

Study on the zooplankton of Sona Dighi in Rajshahi, Bangladesh

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Abstract: Zooplankton populations of Sona Dighi were remarkable. In all 31 genera and 45 species represented by five major groups have been reported from Sona Dighi, Rajshahi based on a year investigation. The recorded groups were as follows as Protozoa (5 genera, 4 species), Rotifera (7 genera, 11 species), Cladocera (6 genera, 8 species), Ostracoda (4 genera, 6 species) and Copepoda (9 genera, 15 species). Physical chemical characteristics and zooplankton diversity of the reservoir indicates its eutrophic nature.

Key words: Zooplankton, Sona Dighi, Rajshahi, Bangladesh.

Introduction

In freshwater system zooplanktons form an important group as most of them feed upon and incorporate the primary producers into their bodies and make themselves available to higher organisms in food chain (Michael, 1968). They play a major role in the energy transfer at secondary level. They contribute significantly to biological productivity of freshwater ecosystem. Thus they can be used as bio-indicators. In most of the aquatic ecosystem different zooplankton groups acts as one of the major primary consumer as a result their diversity, abundance and seasonality effects the other biotic components therein. The present communication deals with systematic description of zooplankton population of the reservoir named Sonadighi. During the study major limnological conditions were also taken under consideration.

Materials and Methods

Sona Dighi is situated in the central region of Rajshahi city. It is more or less rectangular in shape. The reservoir has a water span of 3633m² with a depth varying from 3.66 m to 4.88m at mid region. Almost in all the sides brick- build embankment were present about 1 meter high from the water surface. There was no macro vegetation in the littoral zone and surface area of the reservoir. Monthly sampling was carried out for a year, three representative samples were collected from three selected sites of the water body. Samples were collected from below the surface using plankton net No: 20 silk bolting cloth (mesh size 0.076mm) and preserved in Transeau's solution (Transeau, 1951). The figures of individual zooplankter were drawn by camera lucida at the time of microscopic examination. Zooplankton were identified up to species level by following relevant literatures.

Water samples were collected on the same day from 20cm below the surface to estimate the physical chemical condition of reservoir. The water samples were treated for physical chemical studies with the help of digital thermometer for temperature, Secchi disk for transparency, with graduated rope with weight in one end for depth, digital pH meter (HANNA) for pH, free carbon di oxide (CO₂), carbonate, bicarbonate (HCO₃), dissolved oxygen (DO), biochemical oxygen demand, chemical oxygen demand (COD), nitrate nitrogen

(NO₃-N), calcium (Ca), magnesium (Mg) content and total hardness (T-H) were determined following Ambast (1990), APHA (1975), Welch (1948), APHA (1975), Sharup *et al.* (1992), Mishra and Saksena (1992). Oxidation reduction index (rH₂), oxidation reduction potential (Eh) were determined following Gautam (1990).

Results and Observations

Yearly range of the physical chemical parameters of the water concerned during the collection period is presented on in Table-1.

Table 1. Yearly range of physical and chemical parameter

Parameter	Range	Parameter	Range
Air Temp	21.5 -30.5°C	Transparency	14-42.54cm
Water Temp	16 - 30.7°C	Depth	
DO	0.98 -7.12mg/l	BOD	0.42-7.12mg/l
COD	2.99-16.01mg/l	Eh	0.18-.48
pH	7.1- 9.1	CO ₂	2.8-130mg/l
EC	331.33 - 1104.45µS/cm	HCO ₃	41-336mg/l
rH ₂	24.42 - 30.61	Mg-H	3.44-38.75mg/l
T-H	96 - 212mg/l	Ca-H	21-128mg/l

Systematic Enumeration

Detailed description of the collected zooplankton along with their camera lucida drawings (Pl.1 and 2) are presented in the following lines.

Phylum: Protozoa

Super class: Lobosa Class: Amoebae

Family: Thecamoebidae

1. *Astramoeba radiosa* Ehrenberg 1830 (Pl.1 Fig. 1 x 100) Edmondson 1966, p.235, Fig. 9.6.

Length 96µ. Body spherical shaped. Pseudopodus more or less rigid, not withdrawn and reforme rapidly. Spherical shaped single nucleus. A few large radiating pseudo pods present.

Phylum : Ciliophora Class: Oligohymenophorea Order: Peniculida

Family: Paramecidae

2. *Paramecium trichium* Stokes 1885 (Pl.1, Fig.4 x 675) Edmondson 1966, p.276, Fig. 10 11(f).

Single celled ovate body. Cilia present. Two contractile vacuoles, 1 in front and the other in rear half of the cell.



