# GRAFHAM WATER 1992

BIOLOGICAL MONITORING RE: FeSo4 DOSING

SUPPLEMENTARY REPORT:

## ZOOPLANKTON

# GRAFHAM ZOOPLANKTON REPORT 1992

## 1 INTRODUCTION

As part of the ongoing monitoring programme at Grafham Water by the National Rivers Authority, zooplankton have been sampled and enumerated from open water sites on the reservoir. The results are presented in this brief supplementary report.

## 2 SAMPLING PROGRAMME AND METHODS

From 28 April until 6 August 1992 a filtered 15 litre sample was obtained from just below the water surface. From 19 August onwards a filtered 10 litre sample was obtained from a depth of 5 m using a Patalas Sampler. The samples were preserved in formalin, identified and enumerated using a Sedgewick Rafter Cell.

## 3 RESULTS

The results are present in Figures 1 to 6 as listed below:

- Figure 1 - Zooplankton weekly averages
- Figure 2 - Cladocera, Copepod and Rotifer abundance
- Figure 3 - Zooplankton abundance 1990-1992
- Figure 4 - Zooplankton and Unicellular algal abundance
- Figure 5 - Cladocera, Copepod and Unicellular algal abundances
- Figure 6 - Zooplankton and Colonial algal abundance

Overall, Copepods tended to be the dominant zooplankton, followed by Rotifers and then Cladocera. Rotifers dominated until mid-July but were then succeeded by Copepods. Cladocera numbers were generally low except for peaks during the weeks of 8/5, 30/7 and 7/10.

### 3.1 Cladocera

Within the Cladocerans there appeared to be a succession of dominance from the small Bosmina in April and May, to the larger, cyclomorphic Daphnia from May onwards. No other representatives of Cladocera were observed in 1992.

### 3.2 Copepods

This group were represented in Grafham mainly by Cyclopoids and Nauplii. There was a noticeable decline in numbers from peaks of Nauplii to subsequent peaks of adult Cyclopoids indicating the high larval mortality rate. Very few Calanoids were recorded in Grafham in 1992.

### 3.3 Rotifers

Rotifer numbers were high in spring and early summer, whilst very few were present after August. There were a large number of genera recorded, the Rotifers exhibiting the greatest diversity amongst zooplankton in Grafham.

3.4 Comparison to 1990 and 1991

Species diversity was less in 1992 with the absence of Chydorus, Ceriodaphnia and Notholca species which had been present in 1991.

Zooplankton productivity was similar in 1992 to previous years with the average number of animals ranging between 200 and 400 per litre.

## 4 DISCUSSION

Zooplankton are an important grazer of phytoplankton and as such their ecology and distribution should be considered when attempting to control algal growth. Zooplankton consume different sized particles, Rotifers prefer material 1-20 um, Cladocera 1-50 um and Copepods 5-100 um. Cladocera feed at the greatest rate and as such are the most important algal grazers. Unfortunately Cladocera are actively selected by feeding fish as they are large and slow and it is to be expected that in a large fishery lake such as Grafham, predation of Cladocera would be intense, as indicated by the low numbers of Cladocera recorded.

Peaks of zooplankton often coincide with or follow peaks in algal numbers. Smaller Unicellular algae are more intensely grazed by zooplankton as they are an acceptable size. It can be seen in Figures 4 and 5, zooplankton numbers peak either during or just following peaks in numbers of unicellular algae, particularly the Cryptophyceae.

Peaks in colonial green and Blue-green algal numbers do not appear to have associated zooplankton peaks (Figure 6). These algae tend to be too large to be readily acceptable to the zooplankton. In addition some algae, particularly Blue-greens, release toxins when they decay which inhibits zooplankton entering the area.

It is possible that zooplankton grazing can give a competitive advantage to less edible algae such as blue greens. Additionally there is evidence that some species actually benefit from grazing. Ninety percent of Coelosphaerium cells grazed by Daphnia magna are passed through the gut and expelled undamaged. These cells exhibit enhanced growth and reproduction as, during their passage through the Daphina gut they actually absorb nutrients from the gut into their cells.

Despite these apparent paradoxes zooplankton are used as an important tool of Biomanipulation. In many eutrophic reservoirs such as those in the Thames Valley, fish which prey on zooplankton are removed and further inhibited by the addition of larger predatory fish hence encouraging zooplankton, and especially Cladoceran growth which in turn creates a bigger grazing pressure on algae.

However, this biomanipultion would not be possible in a reservoir such as Grafham which has an important fishery use.

5 CONCLUSIONS

Zooplankton numbers and dominance patterns are similar to 1990 and 1991 with the dominant group being copepods.

Numbers of the most effective algal grazers, the Cladocera are generally low probably due to their predation by fish.

