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TITLE: 1979-80 THOMPSON RIVER BIOLOGICAL SURVEY - SAVONA AND WALHACHIN

OBJECTIVE

To summarize and interpret the results of the 1979-80 biological survey of the Thompson River below Kamloops Lake.

CONCLUSIONS

1. Chlorophyll a levels were not significantly different at Savona or Walhachin indicating primary productivity to be comparable at the two sites.
2. Phosphorus influences production significantly at both locations. The amount of phosphorus per unit amount of chlorophyll was significantly greater at Savona which could mean a lesser degree of phosphorus limitation at this site.
3. No significant differences in algal diversity or equitability were observed at either Savona or Walhachin.
4. The invertebrate communities displayed no significant difference in diversity or equitability at the two monitoring stations of Savona and Walhachin.
5. Savona was dominated by the invertebrates, Hydra americana and Orthocladus spp., while Walhachin was totally dominated by the genus Orthocladus.

BACKGROUND

The results of the 1973-75 Federal-Provincial Thompson River Task Force Study suggested that effluent discharge from the Weyerhaeuser Kamloops pulp mill were contributing to nuisance algal growths along with color, foaming, and fish tainting in the Thompson River below Kamloops Lake. In compliance with effluent permit PE-1199, biological monitoring of algae and aquatic invertebrates was initiated at two locations (Savona and Walhachin) below the lake, beginning in 1977. Water quality was also monitored above and below Kamloops Lake in the Thompson River system. This report summarizes the data obtained from the biological survey conducted in 1979-80. A comparative summary of all survey work done to date will soon follow this report.

APPROACH

All methods were identical to those previously described in the 1978-79 Thompson River Biological Survey report. A paired T-test was used to compare data sets at a 95% significance level.

RESULTS AND DISCUSSION

Water Quality

North and South Thompson River water temperatures declined rapidly from October-November 1979 (Tables 1 and 2) with the North Thompson icing over before the South Thompson. During the spring thaw, the South Thompson River warmed at a faster rate than the North Thompson. Both sampling locations below Kamloops Lake at Savona and Walhachin were warmer than either upstream locations (Tables 3 and 4) due to the moderating effects of Kamloops Lake on water temperature. Color was higher at Savona and Walhachin than at the

upstream sites (mean downstream increase was approximately five units). pH did not fluctuate significantly at any location during the survey period, remaining slightly above a pH value of 7. Conductivity rose in the spring at all sampling sites probably due to snow melt inputs. Turbidity was significantly greater in the North Thompson than in the South Thompson, while both sites below Kamloops Lake were almost always less turbid than the Upper Thompson River sites. River velocity measurements were made only at Savona and Walhachin; significantly greater current speeds were found at Walhachin. Total phosphorus and total dissolved phosphorus were low at all survey locations approaching the theoretical limits of detection.

Algae

Data from the substrate trials at Savona and Walhachin are summarized in Tables 5 and 6, respectively. Total suspended solids accumulated at a significantly faster rate at Savona than at Walhachin, possibly due to the lower current velocities at Savona. The percent combustible material, which indicates the proportion of organic matter present on the substrates, was significantly greater at Walhachin than at Savona, though final chlorophyll a levels were not significantly different at the the two locations. The lower percentage of combustible material at Savona is probably due to the relatively greater amounts of inorganics present at this site. The accumulation rates of chlorophyll a may be directly proportional to algal growth in most cases. Chlorophyll a accumulation rates were not significantly different at Savona and Walhachin (Figures 1 and 2). Intracellular total Kjeldahl nitrogen (TKN) and phosphorus (P) levels were not significantly different at the two monitoring stations. The TKN:P ratios at Walhachin were significantly greater than at Savona, though both were generally less than 10:1. There was no correlation, however, between TKN:P and chlorophyll a levels at either location. Chlorophyll a levels were significantly correlated with TKN and P

concentrations at Walhachin and Savona. The method used to determine intracellular-P may be generating artificially high values due to interferences. Examination of this problem is currently being done.

