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Research Article

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Comparative Study of Water Volume for Zooplankton Analysis in the Kangsabati Reservoir, West Bengal, India

Bera Amalesh[1]*, Patra B.C.[1], Sar U.K.[2] and Bhattacharya M.[1] and Dutta, T.K.[3]

[1]Aquaculture Research Unit, Department of Zoology, Vidyasagar University, Midnapore – 721 102, West Bengal, India

[2]National Fisheries Development Board, Govt. of India, Hyderabad, India

[3]Department of Zoology, Bankura Sammilani College, Bankura, West Bengal, India

*Corresponding Author E-mail: amalesh_bera@ymail.com

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ABSTRACT

A comparative study was conducted to standardize the water volume for quantitative analysisof zooplankton during the period from March, 2010 to February, 2011 in Kangsabati Resesrvoir, West Bengal, India. The study revealed the occurrence of six groups of zooplankton viz. Rotifera, Copepoda, Cladocera, Protozoa, Amphipoda and Ostracoda. In order to precise the better results based on the plankton density and species composition, different volume of water like 25 litre, 50 litre, 75 litre, 100 litre, 125 litre and 150 litre were filtered. 75 litre to 100 litre of water filtration gives standard result. Particularly in the most cases 100 litre of water expose maximum species composition of plankton.

Keywords: *Water volume, Species composition, Kangsabati Reservoir, 100 litre.*

INTRODUCTION

The study of zooplankton is required to evaluate the ecological and fishery status in freshwater reservoir[1]. The physico-chemical characteristics of water impact on productivity, species composition, abundance of aquatic organisms. In this regard, Karuthapandi *et al.*[2] pointed out that zooplankton community fluctuate according to physico-chemical parameters of the environment. The plankton population is important food source for fishes maintaining vital role in food chain on account of energy transfer.

Zooplankton is the indicator of pollution of aquatic environment[3] because of their sensitivity, minute changes of environment, short generation time, where as certain phytoplankton species like *Microcystis aeruginosa* have served as a bioindicators of water quality[4,5] and it is a suitable tool to assess the status of water pollution[6].

There are so many workers carried out studies on diversity, species composition, seasonal abundance, relationship with physico-chemical parameters of plankton etc. but no specific information on water volume which will be filtered for quantitative and qualitative analysis of plankton.

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There are so many workers who worked on filtering 10 litre of water[7-10], 20 litre[11], 25 litre[12], 40 litre[13,14], 50 litre[15-23], 72 litre[24], 75 litre[25], 100 litre[26-31], 150 litre[32], 200 litre[33,34]. The main objective of present study was to determine the water volume which is to be filtered for maximum species richness in the concerned aquatic environment in respect to qualitative and quantitative analysis of plankton.

MATERIALS AND METHODS

Zooplankton sampling was done early in the morning in every month during the period from March, 2010 to February, 2011 at regular interval from Kangsabati Reservoir, West Bengal, India. Various methods for qualitative and quantitative analysis of plankton have been adopted by several workers like Apstein plankton net, Water filtration through plankton net pouring water by bucket, area of the plankton net's inlet opening, Ruttner sampler capacity etc.

But here water filteration by plankton net of bolting silk no. 25 (mesh size 64 µm) was done using the bucket collecting volume 25 litre , 50 litre, 75 litre, 100 litre, 125 litre and 150 litre for zooplankton analysis. Every 100 ml of concentrated sample of each volume of filtered water were transferred to 250 ml glass container. 4% formalin and few drops of glycerin also added to it for preservation.

The qualitative analysis of zooplankton was done by using Sedgwick Rafter cell method[35] (Adoni, 1985) with the help of binocular compound microscope applying eye pieces such as 10 X, 40 X. Zooplankton species identification was done following the keys, monographs, standard literature[36-39] of Edmondson, 1959; Battish, 1992; Needham and Needham, 1962; Sharma, 1998 and with the help of expert of Zoological Survey of India, Kolkata.

RESULTS AND DISCUSSION

To study the qualitative and quantitative analysis of zooplankton like species richness and density, the sampling was done so as to represent entire zooplankton population and to avoid or minimize sampling errors. We have tried to prove the observed results from the two angle of argument – applying species volume curve and trend line plot along with regression equation. The results are represented in the table – 1 mentioning number of species, density i.e. number of individuals per litre on monthly basis. Based on clarification of figure A – L pointing Species Volume Curve, we find that 50 litre, 75 litre and 100 litre shows maximum species richness. Among them in most of the months 100 litre of water stands first position for maximum zooplankton species richness. The species volume curves of 12 months establish that there is no notable increase of species in number when the filtration volume increase to 125 litre and 150 litre. Centre for Ecological Sciences, IISC, Bangalore published the same report through the experiment in their technical report number-115[40].In this regard, it is to be exemplified that 25L, 50L, 75L, 100L, 125L, 150L volume of water also filtered to obtain errorless result of rotifer diversity in the Jalaser Tank, Mandalgarh, Rajasthan[41].

