INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
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www.vmsindia.org

QUALITATIVE AND QUANTITATIVE STUDY OF ZOOPLANKTON IN RIVER WARDHA OF CHANDRAPUR DISTRICT IN MAHARASHTRA, INDIA

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Abstract:-
The lotic ecosystem is a unique ecosystem of the inland area.During their flow they cover land area of varying physical, chemical and geological features.Biodiversity plays a major role in maintaining natural cycle and ecological balance. These are the basis of existence, wealth of human beings and sustenance of nature on the earth. Among plankton zooplankton being the first consumers in the food chain of an aquatic ecosystem is placed at the second trophic level. They exhibit a major link between the energy transfer systems from the producers to the higher level of consumers in an aquatic ecosystem. As such, a water body is enriched with a potentially functional and dynamic community in the form of zooplankton. The present investigation aims at the qualitative and quantitative distribution of such a zooplankton in lotic ecosystem. During the study, samples were collected from four sites selected across the stretch of River Wardha. The samples were collected once in month for a year during October 2009 to September 2010. In the study, 39 species of zooplankton were identified belonging to four groups, Rotifera with 21 species, Cladocera with 12 species,Copepoda with 4 and Ostracoda with 2 species.
Keywords: - Zooplankton, Rotifera, Cladocera, River Wardha

Introduction:-

Zooplankton are microscopic free swimming components of an aquatic ecosystem which act as primary consumers on phytoplankton. They occupy a central position in the aquatic food web. Zooplankton not only form an integral part of the lotic community but also contribute significantly to the biological productivity of the fresh water ecosystem (Wetzel and Likens, 1991).They also serve the purpose of biomonitoring environmental pollution as they are tolerant to adverse environmental conditions and are capable of measuring the actual response of organism or population to the environmental hindrances.

As zooplankton communities are very sensitive to environmental changes thus, are of considerable potential value as a water quality indicator. They also play an important role in indicating the presence or absence of certain species of fishes. As such various ecological aspects of zooplankton have been studied by number of workers in the country including Verma and Dalela (1975), Biswas and Konnar (2001), Sawane *et.al.* (2006), Vanjare *et. al.* (2010)

Materials and Methods:-

Monthly samples were collected for a period of twelve months (October, 2009 to September, 2010) from the four sites (SW_1, SW_2, SW_3 and SW_4) along the stretch of River Wardha during morning hours between 8:30-10:30 am. 50 liters of water sample was filtered through the plankton net made of bolting silk number 25 with mesh size 50 µm. Each sample was concentrated up to 50 ml depending on the number of plankton and preserved in 5% formalin. Quantitative enumeration of zooplankton was done by Sedgwick rafter cell method following Saxena, 1987, APHA, 1992 and IAAB (2), 1998.

Results and Discussion:-

The present study was wholly emphasized on the qualitative and quantitative study of zooplankton on monthly and seasonal basis (from October -2009 to September -2010) along the four sites selected for investigation. In the study, 39 species of zooplankton were identified belonging to four groups, Rotifera with 21 species, Cladocera with 12 species, Copepoda with 4 and Ostracoda with 2 species.

ROTIFERA

Rotifers are microscopic soft bodied freshwater invertebrates. Their distribution and ecology have interesting evolutionary implication (Reid and Wood, 1976). Rotifera are amongst some of the most abundant and important members of the freshwater fauna, along with Protozoa and Crustacea.

In the present investigation rotifer was represented by 21 species and was the dominant group amongst the zooplankton. Predominance of rotifer has also been reported by Kakkasery(1990), Hameed(1992) and Mone and Madlapure (2003)

In the present investigation, maximum rotifers were recorded at site SW2. Anjeli (1976) reported that simultaneous presence of several rotiferance species in an indication of eutrophic nature of aquatic ecosystem. As far as seasonal fluctuation is concerned, rotifers dominated in winter season. The winter maxima may be due to favorable temperature and ample availability of food material. The said results are in correlation with the findings of Baker and Baker (1979), Edmondson (1996) and Biswas and Konnar (2000).

CLADOCERA

The Cladocera component of zooplankton plays an important role in the benthic trophodynamics. Most of the Cladocerans are primary consumers and feed on microscopic algae and fine particulate matter in the detritus thus influencing the cycling of matter and energy in benthos.

