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RESULTS OF PLANKTON NET AND TORPEDO SAMPLING DURING CRUISES ON BOARD *R/V TANGANYIKA EXPLORER*

by

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PREFACE

The Research for the Management of the Fisheries on Lake Tanganyika project (LTR) became fully operational in January 1992. It is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by the Finnish International Development Agency (FINNIDA) and the Arab Gulf Program for the United Nations Development Organization (AGFUND).

LTR's objective is the determination of the biological basis for fish production on Lake Tanganyika, in order to permit the formulation of a coherent lake-wide fisheries management policy for the four riparian States (Burundi, Democratic Republic of Congo, Tanzania, and Zambia).

Particular attention is given to the reinforcement of the skills and physical facilities of the fisheries research units in all four beneficiary countries as well as to the build-up of effective coordination mechanisms to ensure full collaboration between the Governments concerned.

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1. Introduction

LTR (Lake Tanganyika Research) had a regular pelagic zooplankton sampling from July 1993 to July 1996 at three fixed stations. The results covering two years are being published in Hydrobiologia. Results have been published as well in several technical documents produced by LTR. The results so far suggest that the abundance pattern, species composition and the functioning of the pelagic ecosystem differ from north to south.

So far five trawling - hydroacoustics - zooplankton and one limnologyzooplankton lake wide cruises have been conducted. Zooplankton sampling with various gear and simultaneously with trawling has been done to determine the horizontal variation of the zooplankton fauna, how it may vary between the seasons and to clarify zooplankton - fish - interactions.

The aim of this report is to present the horizontal variations in the abundance and species composition of the main copepod groups, fresh water medusa *Limnocnida tanganyicae* and shrimps. The results are discussed regarding earlier findings of spatial and temporal abundances of copepods of Lake Tanganyika. More specific information of shrimps is presented in the TD dealing with Gulf-sampling results.

2. Material and methods

2.1 .Sampling dates

Sampling dates were:
a) Hydroacoustics-trawling-zooplankton cruise
Cruise 02/95 15.6.-30.6. 1995 (from hence forth June 95)
Cruise *05/95* 16.11.-3.12.1995 (from hence forth Nov-Dec 95)
Cruise 07/96 2.4.-9.4. 1996 (from hence forth Apr 96)

b) Limnology-zooplankton cruise
Cruise 03/95 28.8.-6.9.1995 (from hence forth Aug-Sept *95)*

2.2. The gear and the sampling methods

2.2.1. Hydroacoustics-trawling-zooplankton cruise (June 95, Nov-Dec 95 and Apr 96)

2.2.1.1. Plankton net tow

Vertical plankton tow (50 µm mesh in June 95 and 100 µm mesh in cruise Nov-Dec 95 and Apr 96, mouth opening 25 cm) was done from 100 m depth at the speed of less than 0.5 ms^{-1}. Three replicate hauls were made (distance of each haul from each other varied from 19 m to 4189 m) so that the third point of plankton tow was approximately the starting point of the trawl operations. Replicates were treated separately and preserved in 4% formaldehyde. The sampling procedure was according to Vuorinen (1993), Kurki (1993) and Kurki (1996).

Samples were counted according to instruetions given by Vuorinen (1993) and Kurki (1993) with the exception that cyclopoid copepodids, adults and ovigerous females were classified as small and big ones (small cyclopoids included species *Microcyclops cunningtoni, Thermocyclops oblongatus, Tropocyclops tenellus* and big cyclopoid species *Mesocyclops aequatoralis aequatorialis*). In this report cyclopoid species are treated as one group.

2.2.1.2. Torpedo sampling

Torpedoes of a mesh size 100 µm (mouth opening 2 cm) were attached to the wings of the trawl so that each wing had one torpedo. As the trawl was pulled on the deck the samples were taken from the cod end of the torpedo and preserved in 4 % formaldehyde. The sample from each torpedo was treated separately. The volume of the sieved water was calculated from the start position and the end position of the trawl operation.

The trawling was done mainly in the pelagic area (Table 1) and in night time. Trawling depth varied but was mostly confined above 100 m (Table 2).

Table 1: Average, median, minimum and maximum bottom depth (m) in June 95, Nov-Dec 95 and Apr 96 cruise.

bottom depth	June 95 (m)	Nov-Dec 95 (m)	Apr 96 (m)
average	359	336	340
median	319	234	300
minimum	58	30	130
maximum	>1000	>1000	>1000

Table 2: Average, median, minimum and maximum trawling depth (m) in June 95, Nov-Dec 95 and Apr 96 cruise.

trawling depth	June 95 (m)	Nov-Dec 95 (m)	Apr 96 (m)
average	69	61	51
median	66	60	50
minimum	11	8	25
maximum	135	130	80

2.2.2. Limnology-zooplankton cruise

Three replicate plankton tows (100µm conical plankton net with 25 cm opening) were done from 100 m at the speed of less than 0.5 ms^{-1} before the other limnological sampling. The replicate samples were treated separately and preservation and counting done according the instructions given by Vuorinen (1993) and Kurki (1993).

2.3. Sampling stations and number of the stations

Number of sampling stations at each cruise are presented in the table 3. No torpedo sampling was done in Aug-Sept 95 cruise because the sampling scheme did not include trawling. The number of samples was low in Apr 96 cruise because the cruise was broken of after eight days (6°26,50'S 29°30,50'E) due to problems with the equipment.

Sampling stations of the cruises are presented in the annex 1-7.

Table 3: Number of stations in June 95, Aug-Sept 95, Nov-Dec 95 and Apr 96 cruise. Type of sampling gear is shown.

	plankton net	torpedo
cruise	**n of stations**	**n of stations**
June 95	26	30
Aug-Sept 95	16	-
Nov-Dec 95	27	36
Apr 96	7	19

2.4. The aerial partitioning of the data

The data were divided into three aerial categories (following division by Coulter, 1991) according to the latitude of the sampling station (Table 4).

Table 4: Aerial division of the Lake into three categories according to the latitude.

area	**latitude**
North trough	3°20'-5°40' S
Kalemie shoal	5°40'-6°5O' S
South trough	6°50'-9°0O'S

The number of sampling stations at each aerial category was highly variable and in some occasion the South Trough was not sampled at all (Tables *5* and 6). The number of samples at each part of the Lake was anyhow reasonable because usually three (plankton net) or two (torpedo) replicate samples were taken at each station.

Table 5:Number of stations and samples at each aerial category, net samples.

	June 95		Aug 95		Nov-Dec 95		Apr 96	
category	st*	sa**	st	sa	st	sa	st	sa
North	5	15	3	9	15	44	5	15
Kalemie	8	21	4	12	3	9	2	6
South	13	38	9	27	9	27	-	-
total	26	74	16	48	27	80	7	21

* number of stations
** number of samples

Table 6:Number of stations and samples at each aerial category, torpedo samples.

	June 95		Nov-Dec 95		Apr 96	
category	st*	sa**	st	sa	st	sa
North	10	22	17	34	15	30
Kalemie	9	18	5	10	4	8
South	11	22	14	28	-	-
total	30	62	36	72	19	38

* number of stations
** number of samples

2.5. Statistical tests

The difference between calanoid and cyclopoid mean numbers was tested with non-parametric U-test, the temporal differences and aerial differences was tested with non-parametric Kruskall-Wallis ANOVA.

3. Results

3.1. Copepod composition and temporal variation

3.1.1. Plankton net samples

The post-naupliar cyclopoid copepods dominated numerically over calanoids in June 95 (U=1470 p<O.OOl), Aug-Sept 95 (U=550, p<0.OOl) and NovDec 95 (U=932 p<0.00l) cruise, their share being in June 95 and Nov-Dec 95 77% and in Aug-Sept *95* 66%. In April 96 cyclopoids and calanoids had equal abundance (Fig. 1).

The mean density of post-naupliar calanoids was highest in Apr 96 while among other cruises the mean number was similar. Cyclopoids had lowest mean number in Aug-Sept 95 (Fig. 1) and the mean number among other cruises was not statistically different. Calanoid and cyclopoid egg carrying females had significantly higher abundance in Nov-Dec *95* than in other months (Fig. 2). The mean number of ovigerous calanoids was 43 ± 34 ind m^{-3} in NovDec 95 while in June *95,* Aug *95* and Apr 96 it was 13 ± 17 9 ± 10 and 12 ± 13 ind m^{-3}, respectively. Calanoid nauplii peaked in Apr 96 and the lowest mean numbers were in Jun 95 and Aug-Sept 95 while cyclopoid nauplii had low numbers in Apr 96 and Aug-Sept 95.

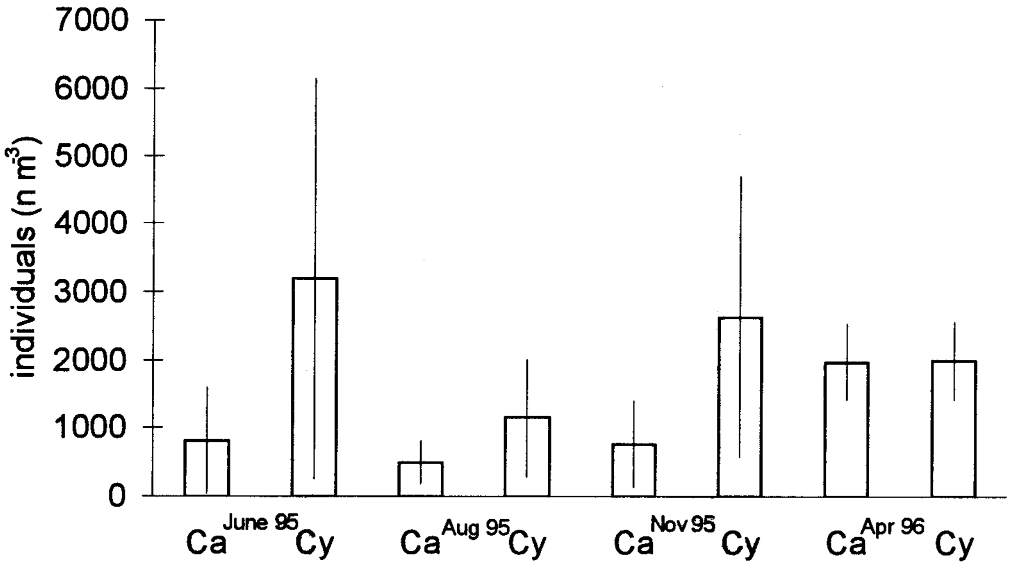

Figure 1: Mean abundance (± standard deviation) of post-naupliar calanoids and cyclopoids from plankton net samples during four lake wide cruises. Ca=calanoids, Cy=cyclopoids. For number of stations and samples see table 5.

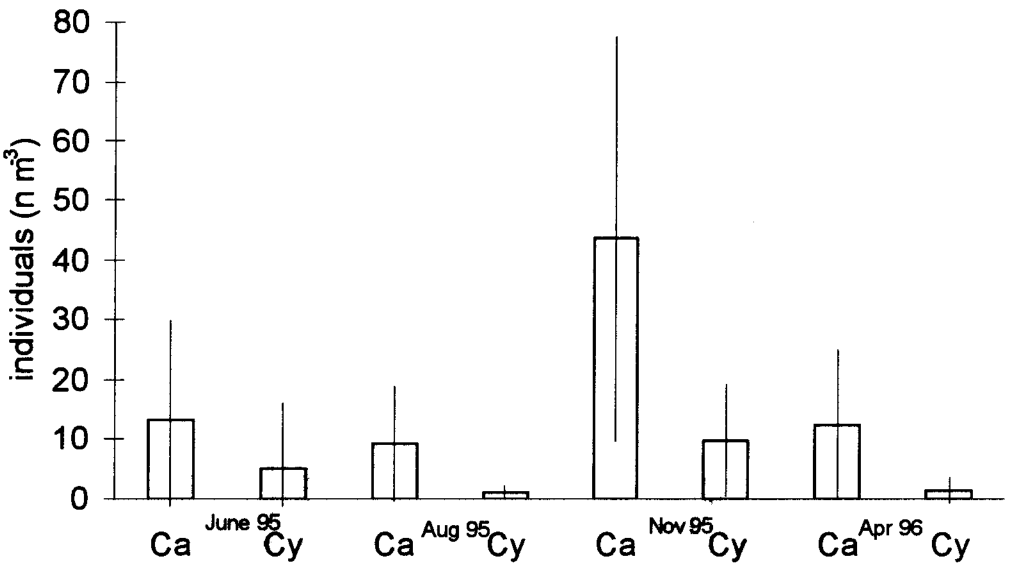

Figure 2: Mean abundance (± standard deviation) of ovigerous calanoids and cyclopoids from plankton net samples during four lake wide cruises. Ca=calanoids, Cy=cyclopoids. For number of stations and samples see table 5.