Trendline plots along with regression equations between different volumes of water and total zooplankton has been given in figure 1 – 6. Linear regression expresses the dependent variable Y as the linear function of the independed variable X. Thus, the values of Y, predicted from those of X, lie around a straight line called the regression line of Y on X. The coefficient of determination (R^2).

Express to what extent the regressors are significantly good at explaining the values of depended variable in the sample. The R^2 value ranges between 0 to 1. Greater the value of R^2 ($\rightarrow$ 1), it is the best fitting straight line for the plotted points and the regression model are more useful. The regression equation as shown in figure 1 – 6. In the present study we get R^2 values= 0.213 (25 L), 0.415 (50 L), 0.190 (75 L), 0.297 (100 L), 0.054 (125 L), 0.109 (150L) [Figure 1 – 6]. In case of 50 L and 100 L , the higher values are 0.415 and 0.297 respectively.But species volume curve support the water volume 100 L than that of 50 L. So, therefore considering the both species volume curve and trendline regression plot, we focus on the water volume of 100 L for zooplankton analysis. Similarly, Ramachandra and Solanki[42] recommended the appropriate sampling volume, 100 litre of water for phytoplankton analysis as per the observed data and graph.

Table: 1 shows month wise (12 months) number of zooplankton species, total number of zooplankton / litre following different volumes of water

Samples	Water Volume	Months											
		March, 2010		April, 2010		May, 2010		June, 2010		July, 2010		Aug., 2010	
		No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L
Sample – 1	25 Litre	22	228	17	160	23	696	22	418	25	280	19	380
Sample – 2	50 Litre	21	272	19	186	22	506	24	472	23	248	22	254
Sample – 3	75 Litre	20	388	22	304	21	643	26	546	26	269	19	267
Sample – 4	100 Litre	26	240	27	278	25	500	25	402	26	220	22	370
Sample – 5	125 Litre	25	409	20	236	22	524	23	504	21	216	20	272
Sample - 6	150 Litre	22	349	19	246	20	498	24	412	24	180	23	207

Samples	Water Volume	Months											
		September, 2010		October, 2010		November, 2010		December, 2010		January, 2011		February, 2011	
		No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L	No. of Sp.	No. of Ind./L
Sample – 1	25 Litre	22	204	24	102	25	776	25	522	18	458	18	464
Sample – 2	50 Litre	25	240	24	186	23	482	26	564	21	878	20	482
Sample – 3	75 Litre	25	347	27	214	28	533	29	427	20	529	21	557
Sample – 4	100 Litre	26	358	29	160	28	617	28	344	22	595	22	386
Sample – 5	125 Litre	23	144	26	112	25	240	27	224	22	512	21	526
Sample - 6	150 Litre	23	260	25	98	26	187	25	207	20	634	20	496