In the present investigation the Cladocera was represented by 12 species i.e. *Alona Bosmina longirostris, Cereodaphnia reticulata, Moina spp,* etc. Balamurugan *et al.,* (1999) reported 7 species of cladocerance and Biswas and Konar (2000) reported six species of cladocerans from river Damodar in West Bengal. Arvindkumar and Sing (2002) recorded 3 species of Cladocera from river Mayurakshi. The group showed its maximum appearance in the winter season as has also been reported by Dahegaonkar (2008) in River Erai and River wardha.

COPEPODA

Copepods are important contributors of zooplankton population dynamics and are almost universally distributed. They constitute an essential link in aquatic food chain. In the present investigation, the Copepode diversity was represented by 4 species i.e. *Cyclops Spp., Diaptomus spp., Mesocyclops leucarti, Eucyclops spp.* Shinde *et al.,* (2011) reported 8 species of copepod with the dominance of *cyclops* and *diaptomus* in river Kham in Aurangabad district of Maharashtra. The Copepods were found to be higher during the summer season of the present investigation. Maximum number of copepods in the summer season has also been reported by Shinde *et.al.* (2011).

The copepods were mainly represented by Cyclops and Diaptomus species with naupliar stages. The naupliar stages were observed constantly in good numbers at all the sampling sites. Arvindkumar and Singh (2002) observed constantly good naupliar stages at all the sampling sites during the study of river Mayurakshi and stated that the number of nauplii at all the sampling site follow the adult individual quantitatively which clearly indicates the reproductive capacity represent in embryonic stages and development.

OSTRACODA

Ostracoda belongs to the class Crustacea, sometimes known as the seed shrimps because of their appearance. Their bodies are flattened from side to side and protected by a bivalve-like, chitinousor calcareous valve or shell. Ostracoda are well represented in both standing as well as running waters. The abundance of these organisms provides very good food for the fishes (Tonapi, 1980). The Ostracoda in the present investigation was dominant during summer and represented by 2 species i.e. *Cypris spp., and Eucypris spp.* The summer maxima might be due to rise in temperature that provided a suitable environment for their growth as has also been opined by Mezquita (1999) and Balamurugan *et.al.* (1999)

Table 1.1 Zooplankton diversity in river Wardha of District Chandrapur

A) Rotifera

Sr. No.	Species
1	*Asplanchna brightwelli*
2	*Filinia longiseta*
3	*Filinia opoliensis*
4	*Brachionus calyciflorus*
5	*Brachionus angularis*
6	*Brachionus bidentata*
7	*Brachionus falcatus*
8	*Brachionus forficula*
9	*Brachionus plicatilis*
10	*Brachionus quadridentata*
11	*Cephalodella spp.*
12	*Lecane luna*
13	*Keratella varga*
14	*Trichocerca similes*
15	*Trichocerca longiseta*
16	*Synchaeta pectinata*
17	*Monostyla bulla*
18	*Platyias spp.*
19	*Polyarthra vulgaris*
20	*Rotaria citrinus*
21	*Rotaria rotatoria*

B) Cladocera

Sr. No.	Species
1	*Alona davidi punctata*
2	*Alonella nana*
3	*Bosmina longirostris*
4	*Cereodaphnia reticulata*
5	*Chydorus sphaericus*
6	*Macrothrix laticornis*
7	*Macrothrix rosea*
8	*Moina brachiata*
9	*Moina dubia*
10	*Pleuroxus spp.*
11	*Sida crystallina*
12	*Simocephalus spp.*

C) Copepoda

Sr. No.	Species
1	*Cyclops spp.*
2	*Diaptomus forbesi*
3	*Eucyclops spp.*
4	*Mesocyclops leucarti*
	Copepod nauplius

D) Ostracoda

Sr. No.	Species
1	*Cypris spp.*
2	*Eucypris spp.*

Table 1.2

Seasonal variation of zooplankton in river Wardha at site SW_1 during the year 2009-10