3.1.2. Torpedo samples

The average number of post-naupliar cyclopoids was significantly higher than that of calanoids in June 95 (U=1217 p<0.OOl) and Nov-Dec 95 (U=1540 p<O.OOl), their share being 64% and 66%, respectively. The calanoids and cyclopoids had an equal mean density in Apr 96 (the share of calanoids was 54%).

As the whole lake was considered the mean number of calanoids (post-naupliar and nauplii) did not vary among cruises (Fig. 3) but cyclopoids had decreasing temporal mean number. In Nov-Dec 95 the coefficient of variation (cv) was high in both calanoids and cyclopoids (cv for both groups was 1.5). Egg carrying calanoids and cyclopoids had a peak abundance in Nov-Dec 95 (mean number of calanoids 136 ind m^{-3} and cv 1.3, for cyclopoids 27 ind m^{-3} and 1.3, respectively).

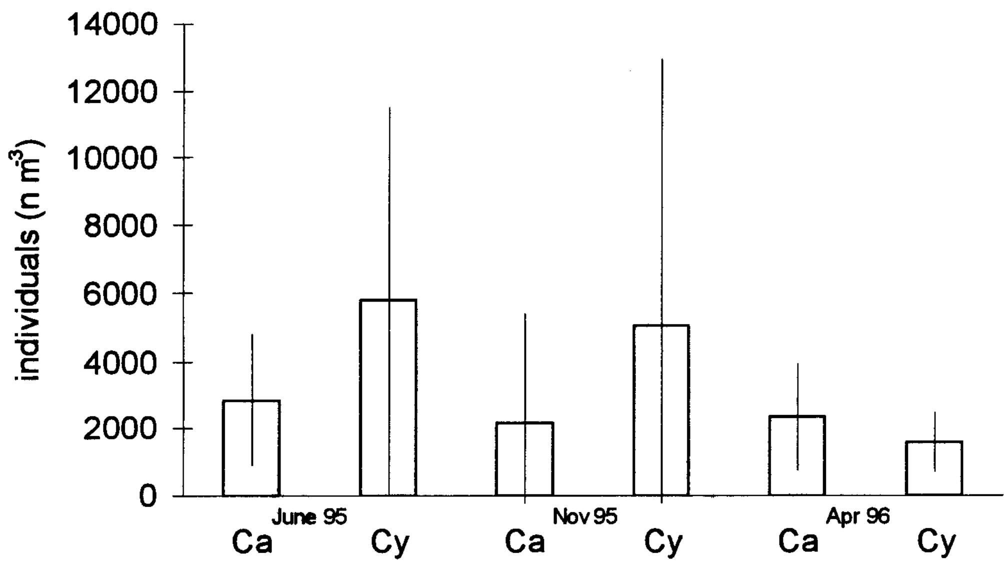

Figure 3: Mean abundance (± standard deviation) of post-naupliar calanoids and cyclopoids from torpedo samples during three lake wide cruises. Ca=calanoid, Cy=cyclopoid. For number of stations and samples see table 6.

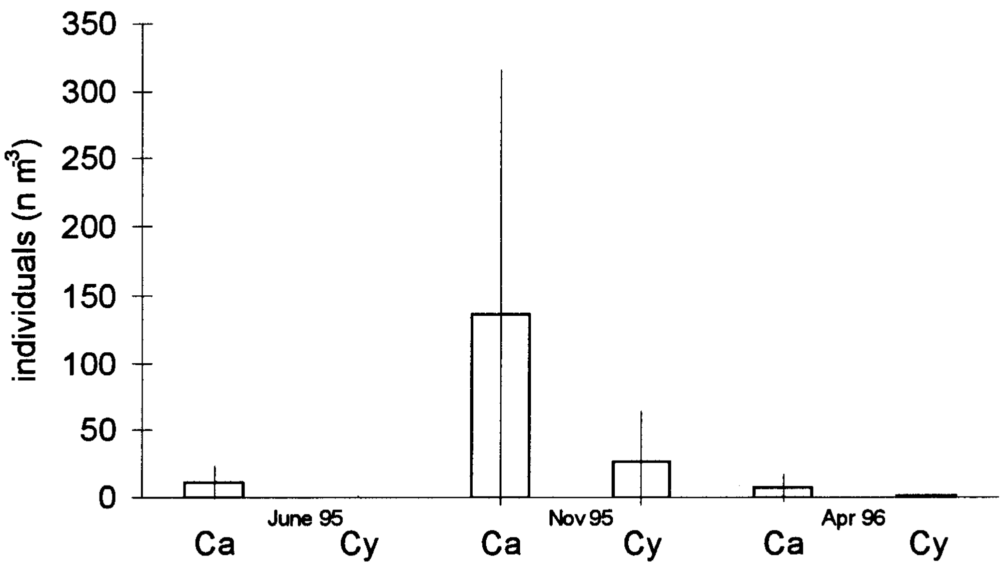

Figure 4: Mean abundance (± standard deviation) of ovigerous calanoids and cyclopoids from torpedo samples during three lake wide cruises. Ca=calanoid, Cy=cyclopoid. For number of stations and samples see table 6.

Neither post-naupliar nor nauplii stages of calanoids had any statistically significant temporal abundance variation in any area, except for the South Basin, where the number of post-naupliar calanoids was elevated in June 95 compared to Nov-Dec 95 (Table 8). Instead ovigerous calanoids had highest mean abundance in each area in Nov-Dec 95. Ovigerous and nauplii cyclopoids had highest mean abundances in all the areas in Nov-Dec 95. Post-naupliar cyclopoids had elevated mean numbers in June *95* (North, Kalemie and South) and Nov-Dec *95* (North, Kalemie).

3.2. Horizontal variation

3.2.1. Plankton net samples

(Note: The mean values of June *95* in the North basin are questionable because the plankton net most probably had been clogged)

Post-naupliar calanoids and cyclopoids had a reverse aerial abundance pattern in Aug-Sept 95*:* Number of calanoids increased and number of cyclopoids decreased from North to South (Table 7). The difference was statistically significant between the North and South Basins (calanoids U=21 p<0.OOl and cyclopoids U=46 p<0.0S). Ovigerous calanoids had an increasing mean abundance from North to South. The number of calanoid nauplii did not vary among the areas whereas cyclopoid nauplii had higher mean number in the North basin than in the South basin (U=29 p<0.OOl).

The number of post-naupliar and ovigerous cyclopoids was not different among the areas in Nov-Dec 95. Contrary to the other stages cyclopoid nauplii had statistically higher mean number in the North basin and in the Kalemie shoal than in the South basin. The mean number of both post-naupliar and ovigerous calanoids was higher in the South basin than in the North Basin (post-naupliar; U=267 p<0.00l, ovigerous U=278 p<O.OOl).

Moving from North to South the share of post-naupliar calanoids (of all the post-naupliar stages increased) was 10% in the North basin, 29% in Kalemie shoal and 44% in the South basin in Aug-Sept 95. The shares were 17%, 22% and 32% for Nov-Dec *95,* respectively.

Table 7: Average abundance (±stdev) of Calanoida and Cyclopoida at North Trough, Kalemie Shoal and South Trough. Number of sampling stations at each aerial category are shown. The results are from plankton net samples.

	number of stations (number of samples)	calanoids cop+ad	ovig. females	nauplii	cyclopoids cop+ad	ovig. females	nauplii
June 95							
North	*5 (15)*	*236±448*	*2±2*	*168±285*	*1224±1756*	*1±2*	*4991±7955*
Kalemie	*8 (21)*	*1230±966*	*22±22*	*636±466*	*3573±2553*	*6±15*	*12421±8496*
South	*13 (38)*	*800±635*	*13±14*	*232±242*	*3746±3237*	*6±11*	*11834±9221*
Aug-Sept 95							
North	3 (9)	199±158	2±3	517±487	1964±966	0±0	2250±1284
Kalemie	4(12)	431±355	8±6	343±210	1034±790	1±1	991±827
South	9 (27)	610±294	12±11	325±220	920±741	1±1	665±473
Nov-Dec 95							
North	15 (44)	635±670	34±33	703±528	2952±2278	10±11	4322±2354
Kalemie	3 (9)	605±285	33±9	251±247	2282±1292	7±5	5016±2250
South	9 (27)	1031±594	62±33	570±541	2245±1893	10±8	2362±1612
April 96							
North	5 (15)	2135±570	13±14	1051±486	2076±559	1±1	806±624
Kalemie	2 (6)	1532±287	11±8	1257±454	1739±565	3±4	1034±496

There were no aerial difference in the mean abundance of post-naupliar calanoids and ovigerous cyclopoids and calanoids when all the data were pooled together (excluding Jun 95). Calanoid and cyclopoid nauplii and post-naupliar cyclopoids had all higher mean number in the North Basin than in the South Basin (calanoid nauplii U=1060 p<O.OOl, cyclopoid nauplii U=979 p<O.00l, post-naupliar cyclopoids U=1170 p<O.OOl).

3.2.2. Torpedo samples

Post-naupliar cyclopoids did not have a statistically different aerial mean number in Jun 95 but the mean number of calanoids was higher in the Kalemie Shoal and in the South Basin than in the North Basin (North-South U=87 p<O.OOl; North-Kalemie U=118 p<0.O5). Neither calanoid nauplii nor cyclopoid nauplii had different mean number among areas.

Post-naupliar cyclopoids decreased in number when moving from North to South in Nov-Dec 95 (Table 8). The difference was statistically significant between North and South Basins (U=253 p<0.0l). The mean number of post-naupliar calanoids was elevated in the Kalemie shoal compared to the other areas. Both calanoid and cyclopoid nauplii had higher mean number in the North Basin than in the South Basin (calanoids U=289 p<O.OOl; cyclopoids U=85 p<0.001).

Table 8: Average abundance (±stdev) of calanoids and cyclopoids at North Through, Kalemie Shoal and South Trough. Number of sampling stations at each aerial category are shown. Results are for torpedo samples.

	number of stations (number of samples)	calanoids cop+ad	ovig. females	nauplii	cyclopoids cop+ad	ovig. females	nauplii
June 95							
North	10 (22)	1656±1382	8±13	575±579	7083±8314	0±1	10236±10254
Kalemie	9 (18)	3291±2400	10±12	1009±766	5447±3458	0±1	9698±6909
South	11 (22)	3621±1541	14±11	521±369	4741±3722	1±1	15570±10932
November 95							
North	17 (34)	2199±4361	142±222	1452±1698	7115±10689	23±34	48967±97174
Kalemie	5 (10)	2939±1751	127±110	717±408	5177±2620	45±43	17964±8297
South	14 (28)	1860±1775	132±141	544±523	2584±2919	25±37	4501±5767
April 96							
North	15 (30)	2241±1574	8±12	761±441	1521±870	1±1	2479±1857
Kalemie	4 (18)	2699±1674	4±4	919±526	1784±940	1±2	3050±2561
South							

In Apr 96 neither calanoids nor cyclopoids had different mean number between the North Basin and the Kalemie Shoal.

Kruskall-Wallis ANOVA and U-test of the pooled data showed that postnaupliar calanoids had higher mean abundance in the Kalemie Shoal and in the South Basin while nauplii had higher mean number in the North Basin and in the Kalemie Shoal. The mean number of both nauplii and post-naupliar cyclopoids did not vary among the areas. Ovigerous copepods had higher abundance in the South Basin compared to two other areas.