No. of Sp. = Number of species, No. of Ind./L = Number of Individuals / Litre

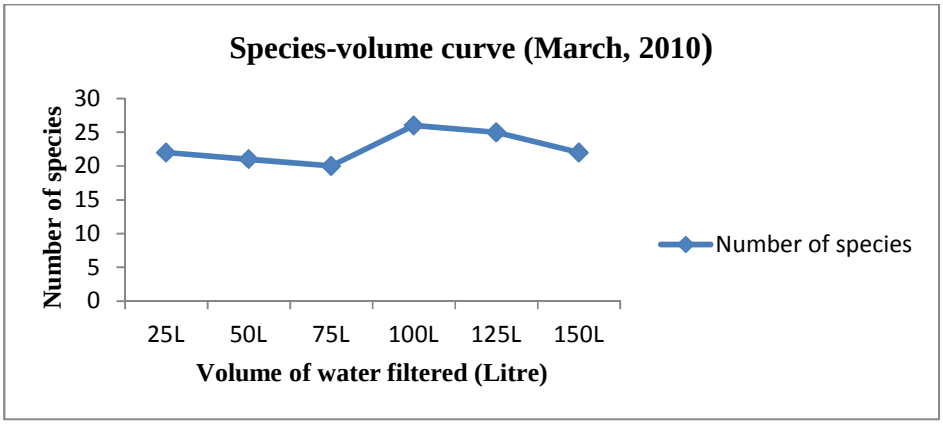

Figure – A

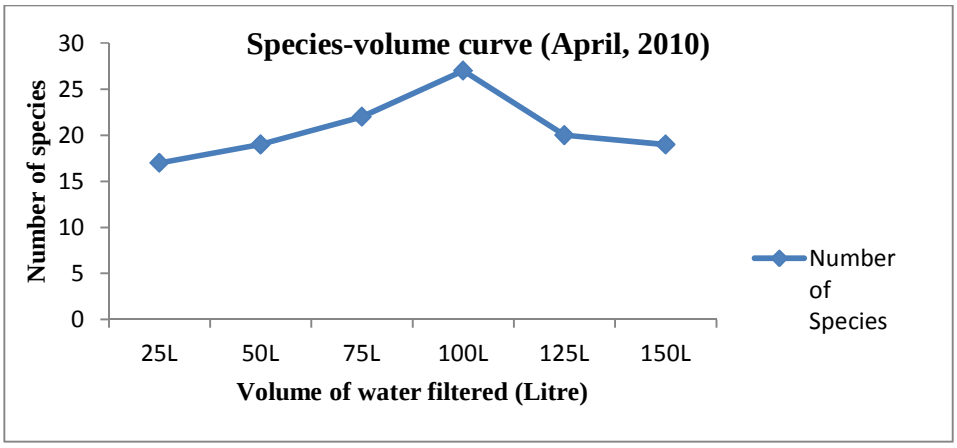

Figure – B