Sr. No.	Zooplankton	Winter 2009			Summer 2010			Monsoon 2010			Total		
1	Rotifera	87.25	±	15.67	73.75	±	15.20	41.50	±	23.43	67.50	±	18.10
2	Cladocera	40.50	±	6.87	26.75	±	9.78	16.75	±	6.94	28.00	±	7.87
3	Copepoda	46.00	±	15.68	53.25	±	25.85	31.25	±	29.63	43.50	±	23.72
4	Ostracoda	0.25	±	0.43	9.75	±	2.28	2.25	±	1.92	4.08	±	1.54

Table 1.3

Seasonal variation of zooplankton in river Wardha at site SW_2 during the year 2009-10

Sr. No.	Zooplankton	Winter 2009			Summer 2010			Monsoon 2010			Total		
1	Rotifera	108.75	±	21.89	80.00	±	18.88	60.25	±	21.05	83.00	±	20.61
2	Cladocera	43.00	±	10.05	30.50	±	11.06	16.00	±	7.18	29.83	±	9.43
3	Copepoda	37.25	±	11.10	41.75	±	12.74	20.25	±	18.50	33.08	±	14.11
4	Ostracoda	0.75	±	1.30	17.00	±	4.95	3.50	±	3.35	7.08	±	3.20

Table 1.4

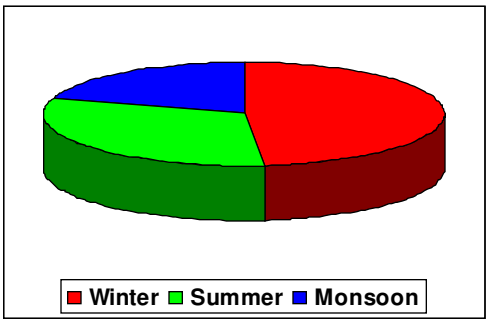
Seasonal variation of zooplankton in river Wardha at site SW_3 during the year 2009-10

Sr. No.	Zooplankton	Winter 2009			Summer 2010			Monsoon 2010			Total		
1	Rotifera	78.25	±	15.51	76.00	±	19.61	47.00	±	24.61	67.08	±	19.91
2	Cladocera	29.50	±	12.09	27.50	±	13.16	9.25	±	4.60	22.08	±	9.95
3	Copepoda	46.50	±	13.24	52.00	±	20.87	25.75	±	23.73	41.42	±	19.28
4	Ostracoda	0.00	±	0.00	6.75	±	2.38	2.75	±	2.59	3.17	±	1.66

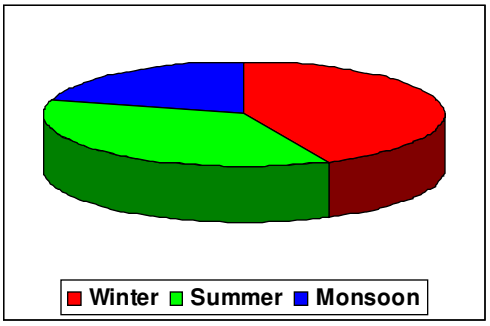
Table 1.4

Seasonal variation of zooplankton in river Wardha at site SW_4 during year 2009-10

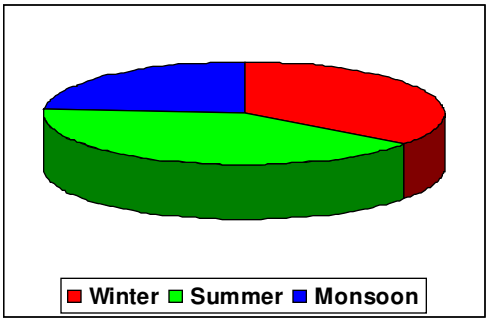
Sr. No.	Zooplankton	Winter 2009			Summer 2010			Monsoon 2010			Total		
1	Rotifera	86.00	±	21.41	71.00	±	15.05	46.25	±	15.27	67.75	±	17.24
2	Cladocera	39.00	±	10.79	28.00	±	11.29	14.00	±	8.51	27.00	±	10.20
3	Copepoda	47.00	±	10.07	49.50	±	24.64	23.50	±	24.95	40.00	±	19.89
4	Ostracoda	0.25	±	0.43	12.25	±	2.05	3.25	±	2.59	5.25	±	1.69