The average share of post-naupliar calanoids (of all the post-naupliar stages) when moving from North to South was 24% for the North basin, 36% for the Kalemie shoal and 47% for the South Basin in June 95. In Nov-Dec 95 the share of calanoids was 23% for the North basin and 47% for both the Kalemie shoal and the South basin.

3.2.3. Division of the data into five aerial categories

A more detailed aerial partition (Table 9) was used for the most complete data (Nov-Dec 95) with regard to the aerial coverage at both in torpedo and plankton net sampling. In this division the most northern end and the most southern end of the Lake were separated from the main basins. The splitting latitude in the North was the Ubwari shoal (lat appr. 4°00'S) and in the South it was the north end of Mpulungu sub-basin (appr. lat 8°10' S)(Table 9).

Table 9: Aerial division of the Lake into five categories according to the latitude.

		Nov-Dec 95	
		net samples	torpedo samples
area	latitude	n of stations (n of samples)	n of stations (n of samples)
Bujumbura sub-basin	3°20' - 4°00'S	4 (11)	6 (12)
North trough	4°00' - 5°40'S	11 (33)	11 (22)
Kalemie shoal	5°40'-6°50'S	3 (9)	5 (10)
South basin	6°50' - 8°10'S	7 (21)	10 (20)
Mpulungu sub-basin	8°10' - 9°00'S	2 (6)	4 (8)

3.2.3.1. Plankton net samples

All the development stages of calanoids had higher mean abundance in Mpulungu sub-basin than in the other basins (Table 10). Post-naupliar cyclopoids had high abundance both in the Northern end and in the Southern end and the mean abundance among other basins was not significantly different. Ovigerous cyclopoids had distinctly higher mean abundance in the Bujumbura sub-basin than in the other areas, which had statistically the same mean number.

Table 10: Average abundance (±stdev) of calanoids and cyclopoids at Bujumbura sub-basin, North Trough, Kalemie Shoal, South Trough and Mpulungu sub-basin. Results are for plankton net samples. For number of stations and number of samples see Table 9.

area	calanoids post-nauplii	ovig. females	nauplii	cyclopoids post-nauplii	ovig. females	nauplii
Bujumbura sb.	801±681	49±54	612±281	5314±2308	21±13	6387±2691
North trough	579±668	29±22	733±588	2164±1659	7±8	3633±1797
Kalemie shoal	605±285	33±9	251±247	2282±1292	7±5	5016±2250
South trough	871±409	60±36	394±172	1699±896	10±8	2712±1642
Mpulungu sb.	1592±825	71±17	1184±905	4154±3130	10±11	1140±651

3.2.3.2. Torpedo samples

Torpedo samples showed that the lowest mean abundance for both post-naupliar calanoids and cyclopoids were recorded in the North and South basin (Table 11) and as statistically tested there was no difference in the mean number among Bujumbura sub-basin, Kalemie shoal and the Mpulungu sub-basin areas (Kruskall-Wallis ANOVA). Cyclopoid nauplii of torpedo samples had statistically no difference among the Bujumbura sub-basin, the North trough and the Kalemie shoal in the mean numbers, which were higher than those of the South trough and the Mpulungu sub-basin. Neither ovigerous copepods nor calanoid nauplii had different mean numbers among areas (Kruskall-Wallis ANOVA). The maximum number of ind was counted for both post-naupliar calanoids and cyclopoids in the Bujumbura sub-basin, 23829 and 52826 ind m^{-3} respectively and the lowest values in the South Basin for the nauplii and post-naupliar stages for the both copepod groups (the same sampling station).

Table 11: Average abundances (±stdev) of calanoids and cyclopoids at Bujumbura sub-basin, North Through, Kalemie Shoal, South Trough and Mpulungu sub-basin.. Results are for torpedo samples. For number of stations and number of samples see Table 9.

area	calanoids post-nauplii	ovig. females	nauplii	cyclopoids post-nauplii	ovig. females	nauplii
Bujumbura sb.	4004±7015	205±318	2194±2441	13909±15887	28±44	103258±151272
North trough	1214±1109	108±146	1047±961	3410±2562	21±27	19353 ±15780
Kalemie shoal	2939±1751	127±110	717±408	5177±2620	45±43	17964±8297
South trough	1540±1190	133±128	522±494	1887±1540	27±42	4407±6566
Mpulungu sb.	2659±2700	129±179	598±625	4326±2659	21±18	4736±3343

3.3. Shrimps

The pooled data of the torpedoes and the plankton net showed that shrimps had a elevated mean number in the Kalemie shoal and in the South basin compared to the North basin. The mean number of shrimps caught by torpedoes was appr. 3 times higher than that of plankton net. Temporally as the whole lake was considered shrimps peaked in June 95 in torpedo samples while in plankton net samples showed no temporal variation.

3.4. *Limnocnida tanganyicae*

L. tanganyicae had higher abundances in the South basin than in the North basin. The number of medusae was clearly elevated in Nov-Dec 95 in torpedo samples whereas there plankton net samples had no difference in mean medusa number among cruises.

3.5. Comparison of the mean copepod abundances between the plankton net and the torpedo

Average mean numbers (± standard deviation) of the pooled data were calculated for the plankton net and the torpedo and the difference in the mean abundance between the plankton net and the torpedo calculated (as % of the plankton net of the torpedo) (table 12).

Plankton net data of June 95 were disregarded because of a different mesh size (50 µm) used from the other cruises. Mean abundance was higher for all the copepod groups in the torpedo samples than in the plankton net samples (Table 12). The largest difference was in cyclopoid nauplii and the smallest in calanoid nauplii. Approximately one third of the calanoid postnaupliar and half of the cyclopoid post-naupliar stages were not retained by the plankton net when compared to the torpedo results (table 12).

Table 12: Average abundance (± standard deviation) of the pooled data for *T. simplex* and cyclopoids for the plankton net and the torpedo. The difference in the mean number for each zooplankton group between the plankton net and the torpedo is shown. The data of June 95 cruise for the plankton net is not included. Number of samples for plankton net is 149 and the torpedoes 172.

zooplankton group	net (ind m^{-3})	torpedo (ind m^{-3})	net of tor (%)
T. simplex nauplii	603 ± 523	838 ± 940	72
T.simplex copad	845 ± 719	2444 ± 2527	35
T.simplex ovig.	28 ± 31	62 ±132	45
Cyclopoida nauplii	2485 ± 2344	16346 ± 46374	15
Cyclopoida copad	2064 ± 1742	4559 ± 6336	45
Cyclopoida ovig.	6 ± 9	12 ± 27	50

3.6. Preliminary connections to the fish data

In the South basin the total catch of the target species *(S. tanganicae, L. miodon and L. stappersii)* caught with the trawl closely followed the fluctuation of post-naupliar copepods from torpedo samples (Fig. 5) in Nov-Dec 95. The total catch of the target species composed 47% of S. *tanganicae,* 30% of *L. miodon* and 23% of *L. stappersii.* The trend was similar in the other cruises though not as distinct as in Nov-Dec 95 cruise.

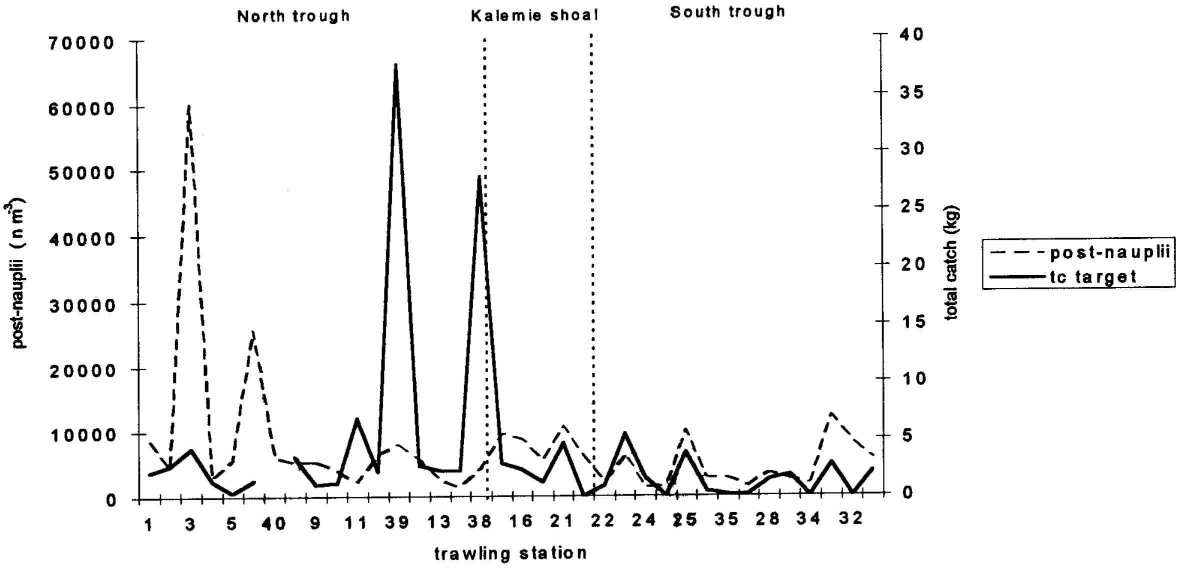

Fig 5. Number (ind m^{-3}) of post-naupliar copepods and total catch (kg) of the target species at the trawling stations in Nov-Dec 95.

4. Discussion

The cyclopoids are more numerous in the North than in the South and the calanoids are found more abundant in the South than in the North. Hence the share of postnaupliar calanoids is higher in the South than in the North. Similar results have been obtained before (Kurki 1996, Kurki *et al.* 1997a) and statement of the north-south differences with regard to copepod composition (Kurki *et al.* 1997) gets support from this study. Anyhow the difference between North and South does not appear to be as striking as previously suggested. Equally the abundance of calanoids according to present study seem to be higher than previously presented. If the abundance were converted to standing biomass the contribution of calanoids to the total copepod biomass would overcome that of cyclopoids in the South and also in the North their share would be more equal than what the number results show.

According to the present results copepods have clear production peak at the beginning of the rainy season at all the parts of the lake (the average number of egg carrying females was highest in Nov-Dec 95). Previous results (Kurki 1996, Kurki *et al.* 1997a) show the same but mainly for Kigoma area. This production peak is most probably associated with the secondary upwelling (Plisnier *et al.* 1996).

As the data set for some cruises were incomplete it was relevant to observe the Northern and Southern end abundance only from Nov-Dec 95. Plankton net samples showed that all the development stages of calanoids had higher mean abundance in Mpulungu sub-basin than in the other basins while from the torpedo samples maximum number of ind m^{-3} was counted for both post-naupliar calanoids and cyclopoids in the Bujumbura sub-basin. High variation of zooplankton abundance and zooplankton blooms in the Northern end have been observed also by Kurki *et al.* (1997a), which suggest that higher variability of plankton abundances in the north also indicates differences in the structure and functioning of the mesozooplankton community.

Shrimps and medusae tend to be more numerous in the South than in the North. Kurki *et al.* (1997b) states the North end of the lake to be dominated by medusae while the South end has higher abundance of shrimps. Thus the present study supports only the finding of shrimps being more abundant in the South. Anyhow it has to be noted that the present sampling gear are not designed to catch shrimps and medusae are usually only a side catch.

The plankton net caught approximately only half of the calanoids which torpedoes caught. These two gear are operated in a differently from each other, the torpedoes are pulled in water more or less laterally attached to the trawl while the plankton net is pulled vertically on its' own. Highest numbers of cyclopoids are found at water layers of 20-40 m from the surface throughout the day and night (Vuorinen *et al.* 1997). Calanoids are found in high number in the same water columns but they tend to migrate deeper in the water column during the day light hours (Vuorinen *et al.* 1997). The deepest point of zooplankton fauna is appr. 140 m in the Northern part of the Lake and as deep as 220 m in the Southern end (Vuorinen *et al* 1997) The torpedoes were operated horizontally in the average of 60 m deep where as plankton net was pulled vertically from the depth of 100 m. Thus plankton net integrates the whole water column where copepods are found and torpedo results show the peak abundance.

