

Research article

## Study on Plankton in Jebel Aulia Dam Reservoir (El hashaba to El nuzul)

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### Abstract

This study was conducted during a period from March 2008 to February 2009 on the three main fisheries sites of Jebel Aulia dam (45 Km South of Khartoum State), El hashaba, Kosti and El nuzul. The study was conducted during March 2008 to February 2009. Samples were collected monthly from three main fishing grounds in Jebel Aulia Reservoir. In the study area five families of phytoplankton; *Coseinodiscaceae*, *Naviculaceae*, *Nitzschiceae*, *Volvocaceae* and *Fragilariaceae* belonging to three classes Bacillariophyceae, Cyanophyceae and Chlorophyceae were found included 77 species in El nuzul, 62 species in Kosti and 56 species in El hashaba. The common species found to be in the study area: *Limnocalanus macrurus* 30.69%, *Daphnia pulex* 25.88 % (El nuzul), *Cyclops* 37.5%, *Daphnia pulex* 21.9% (Kosti) and *Cyclops* 48.28% and *Daphnia pulex* 13.03% (El hashaba) *Daphnia pulex* was most dominant in the study area. Zooplankton composition were represented by seven families *Daphnidae*, *Bosminidae*, *Cyclopoidae*, *Centropagidae*, *Branchionidae*, *Testudinellidae* and *Diaptomidae* included 85 species in El nuzul, 200 species in Kosti and 261 in El hashaba. The aim of this study was to determine different types of plankton species in Jebel Aulia Reservoir.

**Key world:** Plankton- Zoo and Phytoplankton, Jebel Aulia Reservoir.

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### Introduction

Jebel Aulia Dam was constructed in 1937 across White Nile River, situated 45 km South of Khartoum State. The dam is situated between Longitude 032°29' E and Latitude 15°14' N and altitude 377.4 m above sea level and surface area of the dam reservoir extending over 1246 Km<sup>2</sup>, mean depth range between 2.3- 6 m and maximum depth 12 m and design capacity is 3.5 mm<sup>3</sup> (Belleman and Khalid, 1998).

Algae are the major primary producers in many aquatic systems and are an important food source for other organisms (Farazaneh, et. al, 2006). Kenyi (2006) showed that six algal and two zooplankton classes were reported in Jebel Aulia dam reservoir these are Bacillariophyceae, Cyanophyceae, Chlorophyceae, Zygnematophyceae, Dinophyceae and Oedogoinophyceae. Balli (1995) recorded six algal classes having 13 orders and 108 species in Jasir closed channel these are: Bacillariophyceae, Cyanophyceae, Chlorophyceae, Euglenophyceae, Dinophyceae and Xanthophyceae. Average zooplankton biomass throughout the whole reservoir was 0.192 gm/m<sup>3</sup> in November and 0.3560 gm/m<sup>3</sup> in April, was found in the vicinity of the dam (Russian mission report, 1964). Adam (1975) reported and classified the plankton in Jebel Aulia dam reservoir. Zooplankton contain two phylum (Phylum: Arthropoda contain four families are Daphnidae, Sididae, Bosminidae and Chydoridae; Phylum: Rotatoria, Branchionidae, Flasculariidae, Trichoceridae). Phytoplankton contain six families (Coseinodiscaceae, Naviculaceae, Fragilariaceae, Nitzchiaceae, Chloroyceae (Green Algae) and Volovcaeeae).

### Objectives

This study with following objectives

- To assess common plankton at the three sampling locations.
- To determine differ types of plankton species.
- To determine most plankton species at the three sampling location.

### Literature Review

El Moghraby (1973) surveyed the longitudinal succession of zooplankton in the White Nile and its tributaries. Adam (1976) wrote a report on productivity of Jebel Aulia reservoir, the investigated area extended from Jebel Aulia dam site to the town of Kosti. Hamza (1980) cited that Rzoska, et. al (1955) studied the plankton of the Blue and White Niles and showed that densities of plankton in the two rivers went short term fluctuations in which there was a regular annual rise in number in autumn. Abu Gideiri and Awad El Karim (1970) assessed the influence of mixing of the water of Blue and White Niles at the junction of the two rivers on the original zooplankton composition of the rivers (cited by Ahmed, 1978).