Inputs of given amounts of any limiting nutrient into the Thompson River should cause proportional increases in algal biomass. By regressing possible limiting intracellular nutrient concentrations against chlorophyll a levels, some limited predictions may be made. At Savona, a linear regression was done using the chlorophyll a concentrations versus intracellular TKN and P concentrations. The results indicated that intracellular P was significantly correlated with chlorophyll a having a correlation coefficient of 0.898. From this, the slope of the linear regression, it may be predicted that if P were the limiting nutrient at Savona, an increase of $1 \mu\text{g P/cm}^2$ would cause a corresponding increase in chlorophyll a of 0.353 mg/cm^2 . Similarly, intracellular TKN versus chlorophyll a had a significant correlation coefficient of 0.960. If N were the limiting nutrient at Savona, an increase of $1 \mu\text{g N/cm}^2$ would cause an increase of 0.102 mg/cm^2 of chlorophyll a. At Walhachin, correlation coefficients for TKN and P versus chlorophyll a were both significant at 0.923 and 0.900, respectively. Under similar hypothetical conditions as discussed before for Savona, $1 \mu\text{g N}$ or P/cm^2 would produce 0.073 mg/cm^2 and 0.476 mg/cm^2 chlorophyll a, respectively. Inputs of P would produce greater increases in chlorophyll at Savona than at Walhachin, while inputs of N would act in the reverse fashion. It should be emphasized that these are hypothetical situations with rather broad extrapolations taking place. More rigorously controlled experiments should provide much better predictive data.

The number of species or taxa identified at both sampling locations ranged from 12-27 (Tables 7 and 8). Equitability is an index of how well the total number of organisms present are distributed among the various taxonomic

groups. No significant differences in equitability or Shannon-Weaver diversity indices were observed at either location. Algal community dominance appeared to shift from Gomphonema olivaceum and Synedra spp. at Savona to Achnanthes spp. and other algal species at Walhachin (Figure 3 and 4). Cell densities were extremely high in October 1979, at Walhachin declining to very low levels at both locations with the onset of winter. Except for October 1979, cell densities were similar at both sites (Figure 5).

Invertebrates

The counts of invertebrates from 0.18 m² samples at Savona and Walhachin from December 1979 to February 1980 are given in Tables 7 and 8, respectively. The total number of taxonomic groups identified was similar at both sites, reaching a maximum of 39 in February, 1980. No significant differences were apparent in equitability or Shannon-Weaver diversity indices at either site.

The total number of organisms was greater in December and January at Walhachin than at Savona (Figures 6 and 7). In February, however, Savona experienced a large increase in the invertebrate community, mainly in the Arthropod and Hydrozoan phyla. The hydrozoans were consistently and significantly greater at Savona throughout the study period, probably due to the inputs of pelagic zooplankton entrained in the Kamloops Lake outlet. The genus Orthocladus in the family Chironomidae was well represented at both locations with community dominance occurring at Walhachin. In percent composition of the invertebrate communities Savona was dominated by Hydra americana and Orthocladus spp. at all of the sampling dates (Figures 8-10). At Walhachin, on the other hand, the genus Orthocladus numerically dominated the community to the exclusion of all other genera (Figures 11-13).

THOMPSON RIVER PHYSICAL AND CHEMICAL PARAMETER

TABLE I

Permit PE 1199

1979 - 1980

PLACE: SOUTH THOMPSONDATES: Oct. 9/79-April 8/80

DATE	TEMPERATURE °C	COLOUR mg/l	pH	CON- DUCTIVITY umhos/cm ²	TURBIDITY mg/lSiO ₂	VELOCITY m/sec.	TOTAL PHOSPHORUS mg "P"/l	TOTAL DISSOLVED mg "P"/l
Oct. 9	15	8	7.4	74	2.0		0.009	< 0.005
16	14	9	7.7	79	4.5		N/A	N/A
23	12	11	7.3	79	5.0		N/A	N/A
30	10.5	9	7.5	81	5.0		0.0178	< 0.005
Nov. 6	8.5	9.6	7.3	91	2.7		0.006	< 0.005
13	2	12	7.4	89	2.0		0.0067	< 0.005
20	5	12	7.4	88	2.1		N/A	N/A
26	2	12.5	7.8	78	1.9		0.008	< 0.005
Dec. 4	4	8	7.5	107	3.4		0.0112	< 0.005
10	4	8	7.1	86	4.3		0.0123	0.0067
18	2	10	7.5	83	1.8		0.0123	0.005
24	2	9	7.1	105	6.9		N/A	N/A
31	2	9	7.3	89	5.1		0.0123	< 0.005
Jan. 7	0.5	10.3	7.1	97	6.9		0.007	0.0063
15				ICE			ICE	
22				"			"	
28				"			"	
Feb. 4	2	14	7.6	143	2.1		N/A	N/A
11	0.1	3.8	7.4	114	1.8		0.0112	0.011
18	0.3	14.8	7.2	89	2.6		0.020	< 0.005
25	0.8	10.3	6.9	90	4.0		N/A	< 0.005
Mar. 10	2.1	8	7.2	136	2.1		N/A	N/A
17	2.3	11	7.1	94	4.1		0.015	< 0.005
24	3.5	7.9	7.7	95	4.5		0.027	0.011
31	4.9	7.0	7.8	90	3.3		N/A	N/A
Apr. 8	5.7	6.1	7.3	89	4.0		0.016	0.007