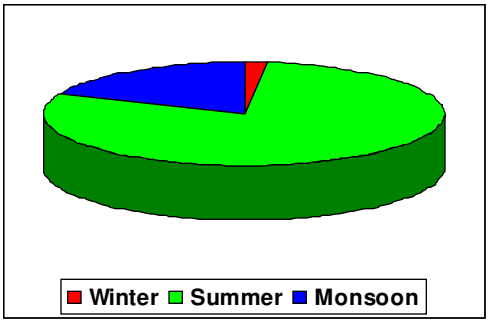
Rotifera



Cladocera

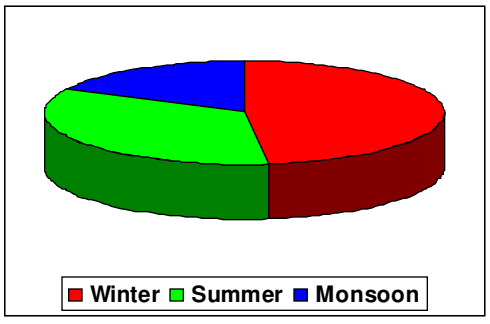


Copepoda

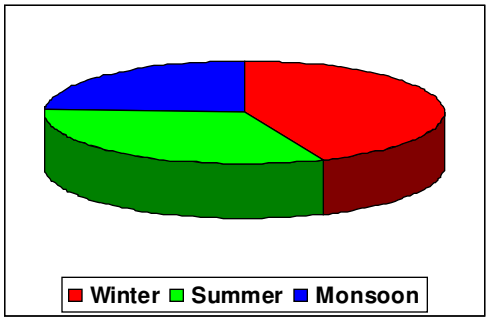


Ostracoda

Figure 1. Seasonal Distribution of Zooplankton at Site SW_1 in the year 2009 –10



Rotifera



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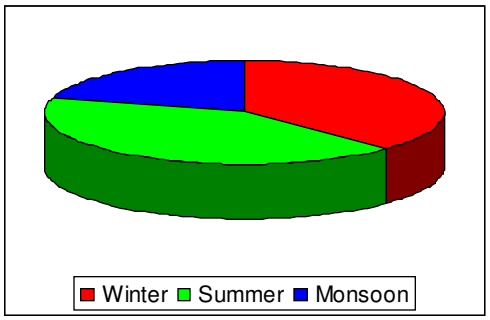

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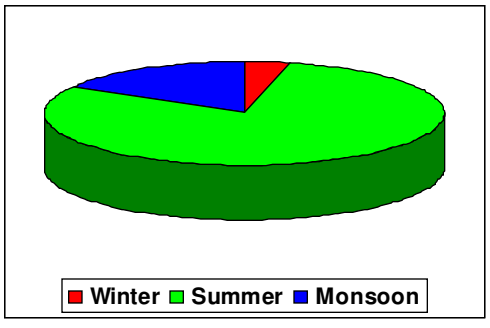
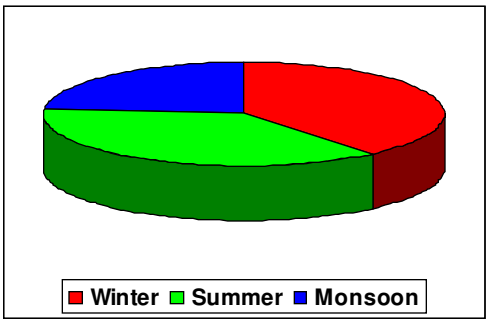
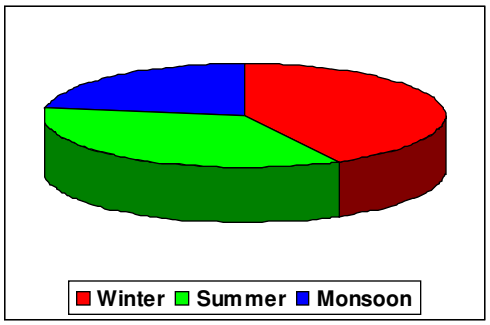