## 2. Materials and Methods

### 2.1. Collection Data

Collection data was conducted once monthly on the three main fisheries sites in Jebel Aulia Reservoir (El hashaba 032° 12'E to 14 ° 18' N; Kosti 032°40'E to 13°10'N and El nuzul 032° 47' E to 12° 37'N (Fig.1). Phyto - and Zooplanktons were collected by standard plankton nets with mesh size 55µm and 35µm. In the morning (8.03-8.44am), three hauls were made from 30 m from shore using wooden boat (Sharook or Moorkab), each haul take 4 minutes against water current. Plankton collection was rinsed on plastic and glass bottle samples of size 100 ml immediately preserved in 4% of formalin solution.

### 2.2. Data Analysis

In laboratory, electrical microscope were used (Karl Kolb) to examine samples with 10× and 40× magnifications to Plankton (Zooplankton and Phytoplankton) respectively. Two drops of each sample were counted in microscope slides (26×76 mm and thick 1-1.2 mm) and using microscopic cover glass 22 mm. Two transects were chosen, one in the upper and second in the lower portion of microscope cover glass. Plankton was identified by using identification key Planteplankton (Saugestad, 1991).

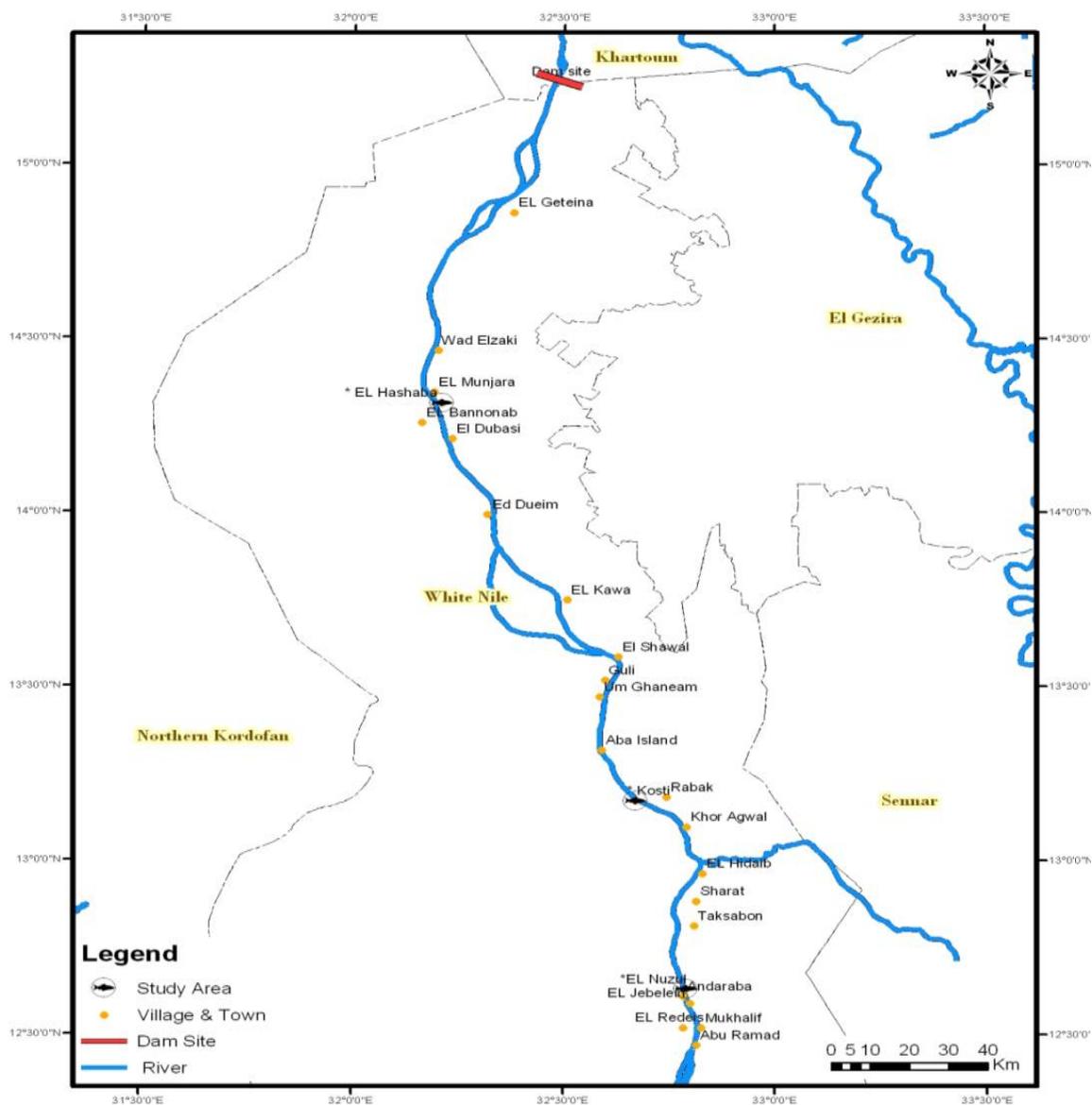


Figure 1: Location of sampling in Jebel Aulia Reservoir, Fishes Showed sampling study area

### 3.0. Results and Discussion

Phytoplankton Composition in the study area, during the period of study four classes of phytoplankton were found such as: Bacillariophyceae, Cyanophyceae, Chlorophyceae and Fragilariaceae. These classes included 77 species in El nuzul, 62 species in Kosti and 56 species in El hashaba. In El nuzul Bacillariophyceae was represented by three families Coseinodiscaceae 