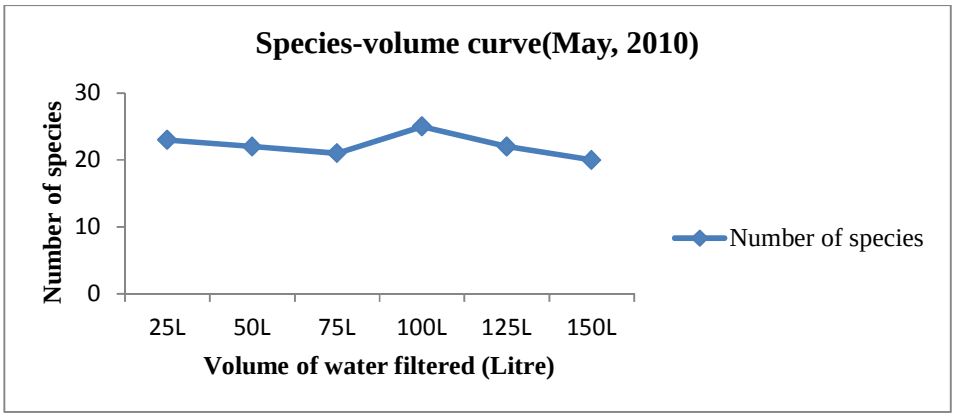

Figure – C

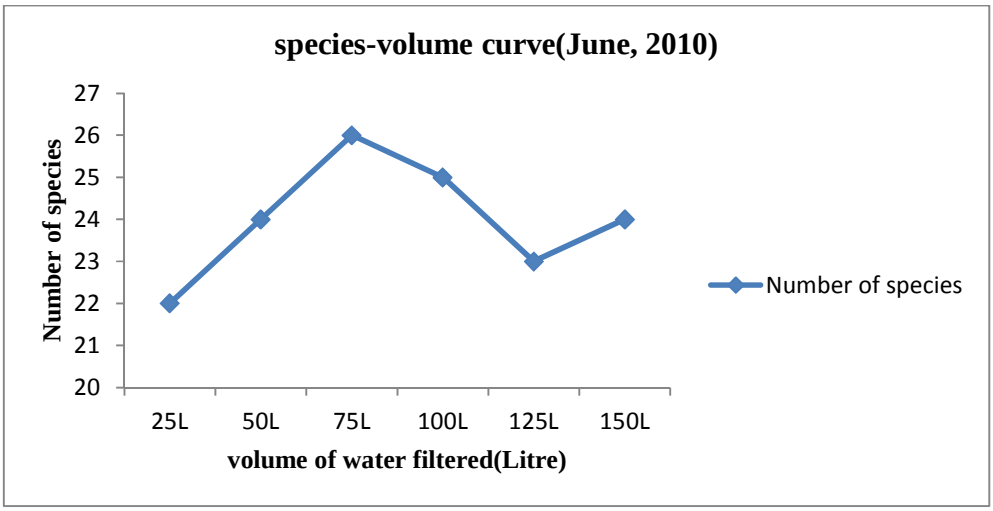

Figure – D

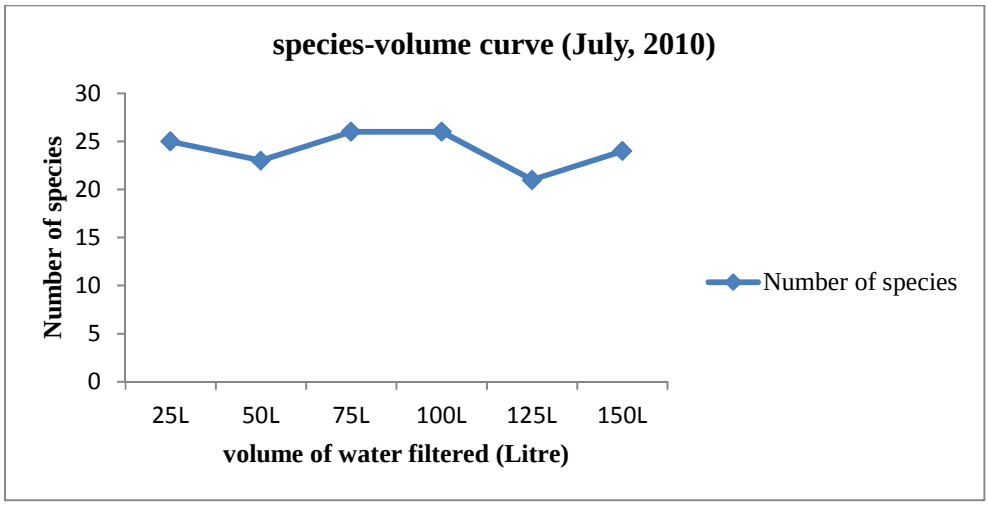

Figure – E

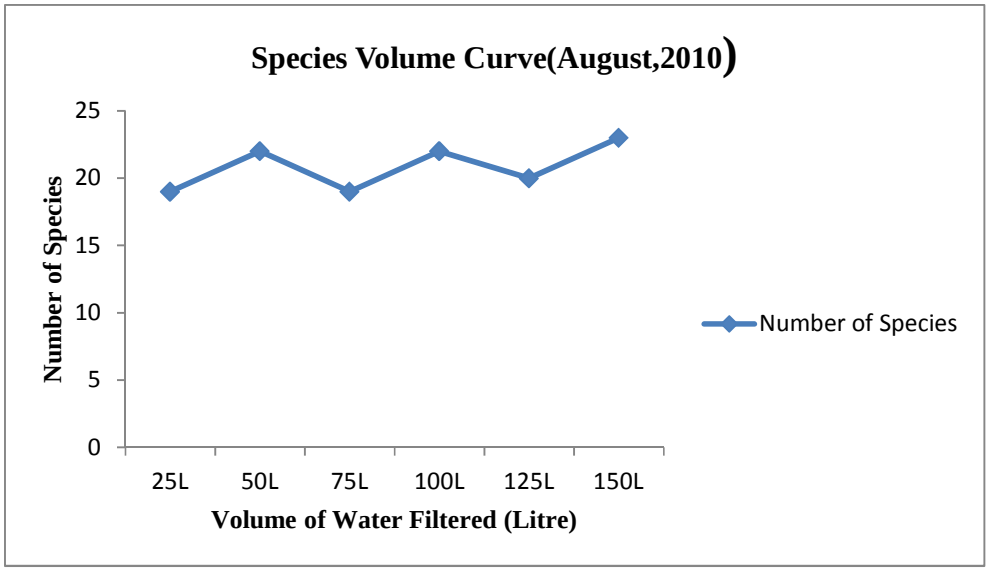

Figure – F