1. *Astrapoeba radiosa* 2. *Brachionus falcatus* 3. *Lepdella imbricata*
 4. *Paramecium trichinum* 5. *Branchiocetes* sp. 6(a,b). *Epistylis plicatilis*,
 7. *Brachionus rubens* 8. *Tetrasiphon hydrocora* 9. *Enteroplea lacustris*
 10. *Brachionus plicatilis* 11. *B. angularis* 12. *Conochiloides dossuarius*
 13. *Trichocerca longiseta* 14. *Intrastylum invaginatum* 15. *Rotaria neptunia*
 16. *Trichocerca cylindrica* 17. *Moina branchiata* 18. *Lymnocythere sant-paetrici*
 19. *Moina trrasa* 20. *Polyphemus pedicatus* 21. *Daphnia parvula* 22. *Cypridopsis*
 23. *Ceriodaphnia reticulata*



1. *Diaphanosoma leuchtenbergianum* 2. *Drepanothrix dentata* 3. *Cypricercus horridus*
 4. *Microcyclops* sp. (female) 5. *Cypricercus obliquus* 6. *Cyprois occidentalis*
 7. *Cyclops varicans* 8. *Paracyclops fimbriatus poppei* 9. *Neodiaptomus strigilipes* (male)
 10. *Cyclops nanus* 11. *Mesocyclops leukarii* 12. *Mesocyclops dybowskii*
 13. *Macrocyclus distinctus* 14. *Mesocyclops inversus* (female) 15. *Mesocyclops hyalinus*
 16. *Diptomus pygmaeus* 17. *Daphnia longispina* 18. *Heliodiptomus contortus*
 19. *Cyclops vernalis* 20. *Cyclops bicolor* 21. *Cypridopsis rhomboidea*
 22. *Neodiaptomus strigilipes* (female) 23. *Eucyclops agilis*

Subphylum: Postciliodesmatophora Class: Litostomatea
 Order: Haptorida
 Family: Tracheliidae

3. *Branchioecetes* sp. Kahl 1931(Pl.1, Fig.5 x 675)
 Edmondson 1966, p.273, Fig.1. 9(b).

Body unicellular and somewhat elliptical, flat, blade like in front view. Cilia present.

Class: Suctoria, Order: Chonotrichida

Family: Epistylidae

4. *Epistylis plicatilis* Ehrenberg 1830 (Pl.1 Fig. 6a x100, 6b x 450) Edmondson 1966, p.292, Fig.10.30 (g).

Cilia present during free juvenile stages only, auctorial tentacles present. One individual at end of each branch of the colony stalk.

Family: Vorticellidae

5. *Intrastylum invaginatum* Stokes 1886(Pl.1, Fig.14) Edmondson 1966, p.292, Fig.10.31 (a).

Spasmoneme poorly developed, stalk spiral. It was not found spiral when contracted. Cilia present on the auctorial tentacles when it was alive.

Phylum: Rotifera, Class: Monogononta, Order: Ploima

Family: Trichocercidae

6. *Trichocerca longiseta* Schrank, 1802 (Pl.1, Fig.13x600) Edmondson 1966 p.448, Fig.18.22 (b).

Length of lorica 480µ. Toes unequal. Breadth 243.1µ.

7. *Trichocerca cylindrica* Imhof, 1891 (Pl.1, Fig.16 x 400) Edmondson 1966,p.448, Fig.18.22 (a)

Length of lorica 178µ. Toes unequal. Breadth 148.5µ. Lorica is cone shaped. Trophi virgule, asymmetric.

Family: Tetrasiphonidae

8. *Tetrasiphon hydrocora* Ehrenberg 1840(Pl.1 Fig.8 x 100)Edmondson 1966,p.464, Fig.18.63 (a).

Long knobbed lateral antenna, near foot, two dorsal antennae are present. The virgule trophy highly modified. Somewhat spindle shaped. Four thickened mass like structure is looked in the body shell.

Family: Notommatidae

9. *Enteroplea lacustris* Ehrenberg 1830,(Pl.1 Fig.9 x 100)Edmondson 1966,p.467, Fig.18.73.

Length 626µ, breadth mid region 208.67µ stomach with large band shaped, forked gastric glands and 2 pairs of other attached structures.

Family: Conochilidae

10. *Conochiloides dossuarius* Hudson 1885(Pl.1 Fig.12 x60) Bhouyain & Asmat, 1992,p 172, Fig.162.

Body cup shaped, foot as long as body. Transparent jelly like substances covers foot and body end straight. Corona circular. Dorsal antennae small. Ordinarily solitary. Length 500µ and breadth in mid region 170µ.