41.9%, Naviculaceae 29.4 and Nitzschiceae 29.4%. Cyanophyceae was represented by one species (Anabena); family Volvocaceae represented by Volvox 4.1%, Ulothrix 77% and Gonium 18.3%.family Fragilariaceae represented by one species Synadra (Table 1). The dominant phytoplankton populations were: Bacillariophyceae 20.9%,

Cyanophyceae 22.7% and Chlorophyceae 56.4%. In family Volvocaceae dominant species were: Ulothrix 77.1%, Gonium 14.3%, Closterium 5.7% and Cosmerium 1.2%. Cyanophyceae was represented by one species Anabena was represented 22.6% of total species in Kosti show in (Table 1). In El hashaba phytoplankton consists of three classes these are: Bacillariophyceae represented 37.5%, Cyanophyceae 12.5% and Chlorophyceae 50%. Class Bacillariophyceae contained three families: Coseinodiscaceae 4.8%, Naviculaceae 19% and Nitzschiceae 76.2%. The most dominant species Nitzschia 28.6%, Anabena 8.9% and Navicula 7.1%. Class Chlorophyceae was represented by one family Volvocaceae consist of tow species Ulothrix and Gonium show in (Table 1).

**Table 1:** Population of Phytoplankton at three sampling station

Class /Station	Family	Species	El nuzul		Kosti		El hashaba	
			No	%	No	%	No	%
Bacillariophyceae	Coseinodiscaceae	Melosira spp.	7	9.09	-	-	1	1.8
	Naviculaceae	Navicula spp.	5	6.49	2	3.2	4	7.1
	Nitzschiceae	Nitzschia spp.	5	6.49	11	17.7	16	28.6
Cyanophyceae		Anabaena spp.	10	12.99	14	22.6	5	8.9
		Oscillatoria spp.	-	-	-	-	3	3.6
Chlorophyceae	Volvocaceae	Volvox spp.	2	2.6	-	-	-	-
		Ulothrix spp.	38	49.05	27	43.6	27	48.2
		Gonium spp.	9	11.69	5	8.1	1	1.8
		Cosmerium spp.	-	-	1	1.2	-	-
		Closterium spp.	-	-	2	3.2	-	-
	Fragilariaceae	Synadra sp.	1	1.3	-	-	-	-
Total			77	100	62	100	56	100