Due to its use as a fishery it would be difficult to encourage Cladoceran growth in Grafham although the provision of marginal plants and floating mats of vegetation could increase the avoidance of predation by providing places of concealment.

March 1993

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FIG.1

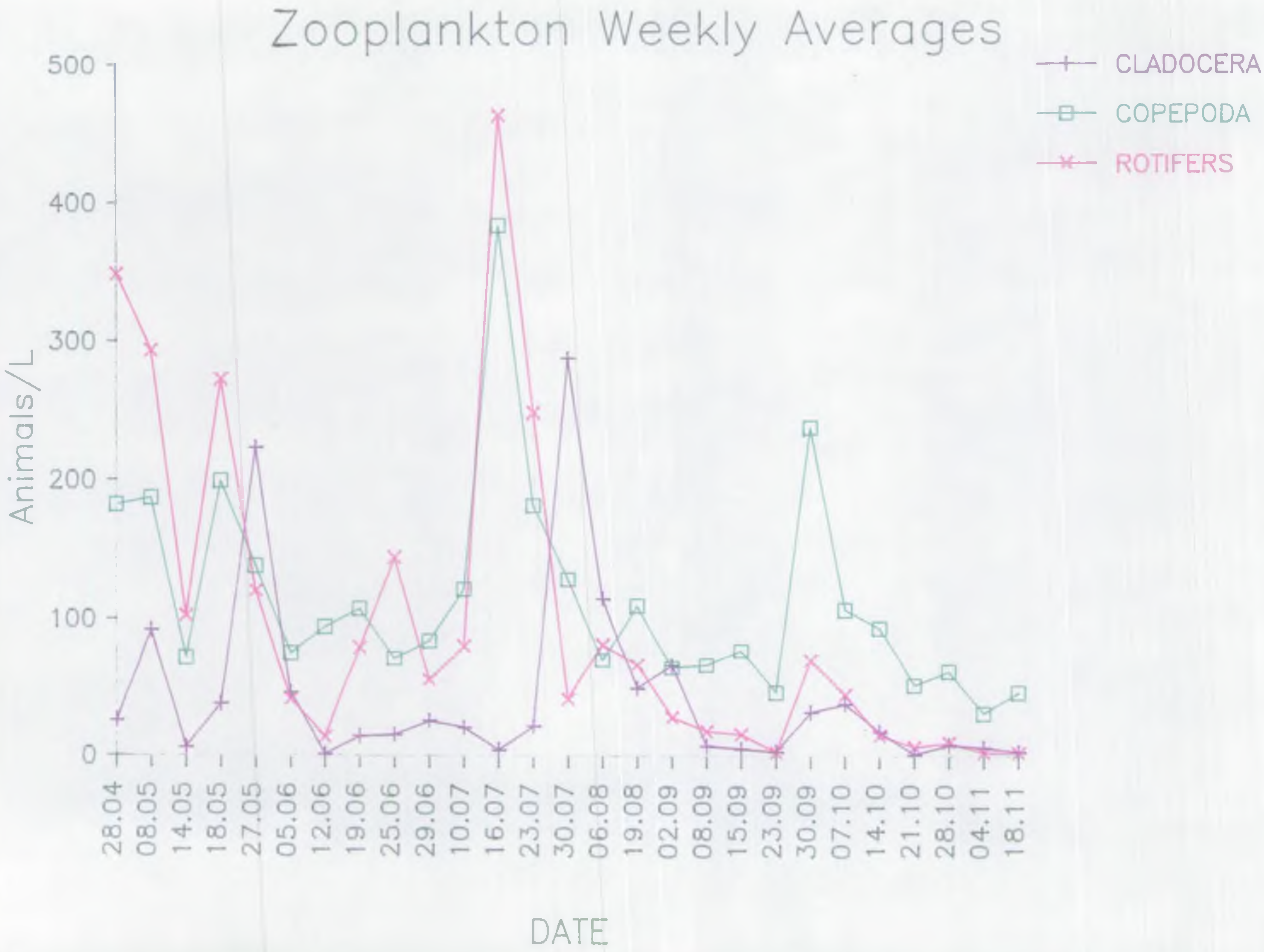

Zooplankton Weekly Averages
Animals/L
500
400
300
200
100
0
CLADOCERA
COPEPODA
ROTIFERS
28.04
08.05
14.05
18.05
27.05
05.06
12.06
19.06
25.06
29.06
10.07
16.07
23.07
30.07
06.08
19.08
02.09
08.09
15.09
23.09
30.09
07.10
14.10
21.10
28.10
04.11
18.11
DATE