* NOTE: October 9, 1979 to January 7, 1980 inclusive
samples collected at Riverside Park.
January 15, 1980 to April 8, 1980 inclusive
samples collected at Vicars Road.

THOMPSON RIVER PHYSICAL AND CHEMICAL PARAMETER

TABLE II

Permit PE 1199

1979 - 1980

PLACE: NORTH THOMPSONDATES: Oct. 9/79 - April 8/80

DATE 1979	TEMPERATURE °C	COLOUR mg/l	pH	CON- DUCTIVITY umhos/cm ²	TURBIDITY mg/lSiO ₂	VELOCITY m/sec.	TOTAL PHOSPHORUS mg "P"/l	TOTAL DISSOLVED mg "P"/l
Oct. 9	10	8	7.2	80	5.0		0.025	0.009
16	9.5	11	7.6	85	6.3		N/A	N/A
23	10	8	7.1	83	6.1		N/A	N/A
30	7	10.5	7.3	86	5.3		0.017	< 0.005
Nov 6	5	96	7.3	114	5.1		0.006	< 0.005
13	2	14.8	7.5	115	6.0		0.0010	< 0.005
20	1	12	7.4	112	5.4		N/A	N/A
26	5	14	7.5	106	4.0		0.007	0.005
Dec. 4	0.5	12	7.3	145	4.0		0.0067	0.010
10	0.5	7	7.0	105	4.3		0.009	0.006
18				ICE				
24				"				
31				"				
Jan. 7				"				
15				"				
22	1.0	15.7	7.3	125	7.2		N/A	N/A
28								
Feb. 4							N/A	N/A
11	0.5	7.8	7.4	124	5.0		0.013	< 0.005
18	0.5	11.2	7.3	134	3.7		0.013	< 0.005
25	0.6	15.8	7.6	126	2.7		N/A	< 0.005
Mar. 10	0.3	16	7.1	103	5.4		N/A	N/A
17	0.8	9	7.1	124	4.1		0.007	0.005
24	2.4	21.4	7.6	117	4.1		0.023	0.010
31	4.8	9.5	7.7	127	3.6		N/A	N/A
Apr. 8	5.9	14.0	7.6	115	5.1		N/A	0.005

* Note: October 9, 1979 to January 7, 1980 inclusive samples collected at Riverside Park. January 15, 1980 to April 8, 1980 inclusive samples collected at Vicars Road.