(-) = Absent

Zooplankton Composition in the Study area in El nuzul class Crustacea was represented by 6 families these were: Daphnidae, Bosminidae, Cyclopoidae, Centropagidae, Branchionidae and Testudinellidae. Family Daphnidae consist of *Daphnia pulex* 75.9%, *Moina* 17.3%, *Ceriodaphnia* 3.4% and *Daphniasoma* 3.4%. Family Bosminidae contained on species *Bosmina* was represented 16.5% of whole species. Family Cyclopoidae was contained tow species Cyclopoid 10.6% and *Mesocyclops leuckarti* 1.2% of whole species in Elnuzul. *Limnocalanus macrurus* belong to family Centropagidae was represented 30.6% of total species.

Families Branchionidae and Testudinellidae were represented by tow species Branchionus 4.7% and *Filinia* 2.4% of whole species show in (Table 2).

In Kosti class Crustacea contained seven families: Daphnidae, Bosminidae, Cyclopoidae, Centropagidae, Branchionidae, Testudinellidae and Diaptomidae. Family Daphnidae consist of five species; *Moina* 9%, *Ceriodaphnia* 5.5%, *Daphnia pulex* 21.5%, *Mesodaphnia* 2.5% and *Eudaphnia* 8%. Family Cyclopoidae was represented by four species; *Mesocyclops leuckarti* 1.5%, Cyclopoid 2%, *Cyclops* 37.5% and *Cyclop sternus* 0.5%. Four families were represented by one species: Centropagidae, Branchionidae, Testudinellidae and Diaptomidae these species were; *Limnocalanus macrurus* 7.5%, Branchionus 3.5%, *Filinia* 0.5%, diaptomus 0.5% show in (Table 2).

In El hashaba class Crustacea was represented by seven families: Daphnidae, Bosminidae, Cyclopoidae, Centropagidae, Branchionidae, Testudinellidae and Diaptomidae. Family Daphnidae was consisting of four species: *Moina* 6.1%, *Ceriodaphnia* 1.5%, *Daphnia pulex* 13% and *Eudaphnia* 2.3%. Family Cyclopoidae composed of four species: *Mesocyclops leuckarti* 2.3%, Cyclopoid 1.9%, *Cyclops* 48.3% and *Cyclop sternus* 1.2%. Four families were represented by one species these were: Bosminidae, Centropagidae, Testudinellidae and Diaptomidae; these species were: *Bosmina* spp 1.5%, *Limnocalanus macrurus* 8.4%, *Filinia* 2.3% and *Nauplius* larvae 5.8% show in (Table 2).

**Table 2:** Population of Zooplankton at three sampling station

Class /Station	Family	Species	El nuzul		Kosti		El hashaba	
			No	%	No	%	No	%
Crustacea	Daphnidae	<i>Moina spp.</i>	5	5.88	18	9	16	6.13
		<i>Ceriodaphnia</i>	1	1.18	11	5.5	4	1.53
		<i>Daphnia pulex</i>	22	25.88	43	21.9	24	13.03
		<i>Daphniasoma</i>	1	1.18	-	-	-	-
		<i>Eudaphnia</i>	-	-	16	8	6	2.3
		<i>Mesodaphnia</i>	-	-	5	2.5	-	-
	Bosminidae	<i>Bosmina</i>	14	16.47	-	-	4	1.53
	Cyclopoidae	<i>Mesocyclops leuckarti</i>	1	1.18	3	1.5	6	2.3
		<i>Cyclopoid</i>	9	10.59	4	2	5	1.92
		<i>Cyclops</i>	-	-	75	37.5	126	48.28
		<i>Cyclop sternus</i>	-	-	1	0.5	3	1.5
	Centropagidae	<i>Limnocalanus macrurus</i>	26	30.59	15	7.5	22	8.43
	Branchionidae	<i>Branchionus</i>	4	4.71	7	3.5	2	0.77
		<i>Keratella</i>	-	-	-	-	12	4.6
	Testudinellidae	<i>Filinia</i>	2	2.23	1	0.5	6	2.3
	Diaptomidae	<i>Diaptomus</i>	-	-	1	0.5	-	-
<i>Nauplius larvae</i>		-	-	-	-	15	5.75	
Total			85	100	200	100	261	100