FIG.2 CLADOCERA,COPEPOD AND ROTIFER ABUNDANCE

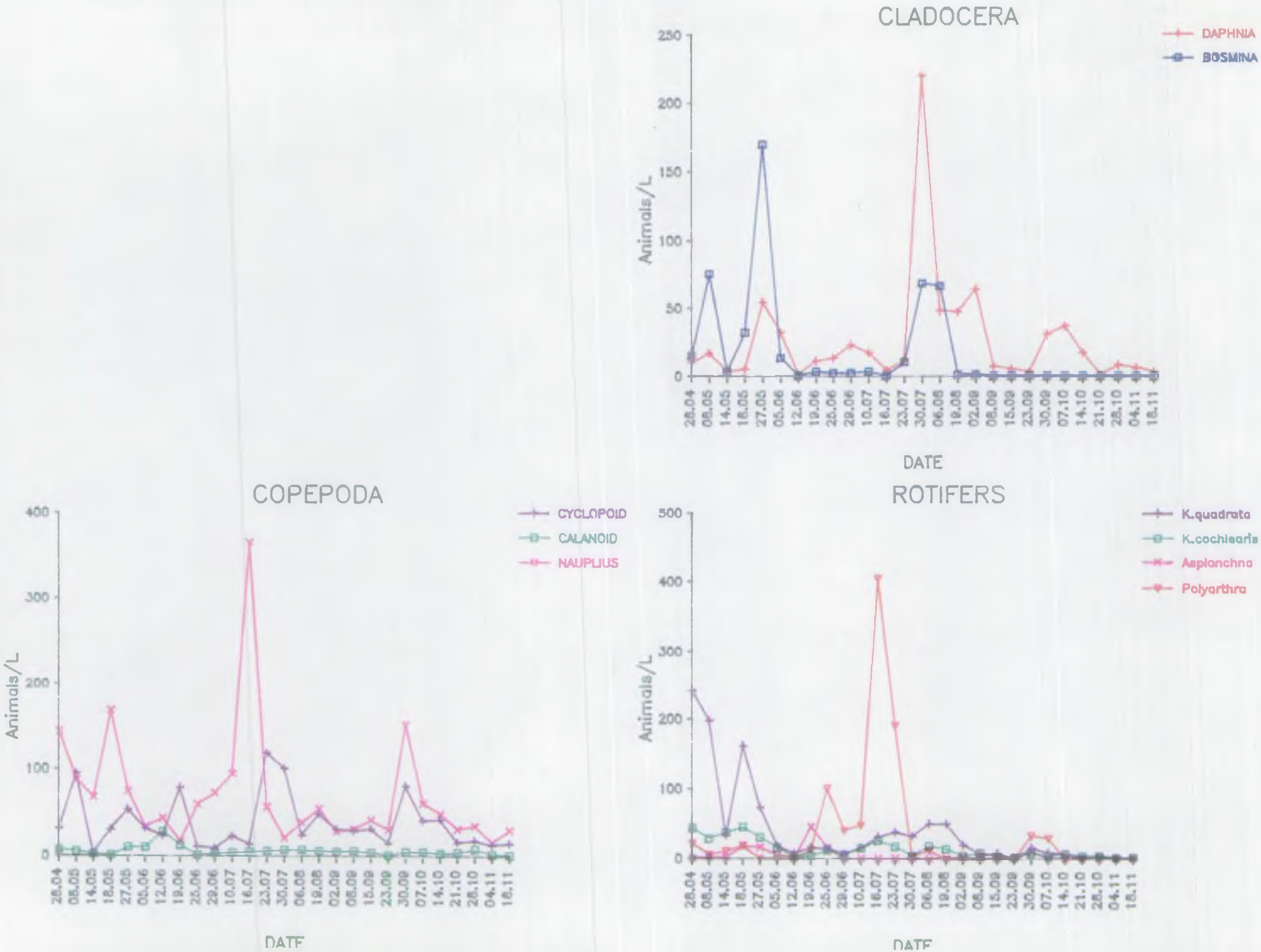
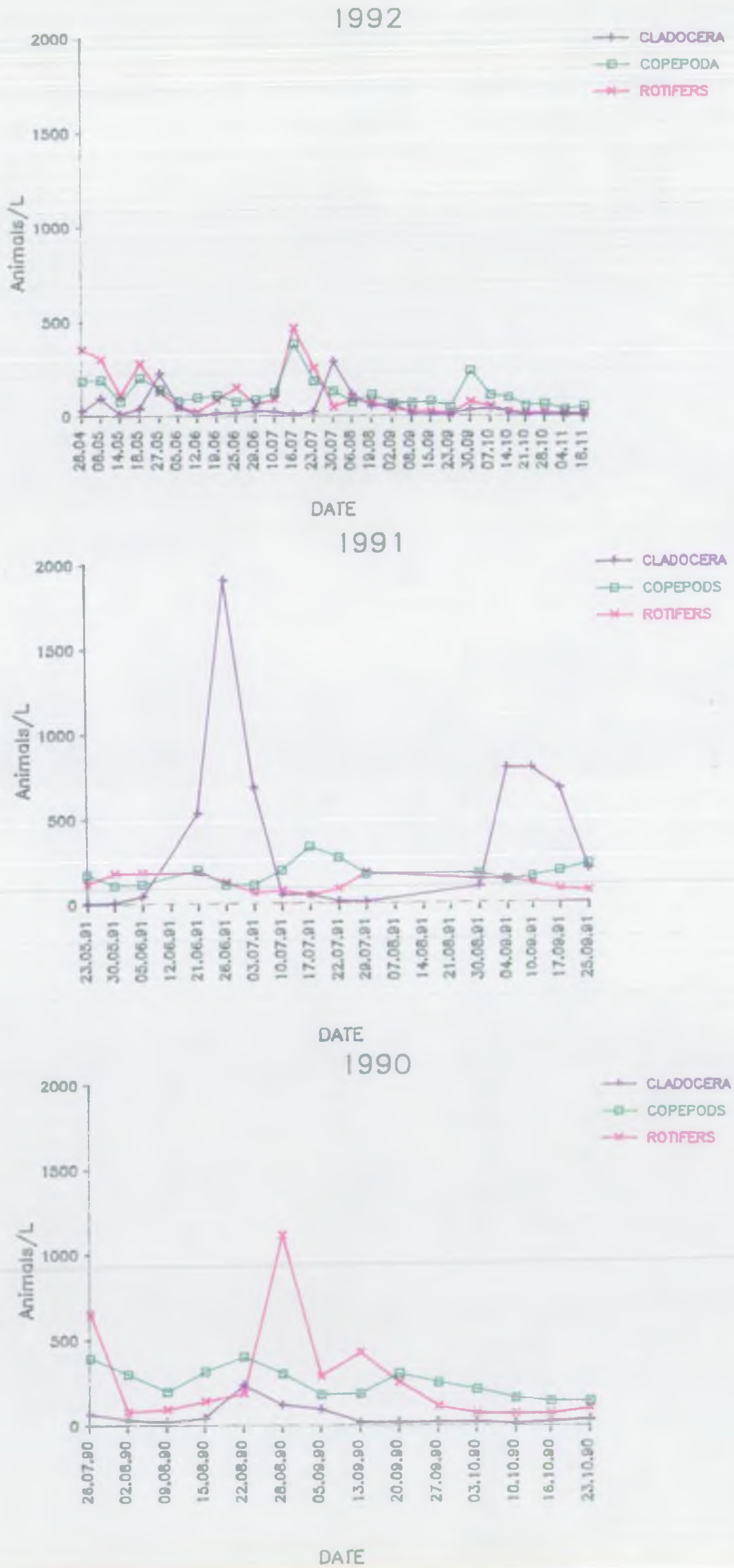