Family: Philodinidae

11. *Rotaria neptunia* Ehrenberg 1832 (Pl.1 Fig.15 x 100) Edmondson 1966, p.488, Fig.18.113(b).

Corona two circular retractile lobes. Eye is present in probasis. Body length 1400 μ . It is known as the most elongate rotifer species.

Family: Brachionidae

Sub family: Brachioninae

12. *Brachionus angularis* Gosse, 1851 (Pl. 1, Fig.11 x 100) Edmondson, 1966,p 451, Fig.18.29(c).

Lorica more or less rounded. Anterior spines are narrow pointed and short with a short strethenning ridge. Median sinus prominent. Length 333 μ and 233.1 μ in diam.

13. *Brachionus plicatilis* Müller1786(Pl. 1, Fig.10 x 100) Edmondson, 1966,p 451, Fig.18.29(a).

Lorica more or less rounded. Foot annotated. 6 species present on the anterior pointed. Spines are short and ridges are not developed. Lorica length 315 μ and 310 μ in diam.

14. *Brachionus rubens* Ehrenberg, 1838(Pl. 1, Fig.7 x 100) Bhoyain & Asmat, 1992,p 113, Fig.80.

Lorica firm, divided into a dorsal and a ventral plate. Lorica moderately compressed dorso-ventrally. Anterior dorsal margin with two median spines divided by a U-shaped sinus. Lateral and median spines weakly developed. Lorica 340 μ and 371 μ in diam.

15. *Brachionus falcatus* Zacharias, 1898 (Pl. 1, Fig.2 x 100) Bhoyain & Asmat, 1992,p 107, Fig.80.

Lorica firm, divided into a dorsal and a ventral plate, quite compressed dorso-ventrally. Anterior dorsal margin with six spines. The intermediates much longer than the other spines. Body terminates posterior in two long spines, widely separated at their bases, bowed and usually converging towards their free ends. Body length 963 μ and 320 μ in diam.

Sub family: Colurinae

16. *Lepadella imbricata* Haring, 1966(Pl. 1, Fig.3 x 100) Battish, 1992,p 81, Fig.66.

Lorica thin, broadly ovate, slightly compressed dorsiventrally, composed of dorsal and ventral plate; foot long with symmetrical toes which is about 2/3 of the length of lorica. Lorica 195 μ and 40 μ in diam.

Phylum:Arthropoda Class: Branchiopoda SubOrder: Cladocera

Family: Daphnidae

17. *Daphnia parvula* Fordyce1901(Pl.1, Fig.21 x 60)Edmondson 1966, P.611, Fig.27.24.

Anterior margin of head with broadly rounded crest longest in mid-line. Length 950 μ and breadth in mid region of body 736.45 μ . The terminal spine or seta and a small rostrum and a rounded helmet are present.

18. *Daphnia longispina* Muller 1776 (Pl.2, Fig.17 x 50) Islam & Haroon 1975, P.37, Fig.100.

Body length 1864.8 μ and breadth in mid region of body 999 μ . The rostrum is very elongated on the front of head. The tail is also with spine and longer than typical *Daphnia* sp.

19. *Moina irrasa* Brehm 1937(Pl.1, Fig.19 x 50) Edmondson 1966,P.622,Fig.27.46.

Total length 850 μ and breadth 566 μ . Dorsal surface of head hairy. Antennule relatively small and short. Post abdomen with about 11 ciliated pecten, claw pectinate with about 10 teeth in pecten.

20. *Moina brachiata* Jurine1820 (Pl.1, Fig.17 x 60) Edmondson 1966, P.623, Fig.27.49.

Total body length including brood sac 1658.8 μ and wide brood sac 629.2 μ . Post – anal spines 7 to 11 beside bident. Valves faintly reticulate. Antennules of with hooks at tip. Head ordinarily much depressed, so that the vertex often lies almost on level of ventral margin of valves.

21. *Ceriodaphnia reticulata* Jurine1820 (Pl.1, Fig.23 x 50) Edmondson 1966, P.618, Fig.36.

Total length 1200 μ and breadth 516.15 μ . Head obtusely angulated in front of antennules. Valves reticulated, ending in spine or angle. Antennules small with sense hair rear apex. Claws with proximal pecten.

Super Family: Sidoidea

Family: Sididae

22. *Diaphanosoma leuchtenbergianum* Fischer 1850 (Pl.2, Fig.1 x 60) Edmondson 1966,P.601, Fig.27.8.