Ovigerous calanoids are constantly more numerous in the samples than the ovigerous cyclopoids both in the plankton net and torpedo samples. This same trend has been shown from the weekly sampling results and the vertical migration results (e.g. Kurki, 1996). This maybe due to higher predation of ovigerous calanoids; they are bound to maximize their reproduction input in order to survive. Furthermore the lifecycle of calanoids is shorter than that of cyclopids (Hyvönen, 1996).

The torpedo data was gathered in order to be able to study predator-prey interactions. Clupeids were collected (June 95) for stomach content analysis but due to very fast decomposition of the prey items in the stomachs it has been almost impossible to make any analysis of prey composition of clupeids (S. Lensu pers.com.). From the trawl results it appears to be that copepods are found where the fishes are. The simultaneous fluctuation of fishes and copepods was very clear in the South Basin in Nov-Dec 95 cruise. Rufli & Chapman (1976) argued that the fishes move in the lake in the manner that they allow zooplankton fauna to recover from the predation. According to Chèné (1974) the calanoids are preferred by the clupeids, thus from the present results it seems that the fishes are where their prey are.

As a conclusion it can be stated than the lake is more uniform with regard to the pelagic copepod composition than previously thought. To determine the share of copepods in the carbon flows in the pelagic food web there is need to convert the present data into production estimates. Seasonal changes are clear and they are connected to the onset of the rainy season and the warming up of the epilimnion. Further more the preliminary results of fish-zooplankton interactions showed that most probably the monitoring of the zooplankton fauna in the lake would enlighten the dynamics of the fishes. Thus the information gathered from the zooplankton ecology is of importance when the lake wide fisheries management plan is designed.

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Research for the management of the Fisheries on lake Tanganyika

R/V Explorer samples - Vertical samples at start location of fish trawls

100µm net (3 hauls)

All bottles were subsampled; 1 or 2 ml per bottle was counted

>: more than 200 specimens/too many to count

CRUISE: 96/07

DEPTH: 100m (or less if bottom depth was less)

Counting team: **Kaoma and Zulu, LTR/Mpulungu**

counts

hour	lat	long	site	basin	tot. S.W. (gr)	sub S.W. ml	Diaptomidae M	Diaptomidae F	Diaptomidae Ov	Diaptomidae co	Diaptomidae Na	Cyclopidae, big M	Cyclopidae, big F	Cyclopidae, big Ov	Cyclopidae, big Co	Cyclopidae, big Na	Cyclopidae, small M	Cyclopidae, small F	Cyclopidae, small Ov	Cyclopidae, small Co	Cyclopidae, small Na	Jelly Fish	Shrim	Free Eggs	F Lar	Vor	Oth	Remarks
23:26	33255	291512	2	north	252.7	1.0	15	12	6	8	29	26	12	0	3	34	3	1	0	0	1	33	4	7	0	0	0	
23:26	33255	291512	2	north	259.4	1.0	19	9	3	11	42	31	18	0	3	47	1	0	1	0	1	57	3	2	1	0	0	
23:26	33255	291512	2	north	256.6	1.0	21	12	1	5	28	18	5	1	4	16	1	1	1	0	1	62	7	8	0	0	0	
22:30	35725	291512	5	north	221.5	1.0	11	31	229	12	15	9	17	10	12	15	0	0	0	0	0	90	8	>	0	0	0	
22:30	35725	291512	5	north	242.7	1.0	25	17	115	18	16	7	21	2	5	9	1	1	0	0	0	92	7	>	2	0	0	
22:30	35725	291512	5	north	254.0	1.0	7	14	81	7	19	11	30	13	7	4	1	0	0	1	2	89	6	>	1	0	0	
23:12	42733	292494	8	north	232.2	1.0	29	17	2	13	21	21	15	0	2	16	0	0	0	1	3	105	3	3	2	0	0	
23:12	42733	292494	8	north	238.3	1.0	13	21	1	4	16	18	21	1	11	3	1	0	0	1	1	101	15	2	0	0	0	
23:12	42733	292494	8	north	233.0	1.0	8	29	3	19	14	9	39	0	8	7	2	0	1	0	1	92	12	0	0	0	0	
2:48	45756	293699	12	north	237.3	1.0	14	11	126	3	7	17	3	10	3	16	1	0	0	1	2	136	24	>	3	0	0	
2:48	45756	293699	12	north	249.6	1.0	9	17	98	2	9	14	9	5	7	17	0	1	0	0	1	101	27	>	3	0	0	
2:48	45756	293699	12	north	251.7	1.0	6	20	104	11	24	11	21	7	7	4	1	1	0	0	1	121	31	>	0	0	0	
2:53	52749	294423	15	north	238.1	1.0	16	13	49	7	31	17	9	7	7	16	1	1	0	0	1	116	60	14	4	0	0	
2:53	52749	294423	15	north	247.8	1.0	11	14	11	19	19	11	15	4	6	9	1	0	0	0	0	127	63	11	2	0	0	
2:53	52749	294423	15	north	252.7	1.0	23	27	124	11	23	14	32	11	12	11	0	0	0	1	1	109	72	>	1	0	0	
4:35	55846	294332	18	Kalemie	251.6	1.0	13	11	3	7	15	13	15	10	4	14	1	0	0	0	2	92	24	3	0	0	0	
4:35	55846	294332	18	Kalemie	236.1	1.0	10	14	40	5	27	9	14	1	6	16	1	2	0	0	3	60	15	2	0	0	0	
4:35	55846	294332	18	Kalemie	254.4	1.0	9	18	11	2	29	18	17	0	3	19	1	0	0	1	1	115	29	0	0	0	0	
20:51	62748	292605	19	Kalemie	172.6	1.0	13	8	67	8	27	10	15	20	6	24	2	1	0	1	1	60	15	7	2	0	0	
20:51	62748	292605	19	Kalemie	181.0	1.0	21	17	82	11	49	31	30	44	3	47	1	0	0	0	1	130	27	2	1	0	0	
20:51	62748	292605	19	Kalemie	153.6	1.0	25	14	91	4	26	18	9	0	2	13	1	1	1	0	1	121	46	0	0	0	0	

June 95	torpedosamples		mesh 100 um		number m-3			
Date	H	Latitude	Longitude	site	distance	basin	MDi	FDi
15 06 95	20:58	32831	291692	1	6763	north trough	755.1	755.1
15 06 95	20:58	32831	291692	1	6763	north trough	0.0	0.0
15 06 95	20:58	32831	291692	1	6763	north trough	193.4	129.0
16 06 95	1:39	34303	291395	2	6512	north trough	0.0	56.8
16 06 95	1:39	34303	291395	2	6512	north trough	65.5	131.0
16 06 95	1:39	34303	291395	2	6512	north trough	49.6	0.0
16 06 95	21:12	41460	292588	3	7170	north trough	54.4	217.7
16 06 95	21:12	41460	292588	3	7170	north trough	287.4	47.9
17 06 95	21:41	43391	291002	5	5063	north trough	495.4	557.3
17 06 95	21:41	43391	291002	5	5063	north trough	516.7	590.5
17 06 95	2:09	43405	293750	4	7176	north trough	801.8	1069.0
17 06 95	2:09	43405	293750	4	7176	north trough	385.7	1060.8
18 06 95	2:06	44562	292581	6	7186	north trough	565.5	391.5
18 06 95	2:06	44562	292581	6	7186	north trough	198.6	347.6
18 06 95	0:31	50395	293791	8	8757	north trough	100.9	302.6
18 06 95	0:31	50395	293791	8	8757	north trough	289.5	418.2
29 06 95	0:34	50423	292980	31r	3410	north trough	82.9	0.0
29 06 95	0:34	50423	292980	31r	3410	north trough	0.0	0.0
28 06 95	16:53	51816	292290	30r	6586	north trough	84.5	126.7
28 06 95	16:53	51816	292290	30r	6586	north trough	85.4	213.4
18 06 95	20:05	52047	294563	7	6015	north trough	725.5	1499.4
18 06 95	20:05	52047	294563	7	6015	north trough	989.6	791.7
20 06 95	1:10	54149	295315	9	7060	Kalemie shoal	569.2	1043.5
20 06 95	1:10	54149	295315	9	7060	Kalemie shoal	718.2	861.9
28 06 95	10:11	55137	292135	29r	6612	Kalemie shoal	458.6	917.2
28 06 95	10:11	55137	292135	29r	6612	Kalemie shoal	904.5	863.4
20 06 95	6:45	55660	293730	10	5914	Kalemie shoal	0.0	0.0
20 06 95	6:45	55660	293730	10	5914	Kalemie shoal	0.0	84.2
20 06 95	11:34	60551	292116	11	7865	Kalemie shoal	0.0	0.0
20 06 95	11:34	60551	292116	11	7865	Kalemie shoal	0.0	0.0
20 06 95	21:00	61226	294203	12	8689	Kalemie shoal	753.4	695.5
20 06 95	21:00	61226	294203	12	8689	Kalemie shoal	474.8	474.8
21 06 95	1:00	62372	293995	13	6729	Kalemie shoal	892.9	1236.3
21 06 95	1:00	62372	293995	13	6729	Kalemie shoal	1108.4	1758.2
21 06 95	5:33	63179	300016	14	7045	Kalemie shoal	142.6	285.2
21 06 95	5:33	63179	300016	14	7045	Kalemie shoal	308.4	308.4
27 06 95	17:13	63342	293103	28r	6769	Kalemie shoal	386.1	154.4
27 06 95	17:13	63342	293103	28r	6769	Kalemie shoal	377.6	490.9
21 06 95	21:01	63722	301706	15	2995	Kalemie shoal	2535.4	1811.0
21 06 95	21:01	63722	301706	15	2995	Kalemie shoal	2513.7	1466.4
22 06 95	2:58	65258	300868	16	7136	south trough	719.6	1354.6
22 06 95	2:58	65258	300868	16	7136	south trough	1696.6	825.4
27 06 95	9:47	70518	295950	27r	6263	south trough	1744.0	608.4
27 06 95	9:47	70518	295950	27r	6263	south trough	1442.6	1154.1
22 06 95	21:10	72458	302136	18	6627	south trough	246.7	205.6
22 06 95	21:10	72458	302136	18	6627	south trough	232.9	543.3
26 06 95	13:49	73233	303443	26r	6802	south trough	568.3	426.2
26 06 95	13:49	73233	303443	26r	6802	south trough	246.3	457.5
23 06 95	1:45	73956	301515	19	7227	south trough	727.0	444.3
23 06 95	1:45	73956	301515	19	7227	south trough	723.0	799.1
26 06 95	8:56	75186	303839	25r	6804	south trough	876.9	1388.4
26 06 95	8:56	75186	303839	25r	6804	south trough	1105.1	1532.9
23 06 95	8:20	75244	304607	20	7569	south trough	457.2	800.1
23 06 95	8:20	75244	304607	20	7569	south trough	144.0	324.0

23 06 95	20:20	80488	305111	21	7333	south trough	439.8	639.7
23 06 95	20:20	80488	305111	21	7333	south trough	578.2	539.6
25 06 95	21:36	81960	303535	24r	7338	south trough	1396.0	875.9
25 06 95	21:36	81960	303535	24r	7338	south trough	590.3	787.1
24 06 95	0:58	82361	305293	22	6508	south trough	500.4	636.8
24 06 95	0:58	82361	305293	22	6508	south trough	747.4	336.3
25 06 95	16:02	83297	305011	23	6053	south trough	268.4	613.4
25 06 95	16:02	83297	305011	23	6053	south trough	732.9	549.6