FIG.3 ZOOPLANKTON ABUNDANCE 1990-1992



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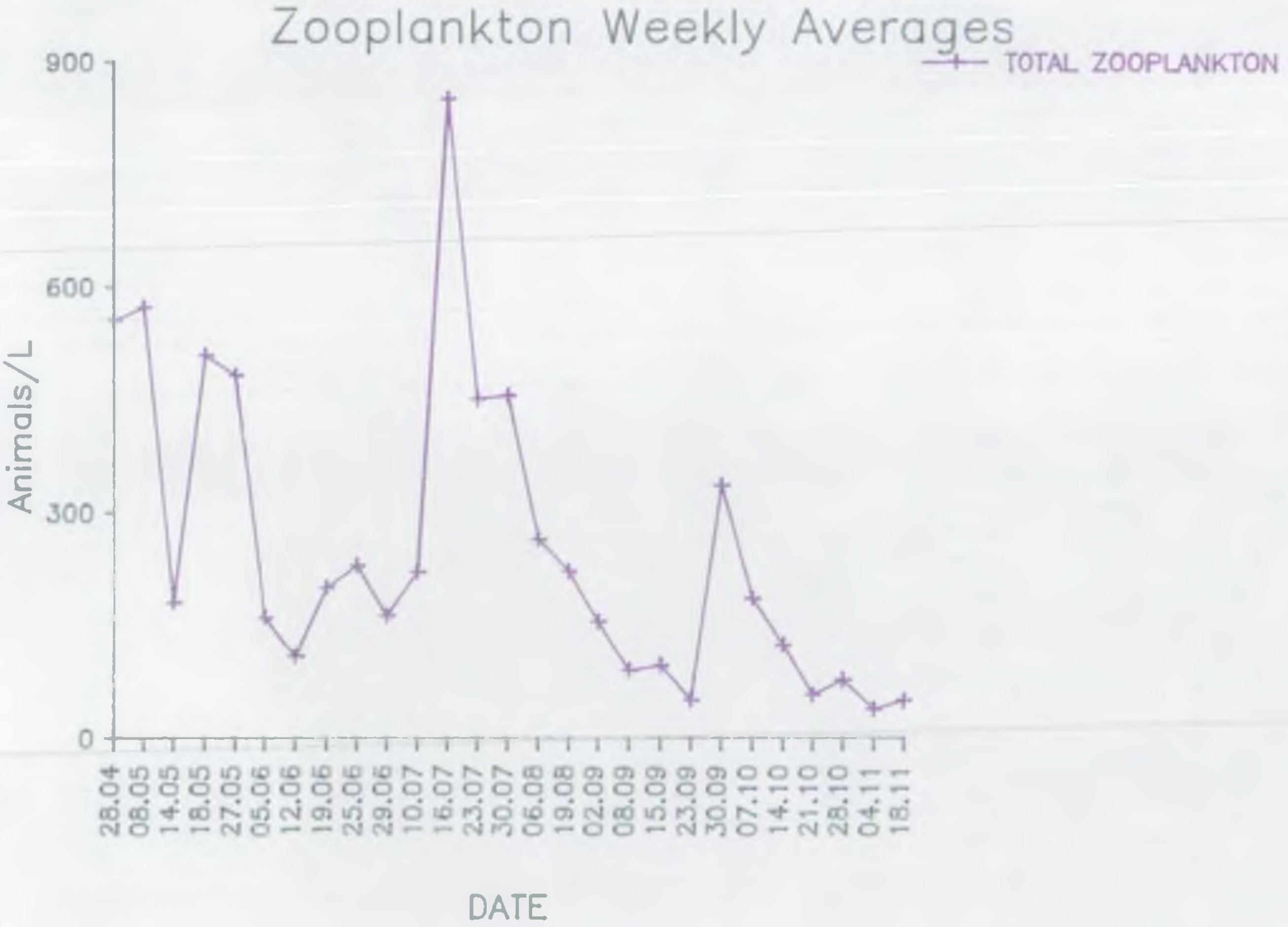

Zooplankton Weekly Averages
TOTAL ZOOPLANKTON
Animals/L
900
600
300
0
28.04
08.05
14.05
18.05
27.05
05.06
12.06
19.06
25.06
29.06
10.07
16.07
23.07
30.07
06.08
19.08
02.09
08.09
15.09
23.09
30.09
07.10
14.10
21.10
28.10
04.11
18.11
DATE