Ostracoda

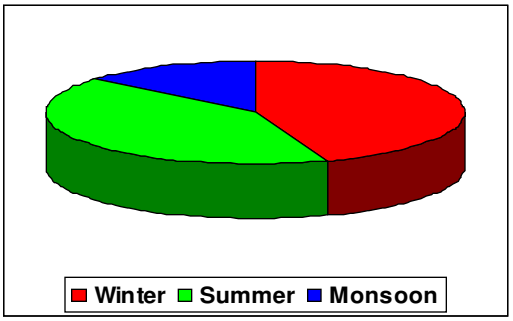
Figure 2. Seasonal Distribution of Zooplankton at Site SW_2 in the year 2009 –10



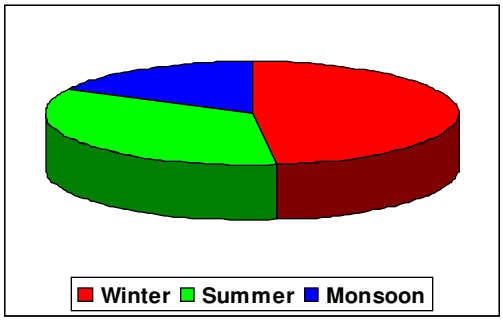
Rotifera



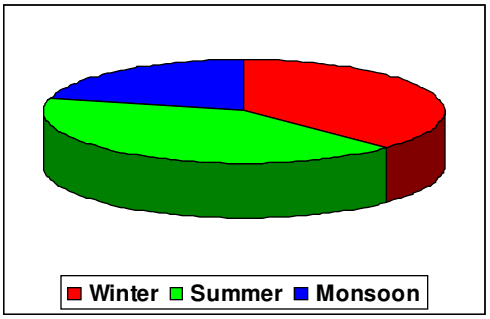
Rotifera



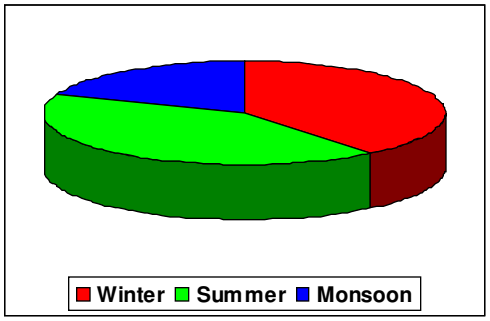
Cladocera



Cladocera



Copepoda



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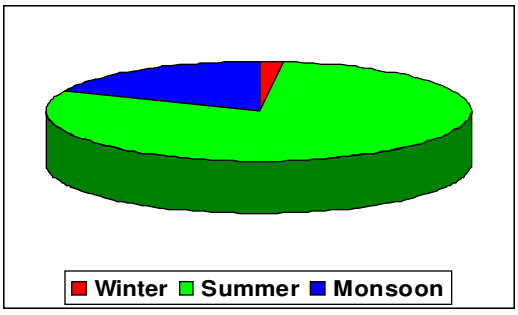
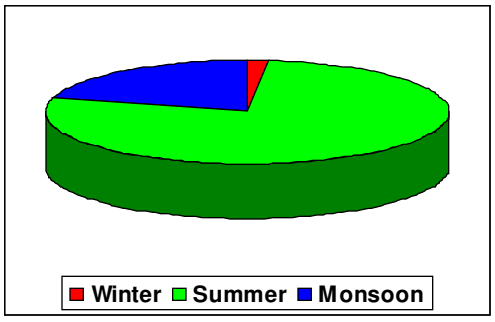


Ostracoda

Figure 3.Seasonal Distribution of Zooplankton at Site SW_3 in the year 2009 –10



Ostracoda

Figure 4. Sessional Distribution of Zoopankton at Site SW_4 in the year 2009 –10

Conclusion:-

During study 39 species of zooplankton were recorded and maximum density of zooplankton was observed in winter season and minimum in monsoon. The winter maxima may be due to water temperature, water velocity and turbidity being lower in winter months which provide favorable environment for their growth as has also been proved by Agarwal and Thapliyal (2005).

References:-

Agrawal, N.K. and Thapliyal, B.L. (2005): Prepaundment hydrobiological study of Bhilangana river from Tehri dam reservoir area in Uttaranchal; *Environmental Biochemistry,* 8: 143-148

Anjeli, D. H., Robinette H. R., Fraiser F. E. and Gray M. H. (1976) : Influence de la pollution des eaux sur les elements du plankton., In Pesson P: La pollution es eaux continentals Ed. Gauthier – Villars. : 97-133.