OvDi	CopDi	NaupDi	TotDi	sMCy	sFcy	sOvCy	sCopCy	naupCy
1.4	2517.1	566.4	4595.1	125.9	440.5	0.0	4719.6	8935.7
20.2	517.0	0.0	537.2	0.0	323.1	0.0	1615.6	4458.9
12.2	967.2	129.0	1430.8	386.9	1354.1	0.0	5223.0	15088.6
0.0	113.7	0.0	170.5	0.0	113.7	0.0	113.7	4263.6
0.0	327.5	131.0	655.0	0.0	131.0	0.0	655.0	1965.0
0.0	49.6	0.0	99.2	49.6	0.0	0.0	99.2	2629.5
1.3	326.6	381.0	981.0	108.9	108.9	0.0	2667.0	5279.5
3.6	1197.5	958.0	2494.5	47.9	335.3	0.0	2395.1	3832.2
0.0	1176.6	557.3	2786.7	0.0	247.7	0.0	5573.4	6440.4
1.9	1328.6	959.5	3397.1	0.0	738.1	0.0	20076.1	19485.6
10.2	962.1	641.4	3484.5	0.0	320.7	0.0	3581.2	8391.8
13.3	1687.6	1157.2	4304.6	0.0	626.8	0.0	6027.1	14223.9
7.1	1174.5	478.5	2617.0	0.0	261.0	0.0	4175.9	6611.8
5.3	446.9	297.9	1296.4	595.9	546.2	0.0	2731.1	6802.8
5.1	739.7	807.0	1955.2	201.7	605.2	0.0	3664.9	9044.6
8.0	2155.3	1351.1	4222.1	193.0	1254.6	0.0	6305.1	10808.8
0.0	248.7	0.0	331.6	331.6	165.8	0.0	5139.3	5222.2
0.0	0.0	78.2	78.2	312.9	156.4	0.0	2268.5	2816.1
0.0	211.2	337.9	760.3	253.4	126.7	0.0	1182.8	4604.3
0.0	512.1	213.4	1024.2	213.4	85.4	0.0	2816.7	7255.0
39.7	1644.5	2273.3	6182.5	386.9	2418.4	0.0	24909.7	43821.7
51.3	2523.5	1336.0	5692.0	247.4	2078.1	0.0	20286.6	33200.8
4.1	1660.1	521.7	3798.5	332.0	47.4	0.0	2371.5	4411.1
13.1	1771.6	861.9	4226.7	239.4	1197.0	0.0	4405.1	11539.5
0.5	1500.9	500.3	3377.4	0.0	83.4	0.0	792.1	2751.6
0.0	1932.3	1850.1	5550.2	0.0	82.2	1.3	1274.5	3946.8
0.0	532.8	159.9	692.7	106.6	213.1	0.0	1492.0	4316.1
0.5	336.7	841.8	1263.2	252.5	1262.7	0.0	2862.1	9091.4
0.0	275.9	473.0	749.0	78.8	157.7	0.0	1182.6	3784.3
0.4	501.2	292.4	794.0	208.8	208.8	0.0	1503.6	2589.5
13.9	1796.6	521.6	3781.0	550.6	1767.6	0.0	4781.2	12605.1
4.8	1835.8	759.6	3549.7	221.6	1614.2	0.0	4937.6	6077.1
11.8	3709.0	2507.0	8357.1	103.0	1991.9	0.0	10818.0	26993.5
15.6	3440.0	2102.2	8424.4	420.4	1184.9	0.5	6268.4	13454.1
9.0	2566.7	713.0	3716.5	332.7	427.8	0.0	6131.6	12120.6
3.6	3392.1	1189.4	5201.9	176.2	1277.5	0.5	8326.0	8810.6
12.2	656.3	540.5	1749.6	115.8	154.4	0.0	810.8	3822.1
23.0	1246.1	377.6	2515.3	226.6	113.3	0.0	1737.0	9553.5
45.7	4165.3	2626.0	11183.5	362.2	815.0	0.0	6157.5	22637.8
20.2	3142.2	1326.7	8469.2	139.7	209.5	0.0	4259.4	16060.0
19.2	4021.5	1185.3	7300.2	211.7	1312.3	0.0	5714.7	27769.3
25.0	3118.2	1008.8	6674.0	91.7	1008.8	0.0	4218.7	28476.1
8.6	1297.8	40.6	3699.4	162.2	283.9	0.0	1135.6	6570.3
9.1	535.8	0.0	3141.7	123.7	123.7	0.0	700.7	4698.9
13.4	2220.2	534.5	3220.5	822.3	1356.8	0.0	4975.0	17803.1
19.7	2600.3	737.4	4133.6	465.7	659.8	0.5	6481.3	21656.0
1.4	1562.8	213.1	2771.9	461.7	284.1	0.0	1172.1	12822.2
2.8	1583.6	211.1	2501.4	211.1	105.6	0.0	1126.1	5736.1
17.6	3958.1	928.9	6075.9	807.8	686.6	0.0	12964.8	37561.7
34.4	2663.8	1027.5	5247.8	1103.6	1598.3	0.0	9133.1	42316.6
1.9	3398.0	182.7	5847.8	401.9	401.9	0.0	986.5	6832.5
2.3	4170.9	142.6	6953.8	142.6	178.2	0.0	1675.5	6488.0
2.5	1181.1	533.4	2974.4	304.8	228.6	0.0	3657.7	5486.6
5.0	900.0	288.0	1661.0	36.0	396.0	0.0	2339.9	7199.7

3.5	1039.4	599.7	2722.0	279.9	399.8	0.0	1439.2	22348.1
3.9	770.9	385.5	2278.1	154.2	385.5	0.0	1349.1	13992.3
12.6	2819.3	383.2	5486.9	136.9	0.0	0.0	2819.3	12317.3
21.7	2853.1	196.8	4448.9	32.8	98.4	0.0	2459.6	9707.0
13.2	1455.6	227.4	2833.4	272.9	454.9	0.0	1637.5	6322.7
26.9	1420.0	635.3	3165.8	336.3	373.7	0.0	1681.5	7361.4
37.9	1341.8	996.7	3258.1	958.4	460.0	0.0	2721.9	14989.4
24.2	2427.6	1007.7	4741.9	412.2	320.6	0.0	5359.0	24092.6

bMCy	bFCy	bOvCy	bCopCy	tot Cy	tot cop	Lim.	Shrimp	Fr eggs
0.0	188.8	0.0	0.0	14410.5	19005.6	0.9	12.2	4.2
0.0	0.0	0.0	0.0	6397.6	6934.8	3.3	20.2	27.3
0.0	129.0	0.0	0.0	22181.5	23612.3	12.7	11.8	17.4
0.0	0.0	0.0	0.0	4491.0	4661.5	1.0	11.7	0.0
0.0	0.0	0.0	0.0	2751.0	3406.0	1.0	14.2	0.5
0.0	0.0	0.0	0.0	2778.4	2877.6	0.0	11.7	1.0
0.0	0.0	0.0	0.0	8164.2	9145.2	0.4	9.3	17.8
0.0	47.9	0.0	0.0	6658.4	9152.8	3.1	9.8	28.4
0.0	123.9	0.0	928.9	13314.3	16101.0	42.1	515.5	13.2
0.0	73.8	0.0	1254.8	41628.4	45025.5	16.3	481.6	74.8
0.0	53.5	0.0	267.3	12614.4	16098.9	4.4	33.7	74.5
0.0	144.7	0.0	0.0	21022.5	25327.1	2.7	71.0	44.8
0.0	87.0	0.0	304.5	11440.1	14057.1	8.0	29.2	44.3
0.0	0.0	0.0	149.0	10824.9	12121.3	8.4	35.4	42.5
0.0	100.9	0.0	168.1	13785.4	15740.7	3.6	9.5	24.4
0.0	257.4	0.0	128.7	18947.6	23169.7	7.3	24.7	48.0
0.0	414.5	0.0	994.7	12267.9	12599.5	0.9	0.9	0.9
78.2	312.9	0.0	391.1	6336.1	6414.4	6.6	0.0	0.0
0.0	126.7	0.0	0.0	6294.0	7054.3	0.5	1.0	0.0
0.0	0.0	0.0	128.0	10498.4	11522.7	5.4	51.8	4.9
145.1	1596.2	1.6	1789.6	75069.2	81251.7	24.9	28.6	104.3
494.8	1434.9	5.3	1385.4	59133.5	64825.5	14.8	25.9	132.8
47.4	237.2	0.0	237.2	7683.8	11482.3	23.0	15.3	47.8
143.6	335.2	0.0	95.8	17955.7	22182.3	16.2	28.0	101.4
333.5	250.1	0.0	375.2	4585.9	7963.3	3.4	52.5	64.0
123.3	575.6	0.0	575.6	6579.3	12129.5	1.9	70.2	111.1
0.0	159.9	0.0	106.6	6394.2	7086.9	9.7	0.5	0.5
0.0	42.1	0.0	126.3	13637.1	14900.3	6.5	1.1	0.5
39.4	0.0	0.0	78.8	5321.6	6070.6	1.6	4.0	0.0
0.0	125.3	0.0	125.3	4761.4	5555.4	3.2	0.8	0.0
29.0	318.7	0.0	202.8	20255.1	24036.1	7.3	23.8	52.4
0.0	189.9	0.0	158.3	13198.7	16748.4	7.0	34.8	33.0
0.0	206.1	0.0	309.1	40421.6	48778.7	11.4	42.6	51.6
38.2	458.7	0.0	152.9	21978.0	30402.4	3.8	41.6	69.5
142.6	760.5	1.8	237.7	20155.3	23871.9	35.2	13.6	43.8
132.2	440.5	0.0	220.3	19383.7	24585.6	23.5	24.9	20.3
154.4	231.6	0.9	308.9	5599.0	7348.5	14.6	22.1	22.6
188.8	302.1	0.0	679.7	12800.9	15316.2	22.1	23.0	32.9
90.6	452.8	1.1	90.6	30607.3	41790.8	41.4	38.3	116.9
69.8	419.0	1.1	139.7	21298.1	29767.3	27.6	27.6	86.1
211.7	973.6	0.9	550.3	36744.5	44044.7	30.3	11.2	89.2
91.7	642.0	3.1	183.4	34715.5	41389.5	34.3	13.8	95.9
243.3	446.1	0.0	121.7	8963.2	12662.6	7.6	29.0	18.8
0.0	82.4	0.0	41.2	5770.5	8912.3	4.6	46.2	95.0
82.2	0.0	1.0	205.6	25246.0	28466.4	44.7	20.7	14.9
38.8	310.5	0.5	271.7	29884.7	34018.3	51.9	21.1	13.4
71.0	284.1	0.5	106.6	15202.4	17974.3	3.7	42.1	1.9
0.0	70.4	0.0	105.6	7354.9	9856.3	10.3	59.9	3.7
121.2	242.3	0.9	525.1	52910.3	58986.3	54.2	30.4	48.9
114.2	152.2	3.1	76.1	54497.1	59745.0	84.1	26.4	45.8
0.0	0.0	0.0	36.5	8659.4	14507.2	6.5	15.0	1.9
0.0	142.6	0.0	35.6	8662.6	15616.4	15.0	11.2	2.8
114.3	114.3	0.0	190.5	10096.9	13071.3	47.5	8.0	5.0
36.0	0.0	0.4	72.0	10080.0	11741.0	55.5	7.6	5.0

