CITES Appendix : Appendix : III.

Remarks : The jackal is hunted for trade of fur and body parts in domestic as well as international markets (Pradhan, 1997). The farmers to protect their livestock from predation are also killing it.

Family MUSTELIDAE

Subfamily LUTRINAE

*3. *Lutragale perspicillata* (Geoffroy)

1826. *Lutra perspicillata* I. Geoffroy, *Dict. Class Hist. Nat.*, 9 : 519.

1993. *Lutragale perspicillata* Geoffroy By Wozencraft In Wilson & Reeder, *Mammal Species of the World* : 313.

Common Name : English : Smooth-coated Indian Otter/Smooth Indian Otter; Marathi : Pan Manjar; *Locality* : Shri Dilip Yardi, a well-known Environmentalist from this region, reported (Personal Communication) that one live otter was sighted in the canal near the dam wall close to Paithan about fifteen years back. It was, then, trapped by the members of his NGO and released with the help of Forest Dept. authorities in the upper catchment area from where it probably came. This record appears to be a stray and accidental incidence as there are no recent sighting records of otter from upper catchment and/or down-stream area since then. However, its occurrence has already been reported in past from nearby upper Bhima river basin in Ahmednagar Dist. (Bharucha and Gogate, 1990 and Pradhan, 1996 & 2002); *External Distribution* : Throughout India; *Status* : Though the distribution is wide the populations are fragmented. Once very common in distribution, but now its population has greatly reduced due to the destruction of its habitat.; *IUCN Criteria proposed as per the CAMP Report (1998)* : Not Evaluated (Nationally).; *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule II Part II, CITES Appendix : Appendix : II.

Family VIVERRIDAE

Subfamily VIVERRINAE

*4. *Viverricula indica indica* (Desmarest)

1817. *Viverra indica* Desmarest, *Nouv. Dict. Hist. Nat.*, Paris, 7 : 170.

1992. *Viverricula indica indica* Desmarest Corbet and Hill, *The Mammals of the Indomalayan region* : 206.

Common Name : English : Small Indian civet; Marathi : Jowadi Manjar; *Locality* : Small Indian civet was sighted in Bramha Gavhan and Ramdoh area of Nathsagar Wetland (Jaikwadi) by the local NGO and Forest Dept. authorities during the project period; *External Distribution* : Throughout

India excluding deserts; *Status* : Though the distribution is wide and the populations are many, they are fragmented. Once very common in distribution, now its population is declining due to the destruction of its habitat, hunting for medicinal use and local illegal trade for body parts; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Near threatened (Nationally); *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule II Part II, *CITES Appendix* : Appendix : III.

Remarks : The civets can easily be tamed. Some are kept under domestication for the regular extraction of the secretion from the scent glands.

Subfamily PARADOXURINAE

*5. *Paradoxurus h. hermaphroditus* (Pallas)

1777. *Viverra hermaphrodita* Pallas, *In Schreber, Die Säugethiere*, 3 : 426.

1992. *Paradoxurus hermaphroditus hermaphroditus* (Pallas), Corbet and Hill, *The Mammals of the Indomalayan region* : 207-208.

Common Name : English : Common Palm civet or Toddy cat; Marathi : Ud Manjar; *Locality* : Common Palm civet or Toddy cat was sighted close to the agricultural fields near Varkhed and Savkheda villages adjoining Nathsagar (Jaikwadi) Wetland Sanctuary by the Local NGO and Forest Dept. authorities during the project period; *External Distribution* : Throughout India excluding deserts; *Status* : Though the distribution is wide and the populations are many, they are fragmented. Its population is, now, declining due to the destruction of its habitat, hunting for medicinal use and local illegal trade for body parts; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Least concern (Nationally) and Data Deficient (Globally); *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule II Part II; *Red Data Book (International, 1996)* : Vulnerable.

Remarks : The young ones are born in all seasons and are usually offered shelter in tree holes or under a rock. The civets can easily be tamed. Some are kept under domestication for the regular extraction of the secretion from the scent glands.

Family HERPESTIDAE

Subfamily HERPESTINAE

*6. *Herpestes edwardsii edwardsii* (Geoffroy)

1818. *Ichneumon edwardsii* E. Geoffroy, *Descr. Egypte* : 2 : 139.

1993. *Herpestes edwardsii edwardsii* (E. Geoffroy), *By Wozencraft In Wilson & Reeder, Mammal Species of the World* : 305

Common Name : English : Indian Grey Mongoose or Common Mongoose; Marathi : Mungus; *Locality* : Indian gray or Common mongoose was sighted at places like Kaigaon, Lakhephal, Paithan

etc. at different times in Nathsagar (Jaikwadi) Wetland region by ZSI Survey parties during the project period; *External Distribution* : Throughout India; *Status* : Distribution of mongoose is wide and populations are many. Fairly common; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Least concern (Nationally) and Data Deficient (Globally); *Indian Wildlife (Protection) Act (1972, as amended unto 2002) Schedule* : Schedule II Part II; *CITES Appendix* : Appendix : III.

Remarks : The mongoose can easily be tamed. However threat to its population due to hunting for medicine, trophies and food and also for local illegal trade for body parts for making articles like brushes etc. cannot be ruled out.