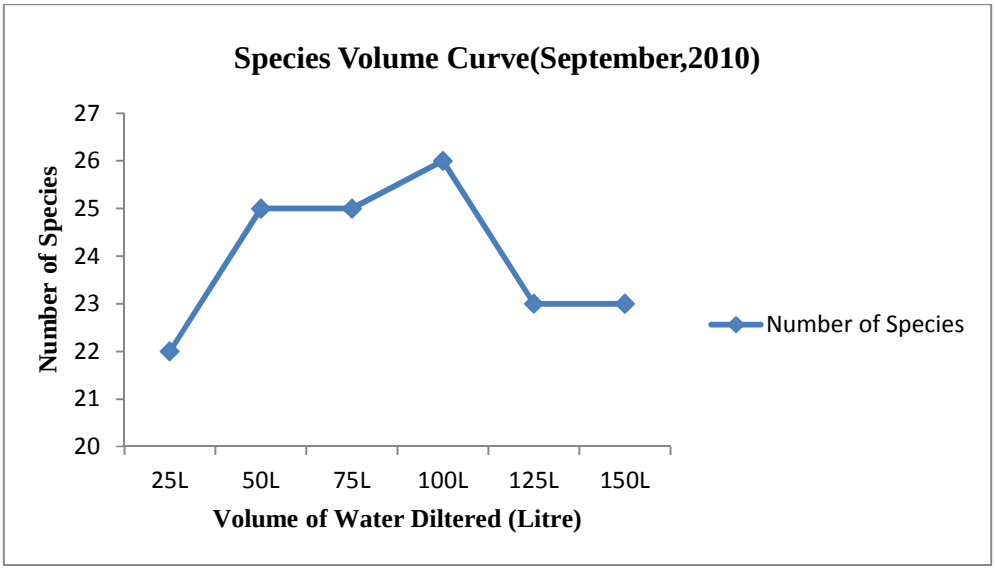

Figure – G

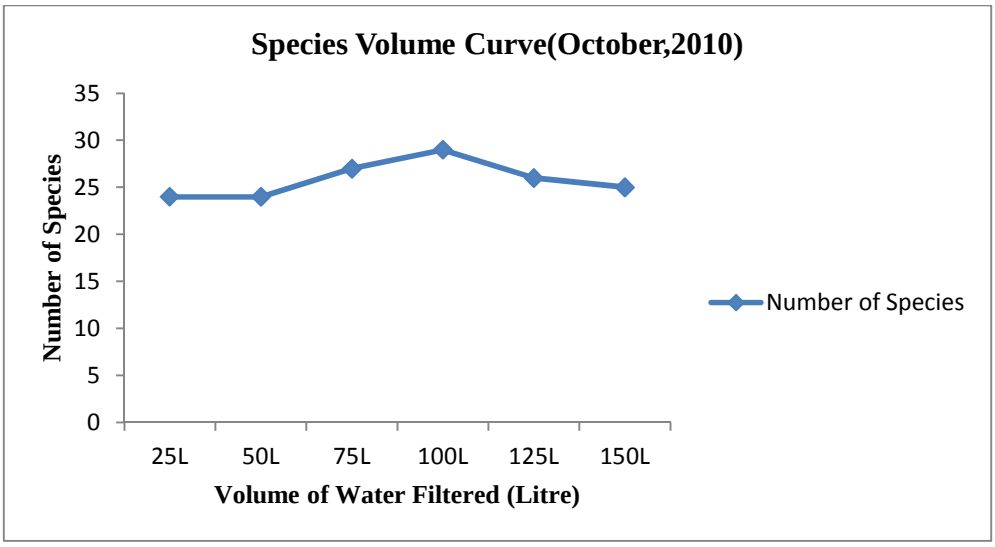

Figure – H

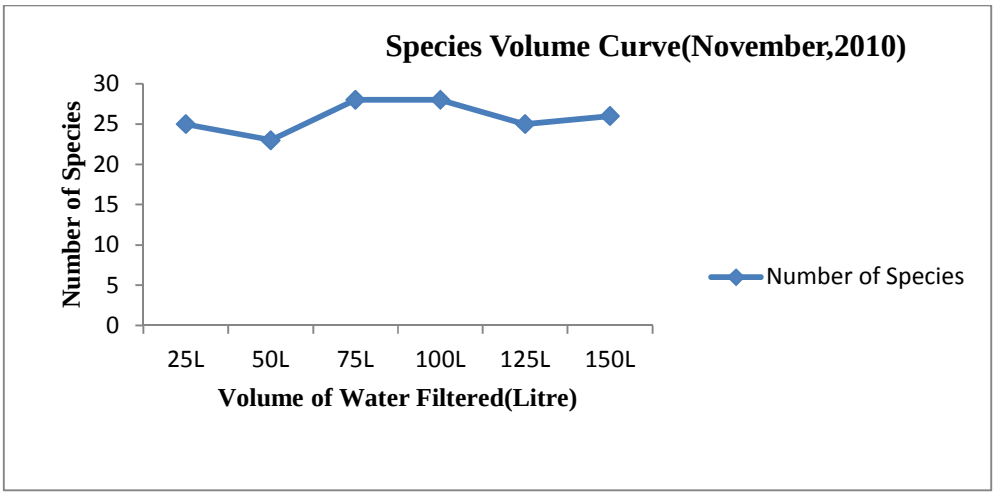

Figure – I

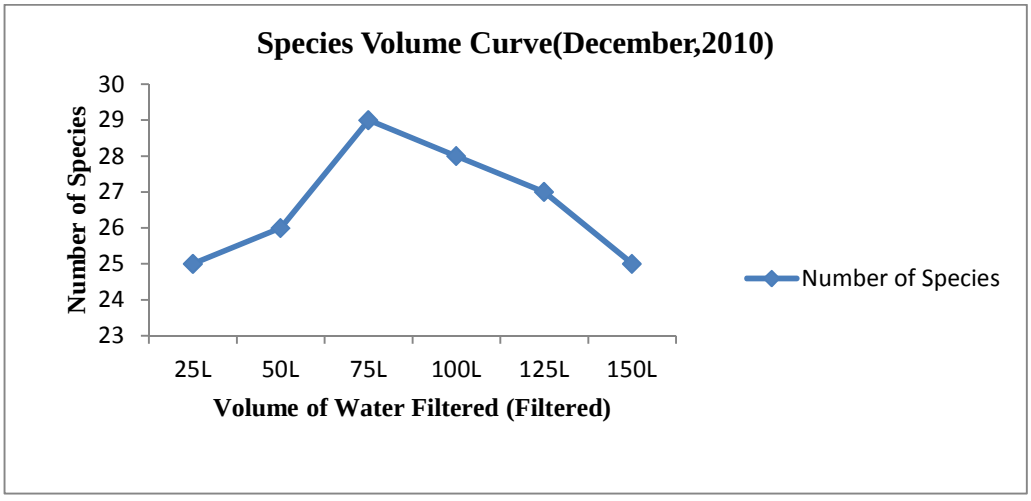