40.0	159.9	0.4	80.0	24747.2	27469.3	29.5	20.0	1.7
0.0	77.1	0.4	115.6	16074.2	18352.3	37.3	20.0	0.9
82.1	164.2	0.0	191.6	15711.4	21198.3	30.4	41.6	6.9
0.0	131.2	0.0	131.2	12560.1	17009.0	32.1	49.9	6.5
91.0	45.5	0.0	181.9	9006.4	11839.8	17.6	51.4	27.4
74.7	112.1	0.0	37.4	9977.2	13143.0	24.9	66.5	36.7
0.0	115.0	0.5	0.0	19245.2	22503.3	47.3	46.8	33.1
137.4	320.6	1.6	91.6	30735.7	35477.6	56.3	56.3	79.4

fish larva	Vorticella	other	copadcy	copadtr	copadscy	copadbcy	ovcy	copad
11.3	0.0	0.0	5474.7	4028.8	5285.9	188.8	0.0	9503.5
1.9	0.0	0.0	1938.7	537.2	1938.7	0.0	0.0	2475.9
0.0	0.0	0.0	7092.9	1301.9	6963.9	129.0	0.0	8394.8
10.3	0.0	0.0	227.4	170.5	227.4	0.0	0.0	397.9
15.6	0.0	0.0	786.0	524.0	786.0	0.0	0.0	1310.0
12.2	0.0	0.0	148.8	99.2	148.8	0.0	0.0	248.1
0.4	3.1	0.0	2884.7	600.0	2884.7	0.0	0.0	3484.7
0.0	0.9	0.0	2826.2	1536.4	2778.3	47.9	0.0	4362.6
0.6	3.1	0.0	6873.9	2229.4	5821.1	1052.8	0.0	9103.2
1.3	6.9	0.0	22142.8	2437.6	20814.2	1328.6	0.0	24580.4
0.4	0.0	0.0	4222.6	2843.1	3901.9	320.7	0.0	7065.7
0.0	0.0	0.0	6798.6	3147.4	6653.9	144.7	0.0	9946.0
0.0	5.3	0.0	4828.3	2138.5	4436.9	391.5	0.0	6966.9
0.9	18.6	0.0	4022.1	998.4	3873.1	149.0	0.0	5020.5
0.4	1.5	0.0	4740.8	1148.3	4471.9	269.0	0.0	5889.1
2.2	0.0	0.0	8138.8	2871.0	7752.7	386.0	0.0	11009.8
0.0	0.0	0.0	7045.8	331.6	5636.6	1409.2	0.0	7377.3
0.0	0.0	0.0	3520.1	0.0	2737.8	782.2	0.0	3520.1
0.0	0.0	0.0	1689.7	422.4	1562.9	126.7	0.0	2112.1
0.5	0.0	0.0	3243.4	810.9	3115.4	128.0	0.0	4054.3
0.5	0.5	0.0	31247.5	3909.2	27715.1	3532.5	1.6	35156.7
0.0	0.0	0.0	25932.6	4356.1	22612.2	3320.4	5.3	30288.7
0.5	0.9	0.0	3272.7	3276.8	2751.0	521.7	0.0	6549.5
1.8	8.6	0.0	6416.2	3364.8	5841.6	574.6	0.0	9781.0
1.0	0.0	0.0	1834.4	2877.1	875.5	958.9	0.0	4711.5
0.0	5.1	0.0	2632.5	3700.1	1358.0	1274.5	1.3	6332.6
0.5	28.5	0.0	2078.1	532.8	1811.7	266.4	0.0	2611.0
0.5	21.5	0.0	4545.7	421.4	4377.3	168.4	0.0	4967.1
0.0	0.8	0.0	1537.4	275.9	1419.1	118.3	0.0	1813.3
0.0	0.0	0.0	2171.9	501.6	1921.3	250.6	0.0	2673.5
2.6	0.0	0.0	7650.0	3259.4	7099.4	550.6	0.0	10909.4
2.9	0.0	0.0	7121.6	2790.1	6773.4	348.2	0.0	9911.7
5.2	0.0	0.0	13428.1	5850.1	12912.9	515.1	0.0	19278.2
0.0	5.7	0.0	8523.9	6322.2	7874.2	649.8	0.5	14846.1
0.5	29.8	0.0	8034.7	3003.5	6892.1	1142.6	1.8	11038.2
0.9	4.1	0.5	10573.1	4012.4	9780.2	793.0	0.5	14585.6
0.0	16.5	0.0	1776.9	1209.1	1081.0	695.9	0.9	2985.9
0.0	17.9	0.0	3247.4	2137.6	2076.8	1170.6	0.0	5385.1
4.3	0.0	0.0	7969.6	8557.5	7334.6	634.9	1.1	16527.0
1.1	3.2	0.0	5238.0	7142.5	4608.5	629.5	1.1	12380.5
1.3	3.6	0.0	8975.1	6114.9	7238.7	1736.5	0.9	15090.0
2.2	0.4	0.4	6239.4	5665.2	5319.2	920.2	3.1	11904.6
0.0	0.0	0.0	2392.9	3658.8	1581.7	811.1	0.0	6051.7
0.5	0.0	0.0	1071.7	3141.7	948.0	123.7	0.0	4213.4
3.4	0.0	0.0	7442.9	2686.0	7154.1	288.8	1.0	10128.9
1.0	0.0	0.0	8228.7	3396.2	7607.3	621.4	1.0	11624.9
0.9	1.4	0.0	2380.2	2558.7	1918.0	462.2	0.5	4939.0
1.9	0.0	0.0	1618.8	2290.2	1442.8	176.0	0.0	3909.0
3.5	4.0	0.0	15348.7	5147.0	14459.2	889.4	0.9	20495.7
0.9	0.0	0.0	12180.5	4220.4	11835.0	345.6	3.1	16400.9
0.0	2.8	0.0	1826.9	5665.2	1790.3	36.5	0.0	7492.0
0.9	0.0	0.0	2174.6	6811.2	1996.3	178.2	0.0	8985.8
0.8	5.9	0.0	4610.3	2441.0	4191.1	419.1	0.0	7051.3
0.4	1.3	0.0	2880.3	1373.0	2771.9	108.4	0.4	4253.3

3.5	2.2	0.0	2399.2	2122.3	2118.9	280.3	0.4	4521.5
5.6	0.9	0.0	2081.9	1892.7	1888.8	193.2	0.4	3974.6
0.0	0.0	0.0	3394.1	5103.7	2956.1	437.9	0.0	8497.8
0.4	49.9	0.0	2853.1	4252.1	2590.7	262.4	0.0	7105.2
1.5	1.5	0.0	2683.7	2606.0	2365.3	318.4	0.0	5289.7
3.4	6.4	0.0	2615.7	2530.5	2391.5	224.2	0.0	5146.3
2.1	9.5	0.0	4255.8	2261.4	4140.3	115.5	0.5	6517.2
2.1	9.5	0.5	6643.1	3734.3	6091.9	551.2	1.6	10377.3

November 95 torpedosamples			100 um mesh		number m-3			
Date	H	Latitude	Longitude	site	distance (m)	basin	MDi	FDi
16 11 95	23:00	32699	290921	1	6481	north	532.9	837.4
16 1195	23:00	32699	290921	1	6481	north	191.5	574.6
17 11 95	1:58	32811	291536	2	6691	north	0.0	125.1
17 1195	1:58	32811	291536	2	6691	north	0.0	747.8
17 1195	4:31	33777	291878	3	1354	north	623.0	8098.8
17 1195	4:31	33777	291878	3	1354	north	1224.8	1224.8
17 1195	20:20	35651	290839	4	6767	north	72.0	215.9
17 1195	20:20	35651	290839	4	6767	north	0.0	83.0
17 1195	23:35	35769	291611	5	8634	north	148.9	372.4
17 1195	23:35	35769	291611	5	8634	north	75.6	604.6
18 11 95	2:47	35809	292405	6	5257	north	283.4	991.8
18 11 95	2:47	35809	292405	6	5257	north	150.8	904.6
3 12 95	12:26	42395	293828	40r	7792	north	0.0	200.3
3 12 95	12:26	42395	293828	40r	7792	north	259.2	345.6
18 11 95	20:45	42787	291421	7	6410	north	446.9	1229.0
18 11 95	20:45	42787	291421	7	6410	north	431.0	646.6
19 11 95	4:01	42842	293859	9	5022	north	164.2	656.6
19 11 95	4:01	42842	293859	9	5022	north	148.3	296.6
20 11 95	4:22	45639	293647	12	6280	north	0.0	0.0
20 11 95	4:22	45639	293647	12	6280	north	0.0	250.4
20 11 95	1:15	45729	292572	11	6055	north	0.0	186.1
20 11 95	1:15	45729	292572	11	6055	north	0.0	462.6
19 11 95	21:18	45737	290806	10	6249	north	136.5	546.1
19 11 95	21:18	45737	290806	10	6249	north	0.0	392.7
1 12 95	16:59	51379	294338	39r	6380	north	161.7	0.0
1 12 95	16:59	51379	294338	39r	6380	north	0.0	0.0
21 11 95	23:37	52739	293559	14	5762	north	452.4	603.3
21 11 95	23:37	52739	293559	14	5762	north	616.0	862.3
21 11 95	20:08	52803	291947	13	6088	north	0.0	0.0
21 11 95	20:08	52803	291947	13	6088	north	225.9	0.0
22 11 95	2:47	52805	294450	15	6404	north	0.0	0.0
22 11 95	2:47	52805	294450	15	6404	north	131.2	0.0
1 12 95	13:02	53773	295190	38r	7780	north	189.6	126.4
1 12 95	13:02	53773	295190	38r	7780	north	222.2	0.0
23 11 95	4:16	55671	294573	18	6575	Kalemie shoa	518.0	777.0
23 11 95	4:16	55671	294573	18	6575	Kalemie shoa	1076.7	2288.0
22 11 95	21:33	55690	291627	16	6377	Kalemie shoa	0.0	1323.3
22 11 95	21:33	55690	291627	16	6377	Kalemie shoa	0.0	244.1
24 11 95	2:08	62843	294660	20	7009	Kalemie shoa	622.2	1119.9
24 11 95	2:08	62843	294660	20	7009	Kalemie shoa	405.1	506.4
24 11 95	5:04	63186	295700	21	6146	Kalemie shoa	1135.3	1986.7
24 11 95	5:04	63186	295700	21	6146	Kalemie shoa	1622.1	2568.3
30 11 95	16:14	63632	301602	37r	6731	Kalemie shoa	487.6	0.0
30 11 95	16:14	63632	301602	37r	6731	Kalemie shoa	0.0	509.8
24 11 95	20:51	65738	294652	22	6839	south	0.0	484.1
24 11 95	20:51	65738	294652	22	6839	south	0.0	97.5
25 11 95	0:19	65768	300561	23	7250	south	219.6	439.2
25 11 95	0:19	65768	300561	23	7250	south	100.1	500.5
25 11 95	4:35	65869	303165	24	7253	south	100.3	100.3
25 11 95	4:35	65869	303165	24	7253	south	179.5	448.7
30 11 95	11:52	65956	302997	36r	6172	south	108.9	435.5
30 11 95	11:52	65956	302997	36r	6172	south	285.7	285.7
25 11 95	20:18	72753	301416	25	6075	south	1851.4	1028.5
25 11 95	20:18	72753	301416	25	6075	south	665.7	665.7

26 11 95	2:26	73082	303349	27	6184	south	553.3	774.7
26 11 95	2:26	73082	303349	27	6184	south	355.5	0.0
29 11 95	20:43	73840	303838	35r	6164	south	717.3	836.8
29 11 95	20:43	73840	303838	35r	6164	south	673.0	224.3
27 11 95	0:46	75815	304060	29	6826	south	87.2	0.0
27 11 95	0:46	75815	304060	29	6826	south	388.0	291.0
26 11 95	21:26	75874	302665	28	7715	south	305.7	1630.5
26 11 95	21:26	75874	302665	28	7715	south	521.5	456.3
27 11 95	3:45	80075	305087	30	6225	south	228.6	114.3
27 11 95	3:45	80075	305087	30	6225	south	108.0	864.4
29 11 95	14:59	81180	305598	34r	6648	south	308.1	513.5
29 11 95	14:59	81180	305598	34r	6648	south	0.0	247.6
27 11 95	20:16	82672	302889	31	6942	south	504.6	2018.4
27 11 95	20:16	82672	302889	31	6942	south	214.0	535.1
28 11 95	0:21	82750	305109	32	7227	south	2071.9	3625.7
28 11 95	0:21	82750	305109	32	7227	south	189.0	189.0
28 11 95	3:47	82847	310703	33	6183	south	466.4	233.2
28 11 95	3:47	82847	310703	33	6183	south	0.0	109.8
				58	mean		332.7531	695.2709
					stdev		424.3806	1102.984
					cv		1.275362	1.58641
					max			
					median			