APHA (1992): Standard Methods of the examination of water and waste water. *APHA (American Public Health Association), Washington DC.*

Arvind, Kumar and Singh, A.K. (2002): Ecology, Conservation and Management of the River Mayurakshi in SanthalPargana (Jharkhand State) with special reference to effect of sewage pollution on abiotic and biotic potentials., Ecology and Conservation of Lakes, Reservoirs and Rivers. *ABD publishers, Rajasthan, India.*: 1-43.

Baker, A.L. and Baker, K.K. (1979): Effect of temperature and current discharge on the concentration and photosynthetic activity of the phytoplankton in the upper Mississippi river; *Freshwat. Biol.,* 9:191-198.

Balamurugan, S., Mohideen, B.M.G. and Subramanian, P. (1999): Biodiversity of zooplankton in Cauveri river at Tirucherapalli, Tamilnadu., *J. Aqua. Bio.* 14 (I & II): 21-25.

Biswas, B.K. and Konnar, S.K. (2000): Influence of Nuniah Nallah (canal) discharge on plankton abundance and diversity in the river Damodar at Narankuri (Ranibagh) in West Bengal, *Indian J. Environ. And Ecoplan.,* 3: 209-218.

Biswas, B.K. and Konnar, S.K. (2001): Influence of hazardous industrial wastes on planktons in the river Damodar at Durgapur in West Bengal, *Pollut. Res.* 20(IV): 583-588.

Dahegaonkar, N.R. (2008): Studies on water quality and biodiversity of lotic ecosystems near Chandrapur, *Thesis submitted to R.T.M. Nagpur University, Nagpur.*

Edmondson, W.T. (1996): Freshwater biology., *John Willey and Sons. Inc. New York.*

Hameed, P.S. (1992): Integrated environmental research programme on Cauvery river., *Consolidated report. Apr. to March,* 1992.

IAAB Pub. No. 2 (1998): Methodology for water analysis, Hyderabad (A. P.).

Kakkasery, K. (1990): A study on rotifer fauna of river Cauvery (Thirucherappalli)., *M. Phil. Thesis, Bharatidasan University, Thirucherappalli.*

Mezquita, F.; Hernandez, R. and Rueda, J. (1999): Ecology and distribution of Ostracods in polluted Mediterranean river; *Life Sciences, 1999-2000, ecology abstracts.*

Mone, A.M. and Madlapure, V.R. (2003): Hydrological studies on Manarriver., Souveniar, Abstarct, National Conference on management of water resources:

Reid, G.K and Wood R.D. (1976): Ecology of inland waters and esturies D.Van Norst and Co.New York: 485.

Sawane, A.P.; Puranik, P.G. and Lonkar, A.N. (2006): Preliminary study on the seasonal distribution of plankton in Irai river at Irai dam site, District Chandrapur, Maharashtra., *Indian J. Environ. and Ecoplan.,* 12 (I): 207-212.

Saxena, M.M. (1987): Environmental analysis, water, soil and air., *Agro Botanical Publishers, India.*,: 1- 176.

Shinde, S.S.; Kamtikar, V.N.; Muley, S.P. and Nimbalkar, R.K. (2011): Studies on physico-chemical parameters of water and zooplanktons diversity in Kham river, Aurangabad district, M.S., India; *Bioscience Discovery,* 2(II): 207-213.

Tonapi, G.T. (1980): Fresh water animals of India an ecological approach., *Oxford and IBH Publishing Co. New Delhi.*

Vanjare, A.I.; Padhye, S.M. and Pai, K. (2010): Zooplankton from a polluted river, Mula (India), with record of Brachionus rubens (Ehrenberg, 1838) epizoic on Moina macrocopa (Straus, 1820); *Opusc. Zool. Budapest,* 41(I): 89-92

Verma, S.R. and Dalela, R.C. (1975): Studies on the pollution of Kalinadi by Industrial wastes near Mansurpur, Part-II: Biological index of pollution and biological characteristics of the river area. *Hydrochem, Hydrobial.,* 3: 256-274

Wetzel, R.G.; and Likens, G.E. (1991). Limnological analysis 2nd Ed. *Springer – Verlag, New York,*: 391.