Figure – J

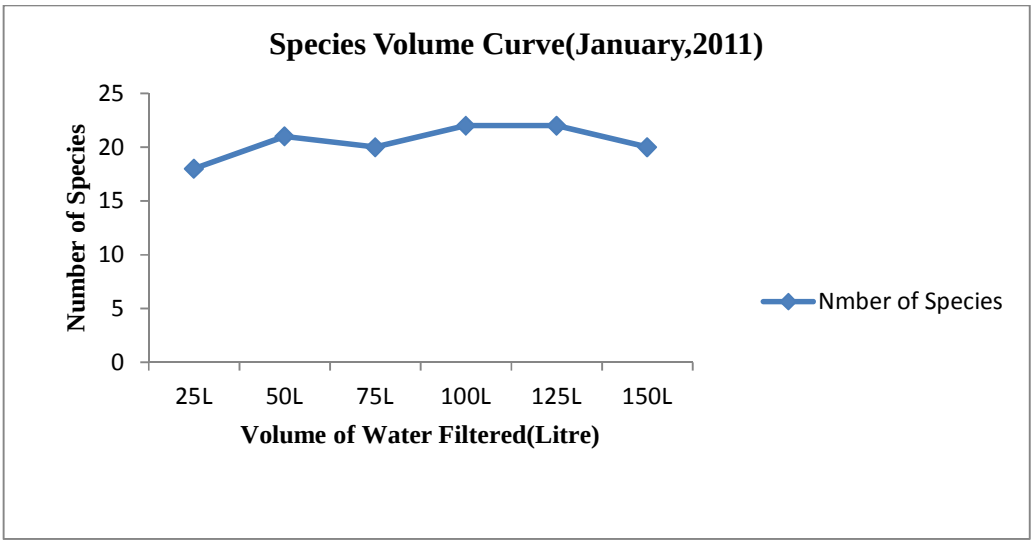

Figure – K

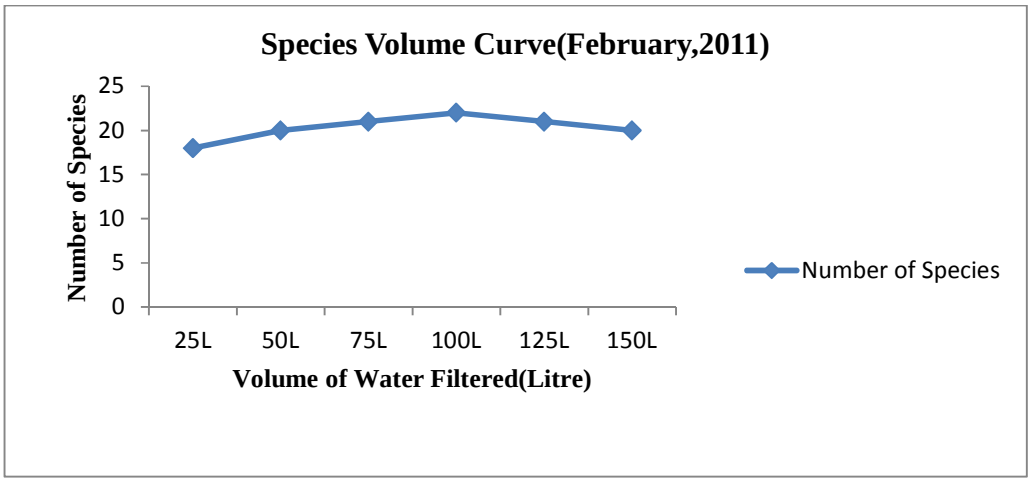

Figure – L

Figure : A – L Month wise species volume curve of zooplankton species and water volume