THOMPSON RIVER PHYSICAL AND CHEMICAL PARAMETER

TABLE III

Permit PE 1199
1979 - 1980

PLACE: SAVONA

DATES: Oct. 9/79-April 18/80

DATE	TEMPERATURE °C	COLOUR mg/l	pH	CON- DUCTIVITY umhos/cm ²	TURBIDITY mg/lSiO ₂	VELOCITY m/sec.	TOTAL PHOSPHORUS mg "P"/l	TOTAL DISSOLVED mg "P"/l
Oct. 9	15	12	7.3	76	2.5	0.122	0.058	0.030
16	14	15	7.5	85	2.2	0.122	N/A	N/A
23	12	10	7.4	81	4.3	0.091	N/A	N/A
30	11	14	7.5	88	1.0	0.213	0.006	< 0.005
Nov. 6	10	14	7.4	98	1.2	0.213	0.005	< 0.005
13	3	14.8	7.4	101	1.1	0.122	0.009	< 0.005
20	7	15	7.5	95	1.3	0.183	N/A	N/A
26	5	16	7.35	95	0.4	0.244	< 0.005	< 0.005
Dec. 4	6	13	7.4	122	1.4	0.213	0.006	< 0.005
10	5	14	7.1	100	3.0	0.244	0.007	0.006
18	4.5	12	7.4	93	2.1	0.244	0.016	< 0.005
24	4	13	7.2	113	3.1	0.213	N/A	N/A
31	4	15	7.3	108	5.4	0.213	< 0.005	0.005
Jan. 7	1	19.5	7.1	111	1.8	0.213	0.012	0.008
15	2	25	7.4	104	0.9	0.168	< 0.005	< 0.005
22	2	16.7	7.25	112	1.5	0.183	< 0.005	< 0.005
28	1.5	19	7.2	111	2.4	0.213	0.018	0.012
Feb. 4	1.5	22.5	7.7	115	2.8	0.152	N/A	N/A
11	1.7	16.6	7.6	114	2.1	0.244	0.008	0.007
18	1.5	18.5	7.5	117	3.7	0.122	< 0.005	< 0.005
25	1.8	22.4	7.5	117	1.8	0.152	< 0.005	< 0.005
Mar. 10	2.5	19	7.2	141	1.9	0.152	N/A	N/A
17	3.0	19.5	7.1	118	2.9	0.152	0.045	0.009
24	3.5	19.5	7.7	118	2.6	0.259	0.015	0.010
31	3.2	13.0	7.7	127	2.7	0.290	N/A	N/A
Apr. 8	3.3	16.5	7.7	117	1.8	0.290	0.107	0.023

PLACE: WALHACHINDATES: Oct. 9/79-April 8/80

DATE	TEMPERATURE °C	COLOUR mg/l	pH	CON- DUCTIVITY umhos/cm ²	TURBIDITY mg/lSiO ₂	VELOCITY m/sec.	TOTAL PHOSPHORUS mg "P"/l	TOTAL DISSOLVED mg "P"/l
Oct. 9	15	12	7.5	78	1.8	0.366	0.007	0.006
16	14	13	7.6	85	2.1	0.366	N/A	N/A
23	12	13	7.4	87	1.8	0.216	N/A	N/A
30	11	14	7.9	88	1.7	0.427	0.012	0.006
Nov. 6	10.5	13	7.7	99	1.8	0.366	0.006	< 0.005
13	3	15.6	7.8	101	0.9	0.351	0.010	0.006
20	7.5	15	7.6	96	1.1	0.366	N/A	N/A
26	5.0	13	7.75	90	0.4	0.381	0.005	< 0.005
Dec. 4	5.0	14	7.6	126	0.6	0.305	0.007	< 0.005
10	5.0	15	7.3	102	2.9	0.305	N/A	0.008
18	4.5	14	7.4	95	1.8	0.335	0.012	0.008
24	4.0	13	7.5	114	1.3	0.335	N/A	N/A
31	4	16	7.2	110	2.8	0.213	< 0.005	< 0.005
Jan. 7	1	19.5	7.3	105	1.8	0.244	0.012	0.009
15	2	21.5	7.5	104	0.9	0.290	< 0.005	< 0.005
22	2.0	16.7	7.3	113	3.0	0.320	< 0.005	< 0.005
28	0.5	19	7.3	111	2.4	0.244	0.021	0.019
4	1.5	23.5	7.7	115	5.0	0.259	N/A	N/A
11	1.7	16.6	7.5	117	2.1	0.274	< 0.005	< 0.005
18	1.5	13.9	7.4	117	2.6	0.213	N/A	N/A
25	1.8	18.5	7.0	116	2.1	0.213	< 0.005	< 0.005
Mar. 10	2.5	22	7.3	132	0.7	0.244	N/A	N/A
17	3.0	17.5	7.3	119	2.4	0.213	0.006	< 0.005
24	3.9	16.5	7.7	120	1.0	0.290	0.015	0.009
31	3.2	14.8	7.8	119	3.6	0.290	N/A	N/A
Apr. 8	3.3	17.5	7.65	119	1.5	0.244	0.005	0.010