(-)=Absent

#### 4. Discussion

Composition of Phyto and Zooplanktons in the Study area in period of study, El nuzul was diversified in number and species of phytoplankton compared to other stations it recorded 77 species.

Present results indicated that three classes (*Bacillariophyceae*, *Cyanophyceae* and *Chlorophyceae*) having five families (*Coseinodiscaceae*, *Naviculaceae*, *Nitzschiceae*, *Volvocaceae* and *Fragilariaceae*) and 185 species. Balli (1995) and Kenyi (2006) who studied plankton in Jebel Aulia Reservoir found the same classes as recorded in this study mentioned above.

Class *Crustacea* was represented with seven families: (*Daphnidae*, *Bosminidae*, *Cyclopoidae*, *Centropagidae*, *Branchionidae*, *Testudinellidae* and *Diaptomidae*). Some species were found to be the common in the study area: *Limnocalanus macrurus* 30.69%, *Daphnia pulex* 25.88 % (in El nuzul), *Cyclops* 37.5%, *Daphnia pulex* 21.9% (in Kosti) and *Cyclops* 48.28% and *Daphnia pulex* 13.03% ( in El hashaba) *Daphnia pulex* was most dominant in the study area.

#### 5. Conclusion

The present study is provided the basic information on Plankton in the area extended from El hashaba to El nuzul from Jebel Aulia Reservoir, Sudan which would be useful for fishery managers, our results may contribute to this invaluable database.

#### References

[1] Adam, A. B (1976).Annual report on the research work carried out on the productivity of Jebel Aulia reservoir.16 pp.

- [2] Ahmed, A. A. (1978). On the Biology of Cyprinidae fish in Northern Part of White Nile. M. Sc. Thesis. Faculty of Sciences, University of Khartoum.
- [3] Balli, J. J. (1995). Phytoplankton dynamic in Jasir Closed Channel, White Nile. M. Sc. Thesis. Institute of Environmental Studies. University of Khartoum.
- [4] Belleman, M. and Khalid, A. M., (1998). Assistance to Fisheries Management Republic of Sudan. TC: TCP/SUD/6611.
- [5] El Moghraby, A. I. (1973). Fishes of the White Nile. Nineteenth Annual Report of Hydrobiological Research Unit, 16-17 pp. University of Khartoum.
- [6] Farazaneh, et. el (2006). Phytoplankton Diversity and Nutrients at the Jajerood River in Iran. Pakistan Journal of Biology Science 9 (9): 1787-1790, 2006.
- [7] Hamza, Kh. M. (1980). Studies on Fish Populations in Jebel aulia Reservoir.M.Sc. Thesis. Department of Zoology, University of Khartoum.127 pp.
- [8] Kenyi, D. D. (2006). Alimnolical study on Jebel Aulia Reservoir with Emphasis on Certain Plankton .M.Sc. Thesis. Natural Resources and Environmental Studies, University of Juba. Russian scientific expedition research report (1964).
- [9]Saugestad, H. A. (1991). Planteplankton far Ferskvann. Naturfagseksjonen, Bergen L ererh ogskole. VANDA prosjektet I Bergen.