Family HYAENIDAE

Subfamily HYAENINAE

*7. *Hyaena hyaena hyaena* (Linnaeus)

1758. *Canis hyaena* Linnaeus, *Syst. Nat.* : 10th Ed. 1 : 40.

1992. *Hyaena hyaena hyaena* (Lin.), Agrawal, V.C. et al., *Fauna of West Bengal, State Fauna Series, 3* (Part 1), ZSI, Publ., Calcutta, : 107.

Common Name : English : Striped Hyaena; Marathi : Taras; *Locality* : Sighting of hyaena in Kaigaon and Ramdoh areas of Nathsagar Wetland (Jaikwadi) water body has been reported by the local NGO authorities during the project period; *External Distribution* : Throughout India; *Status* : Not common in the region; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Near threatened (Nationally) and Data Deficient (Globally); *Indian Wildlife (Protection) Act (1972, as amended unto 2002) Schedule* : Schedule III.

Remarks : Hyaena is killed for fur and body parts for local, domestic and international trade. Pradhan (1999) has reported illegal trade of hyaena's fur. Inclusion of hyaena in CITES Appendix is strongly recommended.

Family FELIDAE

Subfamily FELINAE

?8. *Prionailurus viverrinus* (Bennett)

1833. *Felis viverrinus* Bennett, *Proc. Zool.Soc.* London : 68.

2002. *Prionailurus viverrinus* (Bennett), Alfred et. al., *Checklist of mammals of India, Rec. zool. Surv. India, Occ. Paper No. 199* : 102.

Common Name : English : Fishing Cat; Marathi : Ran manjar; *Locality* : Sighting of Fishing Cat in wild vegetative growth close to Nathsagar waterbody between Savkheda and Bramhan Gavhan belt has been reported by Forest Dept. field staff during the project period. However the

reporting needs authentication; *External Distribution* : South Western and Northern India; *Status* : Doubtful in the region; *IUCN Criteria proposed as per the CAMP Report (1998)* : Vulnerable; *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule I Part I.

Order ARTIODACTYLA

Family BOVIDAE

Subfamily ANTILOPINAE

***9. *Antelope cervicapra cervicapra* (Linn.)**

1758. *Capra cervicapra* Linnaeus, *Syst. Nat.* 10th Ed., I : 69.

1992. *Antelope cervicapra cervicapra* (Linnaeus), By Peter Grub In : *Wilson & Reeder Mammal Species of the World* : 395.

Common Name : English : Blackbuck or Indian Antelope, Marathi : Kalvit; *Locality* : Blackbuck was sighted; in Lakhephal, Brmhan Gavhan and Shevgaon areas close to Nathsagar Wetland (Jaikwadi) water body; *External Distribution* : Throughout the drier parts of peninsular India except in North-East India; *Status* : Fairly common in this region; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Least concern(Nationally) and Data Deficient (Globally), *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule I Part I; *CITES Appendix* : Appendix : III (Nepal); *Red Data Book, National (1994)* : Vulnerable.

Remarks : Blackbuck is hunted for its meat for food and skin and body parts for various purposes including making trophies. Threats to the survival of the species are also due to habitat destructions, human interference and domestic commercial trade. In some areas it is reported to be responsible for the crop damage.

Order RODENTIA

Suborder SCIUROGNATHI

Family SCIURIDAE

Subfamily SCIURINAE

***10. *Funambulus pennanti* Wroughton**

1905. *Funambulus pennanti* Wroughton, *J. Bombay N. H. Soc.*, 16 : 411.

1992. *Funambulus pennanti* Wroughton, Agrawal, V.C. et al., *Fauna of West Bengal, State Fauna Series, 3* (Part 1), ZSI, Publ., Calcutta, : 128-129.

Common Name : English : Indian five striped northern palm squirrel, Marathi : Pateri Khar; *Locality* : Small groups were sighted in Savkheda, Sagardarshan and Paithan areas of Nathsagar

Wetland (Jaikwadi) water body during the project period; *External Distribution* : Peninsular India south of Himalaya. *Status* : Not very uncommon in the region; *IUCN Criteria proposed as per the CAMP Report (1998)* : Lower risk-Least concern (Nationally) and Data Deficient (Globally); *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule : IV.

Remarks : Indian squirrel is hunted for its meat for food and skin and body parts for various purposes including making small trophies and some other articles like brushes etc. Threats to the survival of the species are also due to habitat destructions and isolation, human interference and domestic commercial trade.

SUMMARY

Systematic list given above reports occurrence of 10 mammalian semiaquatic and reservoir dependent species/subspecies in Nathsagar (Jaikwadi) wetland area and its environs. As stated earlier the inventory is based on sighting and bibliographic records. The above listed 10 mammalian species/subspecies belong to six carnivore families, one antelope family and one squirrel family. The inventory lists eight species of carnivores and one species each of antelope (Blackbuck) and squirrel (Five-striped squirrel) species. The list also includes one otter and one fishing cat species. However record of otter species from this region is an accidental one, while that of fishing cat needs authentication confirmation.

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