OvDi	CopDi	NaupDi	TotDi	sMCy	sFcy	sOvCy	sCopCy	naupCy
17.7	1141.9	1598.7	4128.6	2436.1	2207.7	5.4	4339.3	43925.4
19.2	446.9	638.5	1870.8	766.2	1596.2	2.9	1660.1	17303.0
14.7	250.2	375.4	765.4	625.6	750.7	0.0	1000.9	6381.0
28.5	249.3	373.9	1399.6	1745.0	747.8	2.4	2118.9	9348.1
778.7	14328.7	6229.9	30059.0	4983.9	4360.9	4.4	14951.6	19863.0
917.2	8573.7	6124.1	18064.6	6124.1	12248.1	27.5	31845.1	520545.0
15.1	72.0	215.9	590.8	719.7	503.8	1.4	647.7	6477.2
24.0	0.0	249.1	356.1	415.1	166.0	2.8	2075.6	13366.7
25.1	223.4	968.1	1737.9	148.9	521.3	2.6	1489.4	19213.6
44.6	151.2	453.5	1329.4	1058.1	982.5	1.1	4081.2	45270.9
297.1	566.7	3825.5	5964.6	3825.5	4817.3	4.1	10768.2	180084.0
276.0	1507.7	5276.9	8115.9	3166.1	6784.6	2.7	14926.1	180320.0
91.9	133.5	400.5	826.2	133.5	200.3	0.0	667.5	8544.0
5.3	950.4	1728.0	3288.5	3196.8	1641.6	0.0	2851.2	47347.0
170.0	223.5	670.4	2739.8	1229.0	670.4	7.2	1340.8	43910.4
100.8	215.5	862.1	2256.0	1077.6	323.3	1.0	1293.1	22844.8
502.4	164.2	1641.6	3129.0	164.2	1149.1	79.1	2462.4	47114.6
213.3	148.3	593.3	1399.8	148.3	0.0	0.0	2373.1	18687.9
86.7	398.4	664.0	1149.1	398.4	265.6	0.0	398.4	7303.9
45.1	1001.6	500.8	1797.8	1001.6	500.8	0.0	3004.7	20406.8
24.7	0.0	744.4	955.2	279.1	279.1	1.6	1023.5	12840.7
25.2	0.0	925.2	1413.1	578.3	115.7	2.1	925.2	13878.4
86.1	273.0	2184.2	3225.9	682.6	955.6	2.5	2320.7	22251.7
106.6	392.7	3927.3	4819.4	916.4	2225.5	20.4	3534.6	51709.5
2.5	4286.4	2749.7	7200.3	727.9	242.6	0.0	8491.8	32754.3
0.0	311.3	518.9	830.2	0.0	0.0	0.0	934.0	7264.3
227.2	150.8	603.3	2036.9	150.8	301.6	0.0	452.4	4524.4
519.0	1971.1	1971.1	5939.4	492.8	0.0	5.2	1478.3	8993.0
16.2	128.6	0.0	144.8	257.2	0.0	0.0	771.7	8489.0
58.0	0.0	903.5	1187.4	903.5	564.7	0.5	1694.0	27217.4
11.4	391.4	0.0	402.9	0.0	0.0	0.0	391.4	3783.8
60.1	656.1	262.4	1109.9	393.7	131.2	0.0	524.9	4592.7
3.3	1264.2	885.0	2468.5	189.6	442.5	0.0	2781.3	5689.1
22.5	888.6	296.2	1429.5	740.5	370.3	0.0	814.6	5628.1
187.3	906.5	1424.5	3813.3	1295.0	1942.5	0.0	4532.6	19425.4
314.0	1615.0	942.1	6235.8	403.8	403.8	1.7	1615.0	11978.1
220.1	962.4	1082.7	3588.4	2405.9	1203.0	5.1	4571.2	33682.9
54.9	366.1	976.3	1641.4	1220.4	1952.7	1.1	1952.7	23310.2
126.4	1617.7	497.7	3983.9	871.0	373.3	0.0	1742.1	22771.7
53.8	1114.0	303.8	2383.1	101.3	0.0	0.0	1215.3	22482.9
47.0	1561.0	425.7	5155.7	709.5	1986.7	0.0	2128.6	19725.3
253.8	1081.4	540.7	6066.4	135.2	946.2	1.5	3784.9	9191.9
13.7	390.0	97.5	988.8	97.5	292.5	0.0	1072.6	7020.9
2.8	1310.9	873.9	2697.4	728.3	873.9	0.0	5316.4	10050.1
43.8	605.1	484.1	1616.9	121.0	242.0	0.0	1089.1	3509.4
7.9	195.0	97.5	397.9	97.5	97.5	0.0	487.5	5265.5
156.5	549.0	549.0	1913.4	109.8	0.0	1.2	1647.1	12627.7
341.0	2802.9	1401.4	5145.9	600.6	800.8	15.6	2802.9	28729.6
65.0	100.3	401.1	766.9	200.6	0.0	0.0	501.4	2707.6
67.2	0.0	179.5	875.0	0.0	0.0	0.0	359.0	1974.5
15.5	326.6	653.2	1539.7	108.9	0.0	0.0	217.7	2286.3
43.2	142.9	714.3	1471.8	142.9	142.9	6.9	71.4	1357.2
453.8	1131.4	2057.1	6522.2	2262.8	617.1	30.3	2160.0	8022.7
202.3	798.8	932.0	3264.5	1464.5	1331.4	1.1	2929.1	8920.4

275.3	0.0	110.7	1714.0	442.7	110.7	1.3	664.0	1549.3
82.9	0.0	118.5	556.8	237.0	355.5	0.0	237.0	592.5
343.4	1195.5	478.2	3571.2	0.0	0.0	0.0	239.1	1195.5
68.7	149.6	598.2	1713.7	74.8	149.6	0.0	74.8	1570.3
9.8	0.0	0.0	97.0	0.0	0.0	0.0	0.0	348.8
49.4	388.0	679.0	1795.3	194.0	291.0	0.0	582.0	1066.9
123.0	509.5	305.7	2874.6	0.0	0.0	0.0	305.7	1222.9
176.6	1108.2	130.4	2393.0	260.8	130.4	0.0	456.3	2607.5
55.7	571.4	228.6	1198.6	800.0	342.9	0.5	571.4	1942.8
81.3	432.2	324.1	1810.0	0.0	108.0	0.0	432.2	648.3
54.1	718.9	205.4	1800.1	102.7	0.0	1.0	102.7	2156.8
26.3	247.6	0.0	521.6	0.0	82.5	0.0	0.0	6521.1
97.7	3027.7	706.5	6354.8	201.8	908.3	0.0	1917.5	11807.9
62.4	963.2	321.1	2095.8	0.0	214.0	0.0	749.1	5886.1
568.4	1761.1	1761.1	9788.2	207.2	310.8	0.0	1761.1	3522.2
66.5	94.5	0.0	538.9	94.5	94.5	0.0	189.0	1511.6
79.3	777.4	1243.8	2800.1	310.9	155.5	0.0	466.4	2643.1
75.2	1426.9	548.8	2160.6	439.0	1207.3	2.6	878.1	3841.6
136	1005.694	**997**	3166.462	779.4151	885.1966	3.430465	2503.569	24910.4
179.1338	1995.023	1286.997	4228.643	1146.87	1777.765	10.63708	4523.146	66650.92
1.31579	1.983727	1.291384	1.335447	1.471449	2.008328	3.100769	1.806679	2.675626
917		**6230**						**520545**
66		**596**						**8732**

bMCy	bFCy	bOvCy	bCopCy	tot Cy	tot cop	Lim.	Shrimp	Fr eggs
228.4	76.1	8.3	0.0	53226.7	57355.3	31.9	0.5	29.0
0.0	63.8	4.4	0.0	21396.7	23267.4	23.1	0.5	26.5
0.0	125.1	2.4	0.0	8885.7	9651.1	33.3	1.0	9.5
0.0	124.6	6.2	124.6	14217.6	15617.2	22.4	2.4	28.5
2491.9	2491.9	57.8	2491.9	228697.9	258756.9	307.0	22.2	240.3
1224.8	1224.8	131.8	0.0	573371.5	591436.1	538.3	22.0	137.3
72.0	72.0	5.6	287.9	8787.3	9378.1	9.4	0.0	13.2
0.0	0.0	11.3	249.1	16286.6	16642.7	22.6	0.0	10.3
223.4	297.9	4.8	297.9	22199.9	23937.8	20.6	0.0	12.2
226.7	377.9	9.2	151.2	52158.8	53488.2	44.2	1.1	15.5
0.0	0.0	27.5	991.8	200518.0	206482.6	94.9	0.0	34.4
0.0	753.8	8.1	301.5	206262.7	214378.6	90.2	5.4	71.3
0.0	66.8	2.9	0.0	9614.9	10441.1	42.9	11.0	10.2
0.0	691.2	0.0	691.2	56419.0	59707.5	15.1	1.6	4.5
0.0	335.2	18.4	223.5	47734.8	50474.6	30.3	2.4	30.3
107.8	215.5	11.4	0.0	25874.5	28130.5	25.8	3.0	14.9
492.5	985.0	11.9	164.2	52622.9	55751.9	57.4	5.9	83.1
148.3	0.0	11.9	148.3	21517.8	22917.6	35.7	7.6	84.4
132.8	265.6	43.7	132.8	8941.1	10090.2	31.5	10.3	7.3
0.0	0.0	20.3	125.2	25059.3	26857.2	35.5	12.7	3.0
0.0	93.0	26.8	0.0	14544.0	15499.2	20.0	0.5	7.4
0.0	0.0	24.2	115.7	15639.5	17052.6	8.4	2.6	5.8
0.0	273.0	17.3	136.5	26639.9	29865.8	16.3	2.0	27.0
0.0	0.0	64.3	0.0	58470.6	63289.9	21.9	0.8	25.9
0.0	323.5	0.0	242.6	42782.7	49983.1	19.5	0.5	2.5
0.0	0.0	0.0	103.8	8302.0	9132.2	5.5	0.0	0.5
0.0	904.9	22.3	301.6	6658.1	8695.0	67.0	5.0	79.4
123.2	739.2	52.4	739.2	12623.2	18562.7	133.7	2.6	107.5
0.0	0.0	0.0	0.0	9517.9	9662.8	34.5	3.7	6.8
0.0	112.9	0.0	225.9	30718.9	31906.3	69.5	5.8	27.2
0.0	0.0	4.0	0.0	4179.2	4582.0	14.9	23.9	5.0
0.0	0.0	5.5	0.0	5648.0	6757.9	18.4	28.3	8.4
0.0	126.4	0.0	126.4	9355.4	11823.9	22.1	4.1	6.1
0.0	222.2	0.4	148.1	7924.2	9353.7	35.2	2.0	4.5
129.5	259.0	58.4	259.0	27901.4	31714.8	109.4	19.5	14.6
134.6	269.2	81.1	0.0	14887.3	21123.1	143.2	36.2	24.2
0.0	0.0	7.7	721.8	42597.6	46186.0	299.5	312.3	17.9
0.0	122.0	3.4	122.0	28684.6	30326.0	264.2	39.2	9.0
0.0	497.7	131.2	124.4	26511.6	30495.4	60.8	11.6	2.9
0.0	202.5	66.3	101.3	24169.6	26552.7	27.1	7.3	11.5
0.0	425.7	60.3	141.9	25178.1	30333.8	114.4	48.8	9.8
0.0	675.9	31.5	135.2	14902.4	20968.7	148.7	45.1	36.0
0.0	292.5	1.9	97.5	8875.5	9864.4	79.4	36.9	2.8
72.8	218.5	0.0	437.0	17696.9	20394.4	45.4	39.3	2.8
0.0	363.0	4.7	363.0	5692.3	7309.2	20.9	8.4	6.1
0.0	0.0	1.4	0.0	5949.4	6347.4	26.1	4.2	1.4
0.0	0.0	23.4	0.0	14409.1	16322.5	42.1	120.3	39.7
700.7	300.3	53.2	400.4	34404.2	39550.1	87.6	397.3	156.4
0.0	0.0	5.3	100.3	3515.1	4282.0	18.4	3.9	10.5
0.0	359.0	23.3	0.0	2715.7	3590.7	27.5	2.6	40.2
0.0	217.7	0.5	0.0	2831.2	4370.8	3.1	129.4	29.9
0.0	285.7	28.6	71.4	2107.0	3578.8	10.0	115.8	60.2
0.0	514.3	154.3	205.7	13967.1	20489.3	151.3	39.3	115.0
266.3	1198.3	33.5	133.1	16277.7	19542.2	172.0	17.3	31.4