FIG.4 ZOOPLANKTON AND UNICELLULAR ALGAL ABUNDANCE

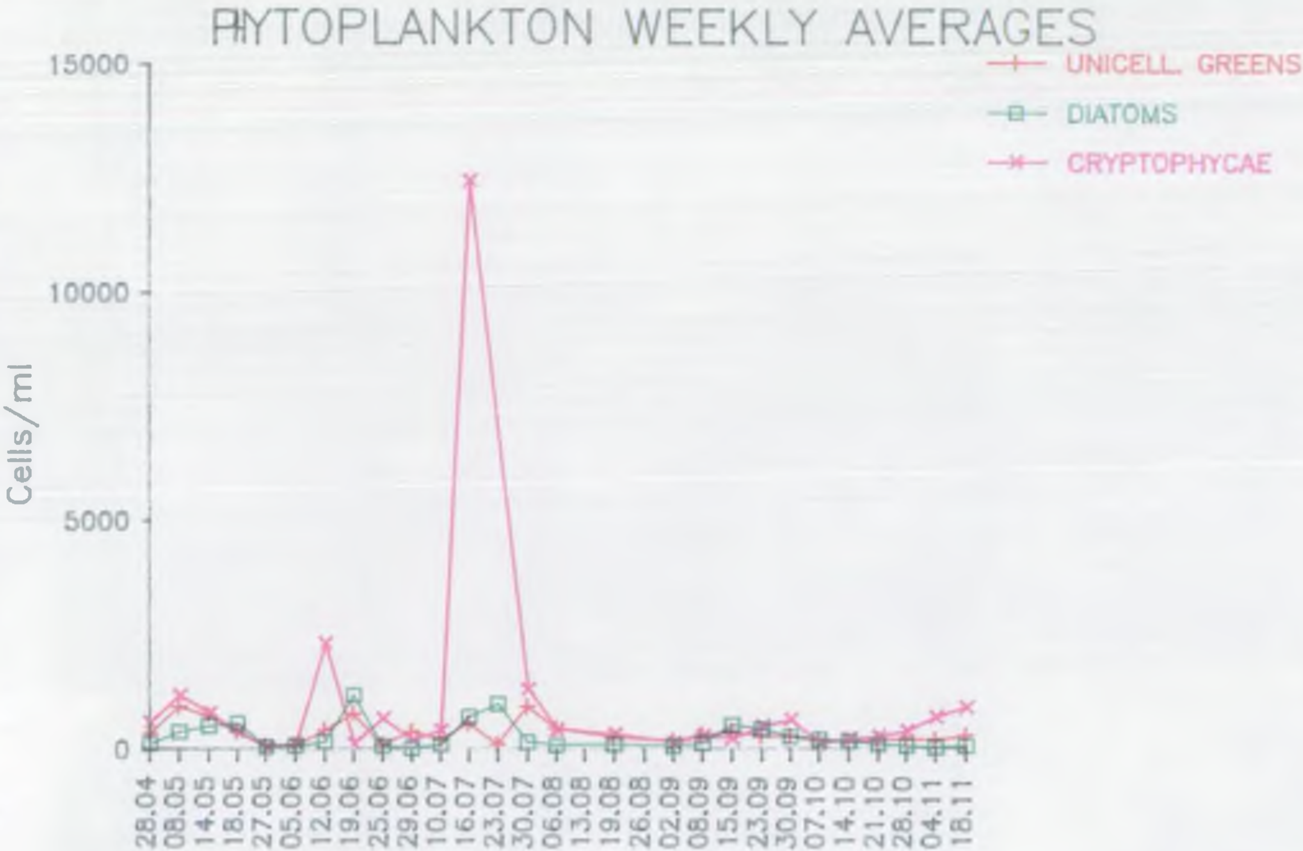