Body flattened, covered by transparent valve; Eyes not filling end of head. Reflexed antenna reaching or exceeding posterior margin of valves. Total length 1200 μ and width 572 μ .

Family: Macrothricidae

23. *Drepanothrix dentata* Euren 1861(Pl.2, Fig.2x100) Edmondson 1966,P.627, Fig.27.60.

Total length 858 μ and breadth 268 μ . Valves reticulated; dorsal margin arched, crested with conspicuous, short, backward-pointing tooth about middle. Antennules broad, flat, twisted.

Super Family: Polyphemoidea

Family: Polyphemidae

24. *Polyphemus pediculus* Linne 1761(Pl.1, Fig20 x50) Edmondson 1966, P.599, Fig.27.3.

Body length of the female measured to back of brood sac found 899 μ . Brood sac globular. Antennules very small on ventral surface of head. Head large and on it huge movable eyes present. Antennae with 7 setae on each ramus. Legs stout with strong claws and bronchial appendages, fourth pair very small.

Class: Crustacea, Order: **Sub class: Ostracoda Suborder: Podocopa

Family: Cypridae

25. *Cyprois occidentalis* Sars1926 (Pl. 2, Fig.5 x 60) Bhoyain &Asmat,1992,p 80, Fig.60.

Body length 1043.9 μ and breadth 715 μ . Valves without sculpturing and with hyaline borders at both ends. Second antenna is a biramous structure and expodite rudimentary. Endopidide consists of three segments and

expodite rudimentary. The basal portion of second antenna bears a long seta.

26. *Cypridopsis rhomboidea* Furtos 1936 (Pl. 2, Fig. 21 x 150) Edmondson 1966, p. 719, Fig. 28.156(a).

Body length 650 μ , height 370 μ and width 390 μ . Surface of valve pitted, hairy.

27. *Cypridopsis yucatanensis* Furtos 1936 (Pl. 1, Fig. 22 x 100) Edmondson 1966, p. 719, Fig. 28.153(a).

Body length 300 μ , height 210 μ and width 250 μ . Surface of valves pitted, hairless. Valves smoothly arched dorsally.

28. *Limnocythere santi - patrici* Brady and Robertson 1869 (Pl. 1, Fig. 18 x 200) Edmondson 1966, p. 725, Fig. 28.174 (a)

Body length 514.8 μ , height 300 μ and width 371.8 μ . Color dark grayish-white. Valves thin and pellucid. Surface faintly reticulated with scattered hairs at each extremity.

29. *Cypricercus obliquus* Brady 1866 (Pl. 2, Fig. 5 x 200) Edmondson 1966, p. 713, Fig. 28.138 (a)

Body length 1200 μ , height 590 μ and width 560 μ . Color light greenish. End view of valves showing an oblique junction line between the two shells. Terminal claws of furca less than $\frac{1}{2}$ the length of ramus.

30. *Cypricercus horridus* Sars 1926 (Pl. 2, Fig. 3 x 100) Edmondson 1966, p. 709, Fig. 28.130

Body length 1000 μ , height 526 μ and width 666.66 μ . Left valves overlaps right. Surface of valves very uneven being everywhere covered with short, stout spikes and densely distributed fine hairs.

Sub class: Copepoda, Order: Eucopepoda
Family : Diaptomadae

31. *Neodiaptomus strigilipes* Gurney 1907 (Pl. 2, Fig. 22 x 60) Bhoyain & Asmat, 1992, p. 80, Fig. 41.

Total length 1251 μ with antennae, female body length 895 μ . Breadth of metasoma 429 μ and urosoma 85.8 μ . Antennule 25 segmented.

32. *Neodiaptomus strigilipes* Gurney 1907 (Pl. 2, Fig. 9 x 60) Bhoyain & Asmat, 1992, p. 80, Fig. 42.

Total length 1410 μ with antennae, male body length 898 μ . Breadth of metasoma 432 μ and urosoma 57.2 μ broad.

33. *Heliodiaptomus contortus* Gurney 1907 (Pl. 2, Fig. 18 x 60) Bhoyain & Asmat, 1992, p. 51, Fig. 38.

Total length 692 μ with antennae, body length 487 μ . Breadth of metasoma 200 μ and urosoma 71.5 μ broad.

34. *Diaptomus pygmaeus* Pearse 1906 (Pl. 2, Fig. 16 x 100) Edmondson, 1966, p. 793, Fig. 29.92(a).

Total length 1229 μ with antennae, body length 657.8 μ . Breadth of metasoma 143 μ and urosoma 57.2 μ .