0.0	221.3	9.4	110.7	3109.5	4823.5	55.3	13.5	59.4
118.5	710.9	8.2	0.0	2259.6	2816.4	20.6	3.6	39.1
0.0	358.6	18.6	119.5	1931.3	5502.5	24.3	55.8	101.7
0.0	0.0	19.6	149.6	2038.5	3752.3	15.0	51.6	314.0
0.0	0.0	6.5	0.0	355.3	452.3	5.6	3.7	3.3
97.0	485.0	72.3	194.0	2982.1	4777.5	28.4	12.1	34.0
0.0	407.6	4.5	0.0	1940.8	4815.4	77.8	7.5	110.2
65.2	391.1	5.4	195.6	4112.2	6505.2	87.5	14.0	73.0
0.0	0.0	0.5	114.3	3772.4	4971.0	57.3	16.9	5.6
0.0	324.1	8.7	0.0	1521.3	3331.4	48.1	25.1	18.9
102.7	205.4	50.8	410.8	3132.8	4932.9	8.6	20.1	10.1
0.0	412.7	29.2	82.5	7128.2	7649.8	10.1	5.7	38.8
1614.8	6963.6	36.5	1009.2	24459.6	30814.4	222.7	15.6	99.0
107.0	2354.4	15.8	856.2	10182.7	12278.5	75.5	25.6	44.6
932.3	3004.2	26.6	1035.9	10800.2	20588.4	90.3	15.9	284.2
0.0	377.9	0.4	0.0	2267.9	2806.7	22.9	2.2	22.5
155.5	1399.3	3.6	388.7	5522.9	8323.0	31.9	4.1	35.0
658.6	1756.1	4.1	219.5	9006.9	11167.5	38.1	22.7	25.2
147.6004	507.4501	23.68863	233.6302	32452.71	35619.17	66.25241	26.97079	43.34354
397.09	967.9628	31.77283	368.4094	77130.05	80147.76	86.33954	61.97678	61.11809
2.690304	1.907503	1.34127	1.576891	2.376691	2.250129	1.303191	2.297922	1.410085

fish larva	Vorticella	other	copadcy	copadtr	copadscy	copadbcy	ovcy	copad
2.9	39.8	0.0	9301.3	2529.9	8988.4	312.9	13.8	11831.2
0.5	28.0	0.0	4093.7	1232.3	4025.4	68.3	7.4	5326.0
0.0	1.9	0.0	2504.7	390.1	2377.2	127.5	2.4	2894.8
0.0	0.0	0.0	4869.6	1025.7	4614.1	255.5	8.6	5895.2
0.0	106.8	0.0	31834.5	23829.2	24300.9	7533.7	62.3	55663.7
0.0	307.6	0.0	52826.2	11940.5	50244.8	2581.4	159.3	64766.8
1.4	14.6	0.0	2310.1	374.9	1872.6	437.5	7.1	2685.0
1.9	8.9	0.0	2919.9	107.0	2659.6	260.4	14.1	3026.9
3.7	17.3	0.0	2986.2	769.8	2162.3	824.0	7.4	3756.0
1.5	184.3	0.4	6887.9	876.0	6122.9	765.0	10.3	7763.8
12.4	491.1	0.0	20434.5	2139.1	19415.2	1019.3	31.6	22573.5
2.7	301.5	0.0	25943.0	2839.0	24879.6	1063.5	10.8	28782.1
0.0	0.0	0.0	1070.9	425.7	1001.3	69.6	2.9	1496.5
0.0	1.6	0.0	9072.0	1560.5	7689.6	1382.4	0.0	10632.5
2.4	473.3	0.0	3824.4	2069.4	3247.4	577.0	25.5	5893.8
4.5	114.7	0.0	3029.7	1393.9	2695.0	334.7	12.4	4423.6
4.0	1641.6	0.0	5508.3	1487.4	3854.8	1653.5	91.0	6995.7
3.2	505.6	0.0	2829.9	806.5	2521.4	308.5	11.9	3636.5
5.5	10.9	0.0	1637.2	485.1	1062.4	574.9	43.7	2122.3
5.6	60.8	0.0	4652.5	1297.1	4507.0	145.5	20.3	5949.6
2.6	0.5	0.0	1703.3	210.8	1583.4	119.9	28.4	1914.1
1.1	0.0	0.0	1761.1	487.8	1621.3	139.8	26.3	2248.9
1.5	35.7	0.0	4388.3	1041.7	3961.4	426.9	19.9	5430.0
2.4	11.8	0.0	6761.1	892.1	6696.8	64.3	84.7	7653.1
0.5	37.4	0.0	10028.5	4450.6	9462.3	566.1	0.0	14479.1
0.0	2.0	0.0	1037.8	311.3	934.0	103.8	0.0	1349.1
0.0	310.3	0.0	2133.7	1433.7	904.9	1228.8	22.3	3567.4
5.2	351.2	0.0	3630.2	3968.4	1976.3	1653.9	57.7	7598.6
0.5	20.9	0.0	1029.0	144.8	1029.0	0.0	0.0	1173.8
2.1	126.5	0.0	3501.5	283.9	3162.7	338.8	0.5	3785.4
1.5	4.5	0.0	395.4	402.9	391.4	4.0	4.0	798.3
1.0	0.0	0.0	1055.2	847.5	1049.8	5.5	5.5	1902.7
2.5	0.0	0.4	3666.3	1583.6	3413.4	252.8	0.0	5249.9
0.8	20.0	0.0	2296.1	1133.3	1925.4	370.7	0.4	3429.4
0.0	268.7	0.0	8476.0	2388.8	7770.2	705.9	58.4	10864.8
0.0	343.4	0.0	2909.1	5293.7	2424.3	484.9	82.8	8202.8
5.1	509.3	0.0	8914.7	2505.7	8185.2	729.5	12.8	11420.4
0.0	176.9	0.0	5374.4	665.1	5126.9	247.4	4.5	6039.4
0.0	399.4	0.0	3739.8	3486.1	2986.5	753.4	131.2	7226.0
0.5	151.9	0.0	1686.7	2079.3	1316.6	370.1	66.3	3765.9
0.9	245.7	0.0	5452.8	4730.0	4824.9	627.9	60.3	10182.8
3.0	564.7	0.0	5710.4	5525.7	4867.8	842.6	33.0	11236.1
2.4	76.1	0.0	1854.6	891.3	1462.7	391.9	1.9	2746.0
1.9	0.9	0.5	7646.8	1823.5	6918.6	728.3	0.0	9470.3
1.4	65.6	0.0	2182.9	1132.9	1452.2	730.7	4.7	3315.8
0.0	14.4	0.0	684.0	300.4	682.6	1.4	1.4	984.4
0.0	1273.3	0.0	1781.4	1364.4	1758.1	23.4	24.5	3145.8
0.0	1270.1	0.0	5674.6	3744.5	4220.0	1454.6	68.8	9419.1
0.9	57.5	0.0	807.5	365.8	702.0	105.5	5.3	1173.3
1.1	38.7	0.0	741.3	695.5	359.0	382.3	23.3	1436.8
0.0	11.3	0.0	544.9	886.4	326.6	218.3	0.5	1431.3
1.5	15.4	0.0	749.8	757.5	364.1	385.7	35.5	1507.3
0.0	341.8	0.0	5944.4	4465.1	5070.1	874.3	184.5	10409.5
0.0	189.3	0.0	7357.3	2332.5	5726.1	1631.2	34.6	9689.8

1.3	2.7	0.0	1560.1	1603.3	1218.7	341.4	10.8	3163.5
0.0	0.5	0.0	1667.1	438.3	829.4	837.7	8.2	2105.5
0.5	33.6	0.0	735.9	3093.0	239.1	496.8	18.6	3828.9
0.0	4.6	0.0	468.3	1115.5	299.1	169.2	19.6	1583.8
0.0	2.8	0.0	6.5	97.0	0.0	6.5	6.5	103.5
0.9	0.9	0.0	1915.2	1116.4	1066.9	848.2	72.3	3031.5
0.8	12.8	0.8	717.9	2568.9	305.7	412.2	4.5	3286.7
0.4	5.4	0.0	1504.7	2262.6	847.5	657.2	5.4	3767.3
0.5	13.3	0.0	1829.6	970.0	1714.8	114.8	1.0	2799.6
0.0	4.6	0.0	873.1	1485.9	540.2	332.8	8.7	2359.0
0.5	4.8	0.0	976.0	1594.7	206.4	769.7	51.7	2570.7
0.0	1.4	0.0	607.0	521.6	82.5	524.5	29.2	1128.6
0.0	83.3	0.0	12651.7	5648.4	3027.7	9624.1	36.5	18300.1
0.0	19.0	0.0	4296.6	1774.7	963.2	3333.4	15.8	6071.3
0.0	29.2	0.0	7278.1	8027.1	2279.0	4999.0	26.6	15305.2
0.0	1.8	0.0	756.2	538.9	377.9	378.3	0.4	1295.1
0.5	0.5	0.0	2879.9	1556.3	932.8	1947.0	3.6	4436.2
0.0	1.5	0.0	5165.3	1611.8	2527.0	2638.3	6.7	6777.1
1.35937	159.2877	0.027855	5083.981	2169.86	4171.611	912.3693	27.11909	7253.84
2.002712	303.3599	0.121082	7852.086	3247.583	7242.329	1553.245	36.39355	10401.31
1.473265	1.904478	4.346811	1.544476	1.496679	1.736099	1.70243	1.34199	1.433904
			52826	**23829**			**185**	
			2895	**1331**			**13**	

14	a	6425	52746	293633	north	239.1	1.0	0	5	18	1	5	3	3	3	0	4	1	0	1	0	0	18	3	17	0	0	0	
14	b	6425	52746	293633	north	262.8	1.0	4	21	11	6	8	1	3	1	14	36	0	0	0	2	1	14	3	8	0	0	0	
15	a	6325	52894	294454	north	240.9	1.0	0	2	3	0	10	1	6	1	0	4	2	1	0	0	1	13	4	6	0	0	0	
15	b	6325	52894	294454	north	224.1	1.0	2	24	21	6	11	1	2	0	11	54	0	0	0	1	1	37	1	4	0	0	0	
16	a	6655	55746	292052	north	242.2	1.0	1	5	13	4	3	2	2	0	7	3	1	0	1	0	1	17	11	21	0	0	0	
16	b	6655	55746	292052	north	260.0	1.0	11	13	19	13	13	8	1	11	14	24	1	0	0	2	1	42	3	13	0	0	0	
17	a	6616	55878	293523	north	215.3	1.0	5	4	0	3	9	2	3	1	4	13	1	0	0	0	0	6	8	4	0	0	0	
17	b	6616	55878	293523	north	247.0	1.0	7	11	15	10	12	4	4	0	7	39	0	0	0	1	1	36	5	11	0	0	0	
18	a	6097	55707	294767	Kalemie	238.2	1.0	4	2	2	9	8	7	8	0	9	8	1	0	1	0	1	4	3	0	0	0	0	
18	b	6097	55707	294767	Kalemie	275.7	1.0	13	8	9	7	7	2	2	0	5	56	1	0	0	1	1	17	2	5	0	0	0	
19	a	9156	62669	292555	Kalemie	213.1	1.0	5	2	0	1	0	2	2	0	3	16	1	0	0	0	1	7	2	4	2	0	0	
19	b	9156	62669	292555	Kalemie	227.3	1.0	9	41	2	10	13	3	1	0	13	51	1	0	0	0	2	18	6	29	0	0	0	
20	a	**lat long data missing!!!!**				207.9	1.0	2	0	1	0	7	3	1	0	0	10	0	0	0	0	0	13	1	1	0	0	0	
20	b					253.9	1.0	11	10	9	4	6	7	9	0	10	62	0	0	0	1	1	31	4	8	0	0	0	
21	a					192.6	1.0	4	5	4	0	2	1	2	0	1	8	0	0	0	1	2	4	0	2	0	0	0	
21	b					230.8	1.0	17	16	13	13	4	1	6	1	6	76	1	0	0	1	1	27	3	12	0	0	0	