SUBSTRATE TRIALS

TABLE V

PLACE: SAVONA

DATES: October 9, 1979 to April 8, 1980

DATE TRIAL NO.	SOLIDS			CHLOROPHYLL "a" mg/cm ²	TOTAL KJELDAHL NITROGEN ug "N"/cm ²	PHOSPHORUS ug "P"/cm ²	RATIO TKN/P	OF COMBUSTIBLE	
	TOTAL SUSPENDED mg/cm ²	INORGANIC mg/cm ²	% COMBUST. mg/cm ²					INTRA- CELLULAR % "P"	INTRA- CELLULAR % TKN
TRIAL #1									
Oct 9	0.025	N/A	N/A	0.007	1.074	0.093	11.548	N/A	N/A
Oct 16	1.366	1.211	11.3	0.242	2.666	1.082	2.464	0.70	1.72
Oct 23	3.062	2.610	15.4	1.488	12.236	2.598	4.710	0.57	2.71
TRIAL #2									
Oct 30	0.057	0.037	36.9	0.030	0.762	0.027	28.222	0.14	3.81
Nov 6	0.234	0.192	18.2	0.190	1.057	0.306	3.454	0.73	2.52
Nov 13	1.719	1.434	17.2	0.662	10.368	2.280	4.547	0.80	3.64
TRIAL #3									
Nov 20	0.054	0.037	27.6	0.018	0.298	0.043	6.930	0.25	1.75
Nov 26	0.129	0.108	17.5	0.045	1.979	0.130	15.223	6.19	9.424
Dec 3	2.250	2.076	7.9	0.471	6.386	2.023	3.157	1.16	3.67
Dec 10	3.138	2.828	10.1	1.484	12.820	3.012	4.256	0.97	4.14
TRIAL #4									
Dec 18	0.090	N/A	N/A	0.021	0.280	0.044	6.363	N/A	N/A
Dec 24	0.101	0.088	12.9	0.027	1.095	0.105	10.429	0.81	8.42
Dec 31	0.563	0.519	9.0	0.034	1.883	0.699	2.694	1.59	4.28
Jan 7	2.878	2.694	6.9	0.683	8.173	1.918	4.261	1.04	4.44
TRIAL #5									
Jan 15	0.229	0.223	2.6	0.004	0.432	0.133	3.248	2.217	7.20
Jan 22	0.279	0.242	13.3	0.011	1.121	0.175	6.406	0.47	3.03
Jan 28	0.520	0.476	8.6	0.065	2.645	0.238	11.113	0.54	6.01
Feb 4	3.818	3.640	5.3	0.244	6.433	1.386	4.641	0.78	3.61
TRIAL #6									
Feb 11	0.070	0.063	10.0	0.003	0.274	0.061	4.492	0.87	3.91
Feb 18	0.233	0.220	6.2	0.015	1.182	0.251	4.709	1.93	9.09
Feb 25	0.861	0.802	7.0	0.054	4.997	N/A	N/A	N/A	8.47
Mar 10	10.914	10.429	4.6	1.023	10.881	4.580	2.376	0.94	2.24
TRIAL #7									
Mar 17	0.090	0.088	2.2	0.006	0.841	0.097	8.670	4.85	42.05
Mar 24	0.197	0.179	16.7	0.017	0.870	0.234	3.718	1.30	4.83
Mar 31	1.465	1.340	12.1	0.191	4.320	1.629	2.652	1.30	3.46
Apr 8	5.376	4.898	10.5	1.579	16.824	3.850	4.370	0.81	3.52