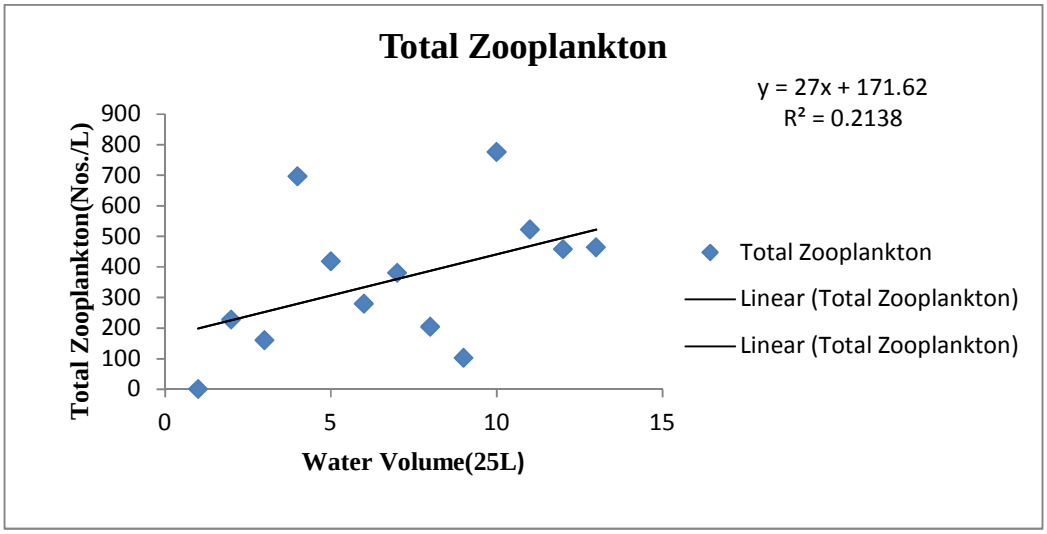

Figure – 1

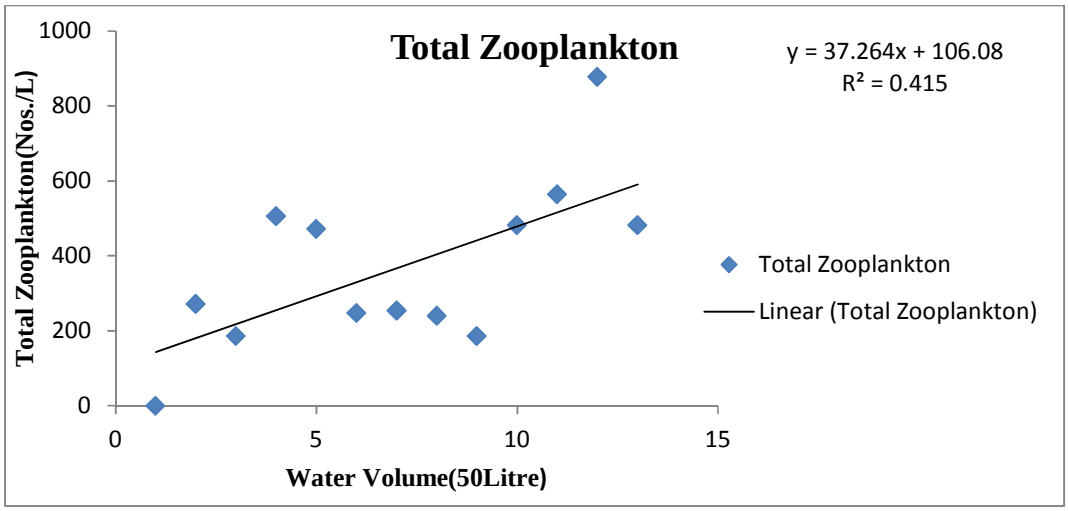

Figure – 2

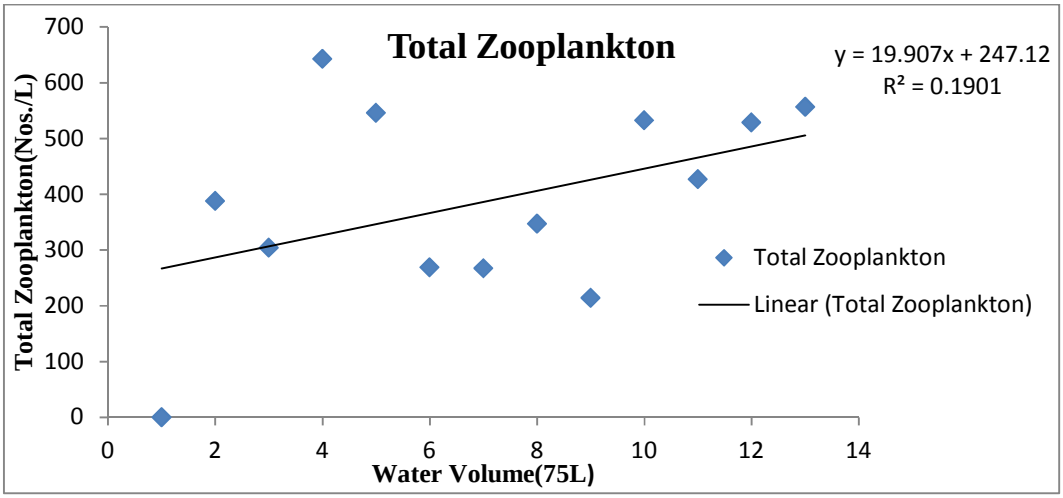

Figure – 3

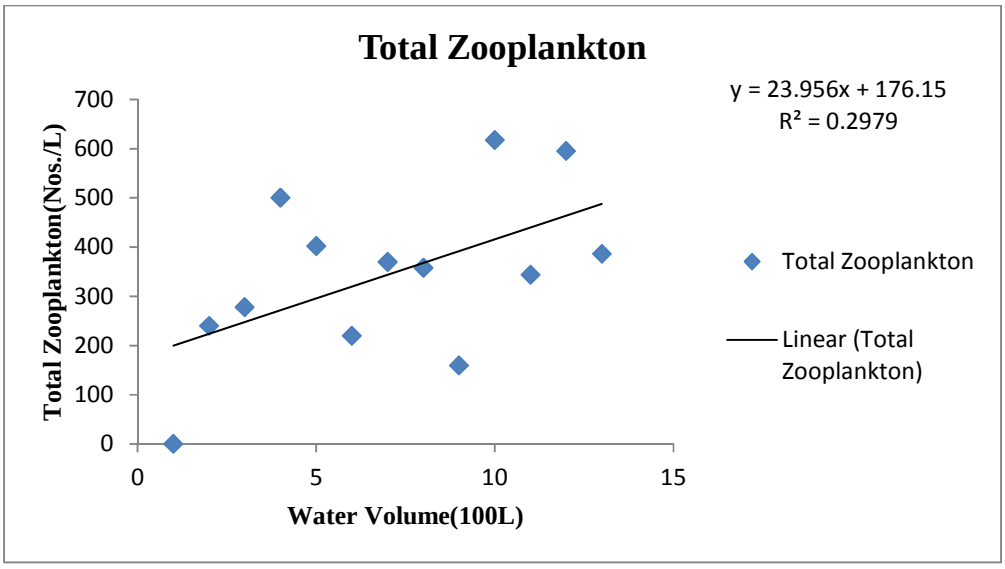

Figure – 4

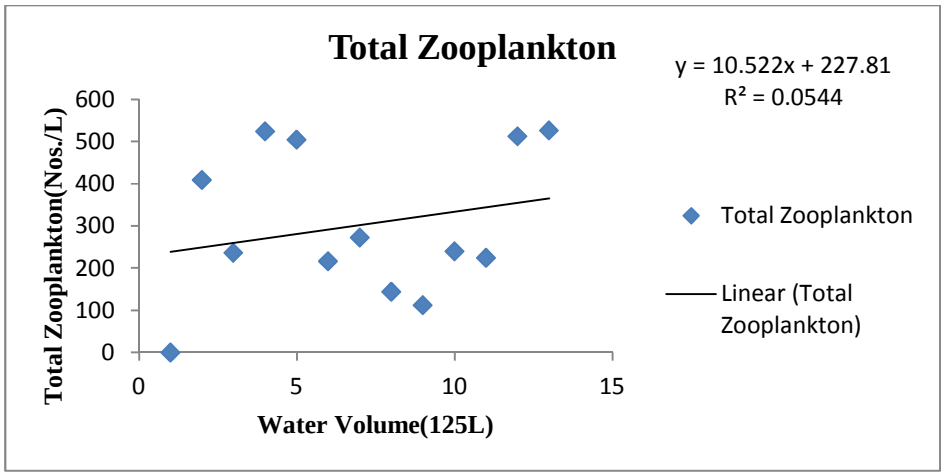

Figure - 5

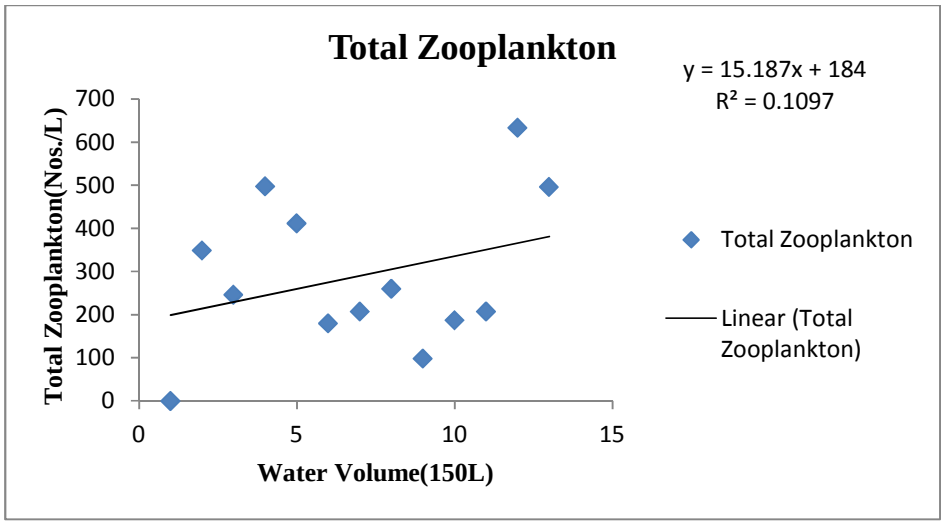

Figure – 6

Figure : 1 – 6 Showing trend line regression plot of total zooplankton verses water volume

CONCLUSION

It was concluded that among the different mentioned volumes, 100 litre of water was more appropriate sampling volume to determine maximum number of species richness as well as standard qualitative analysis of zooplankton.

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