Family: Cyclopidae

35. *Eucyclops agilis* Koch, 1838 (Pl. 2, Fig. 23 x 100) Edmondson, 1966, p. 799, Fig. 29.106(a).

Total length 790 μ with antennule, body length 504 μ . Breadth of metasoma 145.86 μ and urosoma 50.05 μ .

36. *Cyclops nanus* Sars 1863 (Pl. 2, Fig. 10 x 100) Bhoyain & Asmat, 1992, p. 59, Fig. 44.

Total length 640 μ , body length 494.92 μ , metasoma 404 μ broad and urosoma 288.86 μ broad. Antennule 13 segmented.

37. *Cyclops bicolor* Sars 1863 (Pl. 2, Fig. 20 x 100) Edmondson, 1966, p. 811, Fig. 29.139.

Total length 480 μ , body length 307.45 μ , metasoma 171.6 μ broad and urosoma 64.35 μ broad. Antennule 10 segmented.

38. *Cyclops vernalis* Fischer 1853 (Pl. 2, Fig. 19 x 100) Bhoyain and Asmat, 1992, p. 58, Fig. 43.

Total length 680 μ , body length 551.3 μ , metasoma 143 μ broad and urosoma 57.2 μ broad. Antennule 12 segmented.

39. *Cyclops vernalis rubellus* Lilljeborg 1901 (Pl. 2, Fig. 7 x 60) Bhoyain and Asmat, 1992, p. 62, Fig. 46.

Total length of the female 2145 μ , body length 1430 μ , metasoma 271.7 μ broad and urosoma 71.5 μ broad. Antennule 12 segmented. Two elliptical egg sac present. Articulation between metasoma and urosoma is distinct.

40. *Macrocyclops distinctus* Richard 1887 (Pl. 2, Fig. 13 x 60) Battish, 1992, p. 811, Fig. 166.

Total length 400 μ , body length 256.97 μ , metasoma 112.97 μ broad and urosoma 35.75 μ broad. Antennule 17 segmented.

41. *Microcyclops* sp. Claus 1893 (Pl. 2, Fig. 4) Bhoyain and Asmat, 1992, p. 74, Fig. 57.

Total length 1287 μ , body length 1773.2 μ , metasoma 286 μ broad and urosoma 100 μ broad. Antennule 10 - 12 segmented.

42. *Paracyclops fimbriatus poppei* Rehberg, 1880 (Pl. 2, Fig. 8 x 60) Edmondson, 1966, p. 798, Fig. 29.102(a).

Total length 1144 μ , body length 786.5 μ , metasoma 157.3 μ broad and urosoma 42.9 μ broad. Caudal ramus 3 to 4 times.

43. *Mesocyclops leuckarti* Claus 1857 (Pl. 2, Fig. 11 x 60) Bhoyain & Asmat, 1992, p. 63, Fig. 47.

Total length 1029.6 μ , body length 786.5 μ , metasoma 200.2 μ broad and urosoma 85.8 μ broad. Antennule with a hyaline plate at last segment with one deep, round notch.

44. *Mesocyclops hyalinus* Rehberg 1880 (Pl.2, Fig.15 x 100) Bhouyain and Asmat, 1992, p. 66, Fig.50.

Total length 1165.45 μ , body length 817.95 μ , metasoma 200.2 μ broad and urosoma 57.2 μ broad. Last segment of antennule with unnotched hyaline plate. Distal segment of 5th leg armed with an apical seta and a long terminal or subterminal inner spine or seta.

45. *Mesocyclops inversus* Kiefer 1936 (Pl.2, Fig.14 x 60) Bhouyain & Asmat, 1992, p 71, Fig.54.

Total length 1001 μ , body length 572 μ , breadth of metasoma 224.5 μ and urosoma 85.8 μ . Antennule consists of 11 segments.

46. *Mesocyclops dybowskii* Lande 1890(Pl.2, Fig.12 x 60) Bhouyain &Asmat, 1992, p 68, Fig.52.

Total length 850 μ , body length 715 μ , breadth of metasoma 107 μ and urosoma 50.05 μ .metasoma 1.7 times longer than urosoma. Last segment of the antennule's without hyaline plate.

Discussion: The zooplankton occupy an intermediary position between the autotrophs and the carnivores and form an important link in aquatic food webs. The zooplankton population of the concerned habitat was found to be dominated by copepods both in number and diversity followed by rotifers. The abundance of some zooplankton in the aquatic food web is reported to indicate eutrophication(Sprules,1977, Halbach *et al*,1983).Among these members of copepods and rotifers are considered which corroborates with the present findings. Apart this the chemical and redox features of the habitat indicates its eutrophic and presence of high organic load.

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