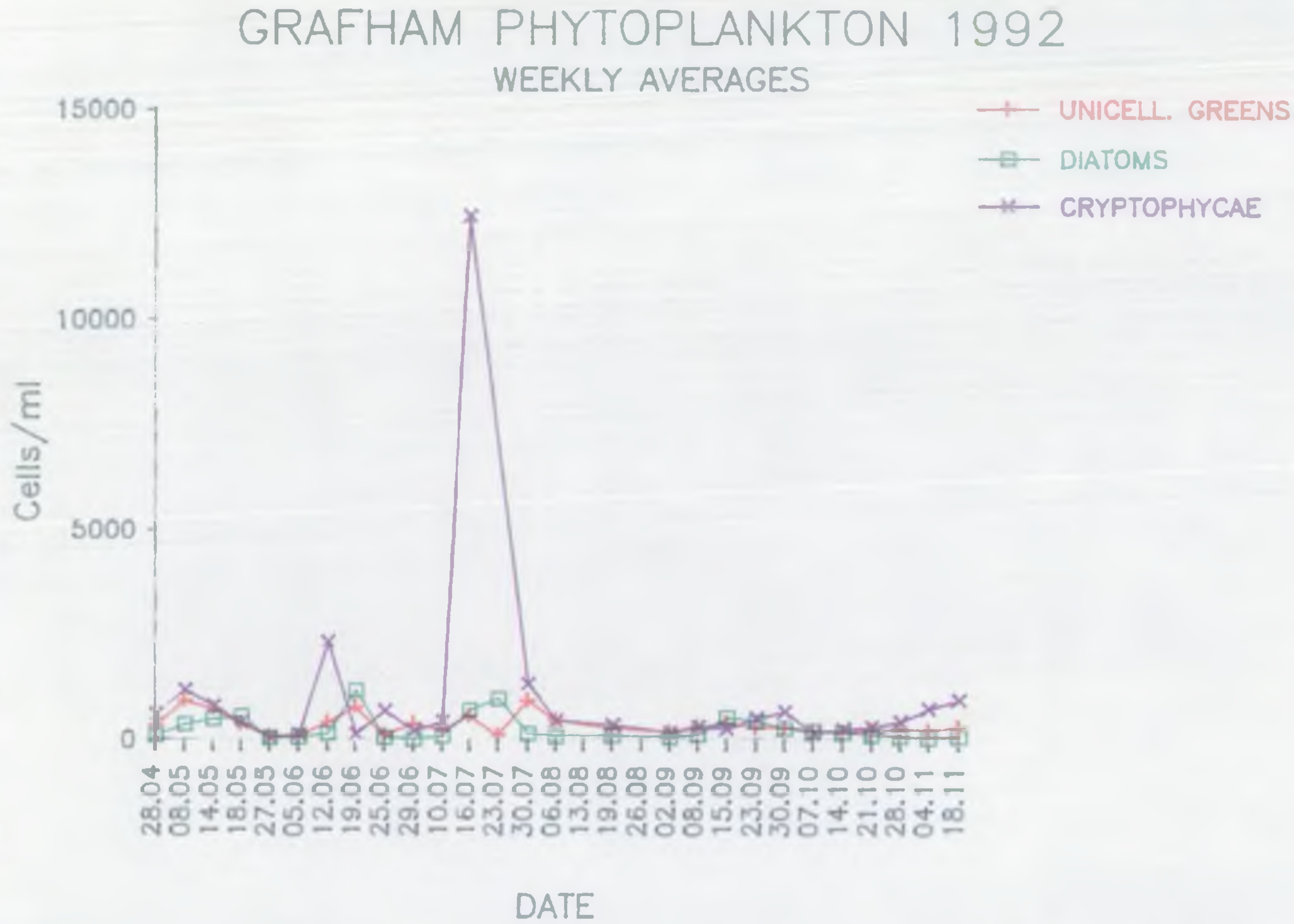
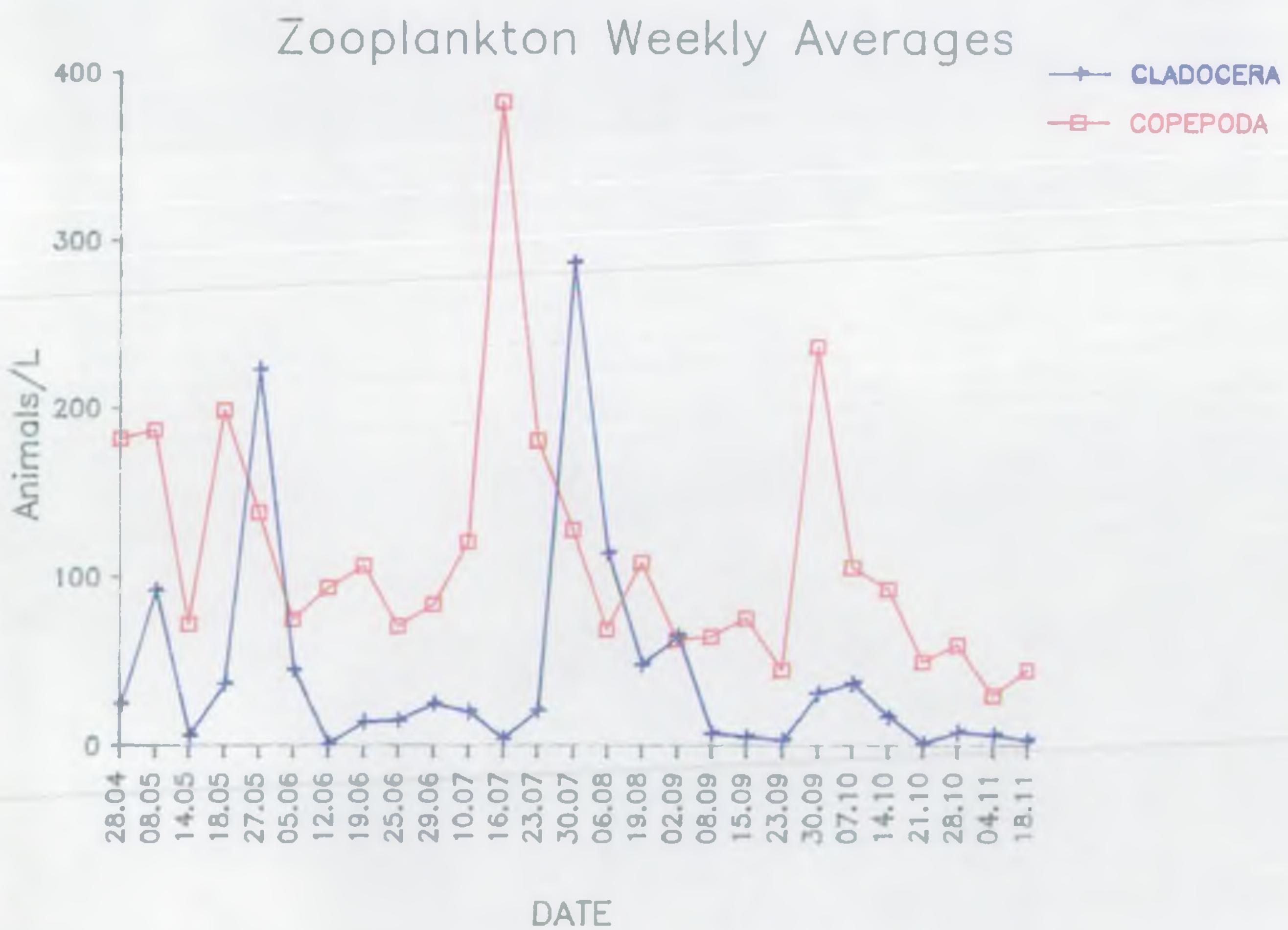


FIG.5 CLADOCERA,COPEPOD AND UNICELLULAR ALGAL ABUNDANCE



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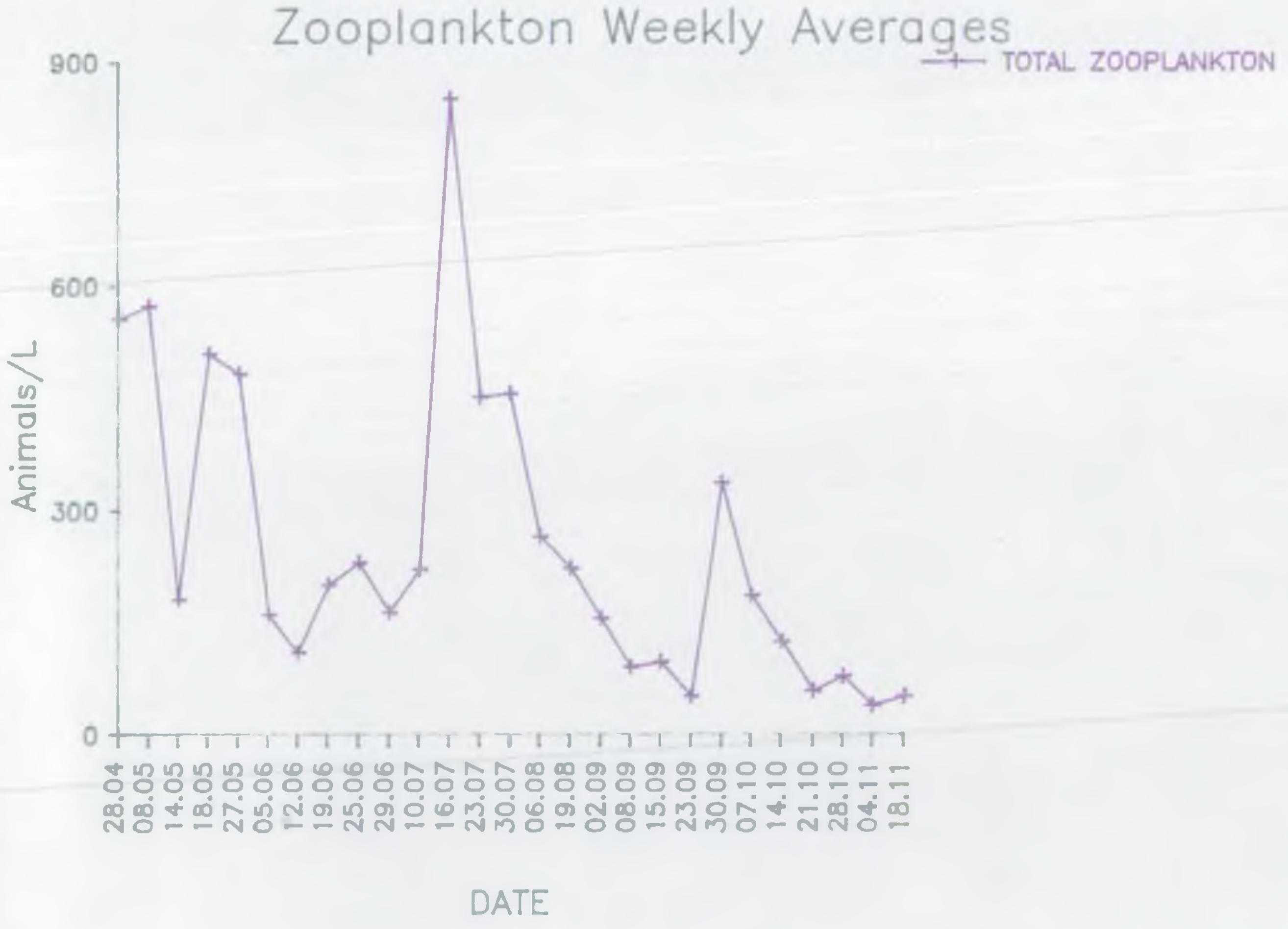
Zooplankton Weekly Averages
TOTAL ZOOPLANKTON
Animals/L
900
600
300
0
28.04
08.05
14.05
18.05
27.05
05.06
12.06
19.06
25.06
29.06
10.07
16.07
23.07
30.07
06.08
19.08
02.09
08.09
15.09
23.09
30.09
07.10
14.10
21.10
28.10
04.11
18.11
DATE

FIG.6 ZOOPLANKTON AND COLONIAL ALGAL ABUNDANCE