SUBSTRATE TRIALS

TABLE VI

PLACE: WALHACHINDATES: October 9, 1979 to April 8, 1980

DATE TRIAL NO.	SOLIDS			CHLOROPHYLL "a" mg/cm ²	TOTAL KJELDAHL NITROGEN ug "N"/cm ²	PHOSPHORUS ug "P"/cm ²	RATIO TKN/P	OF COMBUSTIBLE	
	TOTAL SUSPENDED mg/cm ²	INORGANIC mg/cm ²	% COMBUST. mg/cm ²					INTRA- CELLULAR % "P"	INTRA- CELLULAR % TKN
TRIAL #1									
Oct 9	0.012	N/A	N/A	0.005	0.789	0.071	11.113	N/A	N/A
Oct 16	0.317	0.179	43.5	0.212	2.930	0.866	3.383	0.63	2.12
Oct 23	1.462	0.861	41.7	1.568	24.238	2.314	10.475	0.39	4.03
TRIAL #2									
Oct 30	0.042	0.018	59.0	0.048	1.118	0.023	48.609	0.10	4.66
Nov 6	0.256	0.166	34.5	0.333	2.339	0.708	3.304	0.79	2.60
Nov 13	0.597	0.401	49.0	1.258	11.769	1.669	7.052	0.85	6.00
TRIAL #3									
Nov 20	0.053	N/A	N/A	0.020	0.780	0.059	13.220	N/A	N/A
Nov 26	0.077	0.064	19.1	0.047	2.014	0.174	11.575	1.34	15.49
Dec 3	0.315	0.248	21.1	0.183	5.172	0.801	6.457	1.20	7.72
Dec 10	0.654	0.435	34.3	1.368	8.652	1.731	4.998	0.79	3.95
TRIAL #4									
Dec 18	0.025	N/A	N/A	0.004	0.336	0.041	8.195	N/A	N/A
Dec 24	0.069	0.047	34.8	0.014	1.258	0.098	12.837	0.45	5.72
Dec 31	0.137	0.125	10.2	0.136	2.067	0.358	5.774	2.98	17.23
Jan 7	0.636	0.482	25.2	0.770	10.625	0.738	14.397	4.79	6.90
TRIAL #5									
Jan 15	0.090	0.080	11.1	0.004	0.540	0.077	7.013	0.77	5.40
Jan 22	0.086	0.070	18.6	0.010	1.255	0.100	12.550	0.63	7.84
Jan 28	0.175	0.146	21.8	0.058	3.001	0.174	17.247	0.60	10.35
Feb 4	0.712	0.636	10.4	0.242	6.492	0.680	9.547	0.89	8.54
TRIAL #6									
Feb 11	0.118	0.111	5.9	0.007	0.371	0.083	4.470	1.19	5.30
Feb 18	0.273	0.246	9.7	0.047	1.562	0.248	6.298	0.92	5.78
Feb 25	0.373	0.338	9.6	0.061	4.775	N/A	N/A	N/A	13.64
Mar 10	2.283	1.664	26.8	1.846	25.861	4.542	5.694	0.73	4.18
TRIAL #7									
Mar 17	0.118	0.099	15.7	0.041	1.127	0.201	5.607	1.06	5.93
Mar 24	0.330	0.268	19.4	0.278	2.160	0.456	4.737	0.74	3.48
Mar 31	1.001	0.768	23.0	0.472	11.278	2.041	5.526	0.88	4.84
Apr 8	1.757	1.179	32.8	2.135	18.552	N/A	N/A	0.80	3.21

DIATOMS	SIZE LENGTH MICRONS.	OCTOBER 1979			OCT. - NOV. 1979			NOV. - DEC. 1979			DEC. - JAN. 1980			JAN. - FEB. 1980			FEB. - MARCH 1980			MARCH - APRIL 1980		
		1			2			3			4			5			6			7		
F. sp. (7)	15 - 30	0			60			10			15			0			0			80		
<i>Thalassiosira arcus</i>	30 - 40	0			0			0			0			0			30			0		
	50 - 65	0			0			p			0			0			65			115		
	65 - 80	0			p			0			0			0			10			80		
	90 - 110	0			0			0			0			0			0			10		
<i>Meridion circulare</i>	35 - 40																					
<i>Tabellaria</i> spp.	to 30	0			20			p			0			80			0			0		
	30 - 40	25			12			50			20			50			0			50		
	50 - 60	0			0			80			0			0			0			0		
<i>Synedra</i> spp	20 - 40	8,400			320			2,840			2,200			2,560			1,660			17,320		
S. SPP	40 - 80	2,800			120			70			20			0			35			610		
S. Ulna	80 - 120	1,180			80			155			20			15			15			150		
	120 - 150	960			180			490			50			20			0			150		
	150 - 235	110			390			530			10			10			0			10		
Naviculales																						
F. Cymbellaceae																						
<i>Cymbella aspera</i>	70 - 110	20			0			40			0			0			0			10		
	110 - 180	20			0			30			0			0			0			0		
<i>C. mexicana</i>	55 - 85	p			0			0			0			p			0			0		
<i>C. minuta (=ventricosa)</i>	to 20	810			822			1,200			210			60			15			600		
	25 - 40	1,260			1,440			5,800			1,430			480			360			1,140		
C. SPP	20 - 50	0			60			0			0			0			80			15		

DIATOMS	SIZE LENGTH MICRONS.	OCTOBER 1979		OCT. NOV. 1979		NOV. DEC. 1979		DEC. JAN. 1980		JAN. FEB. 1980		FEB. MAR. 1980		MARCH APRIL 1980	
		1		2		3		4		5		6		7	
<i>F. Epithemiaceae</i>															
<i>Epithemia sorex</i>	40 - 45	0		0		0		0		0		0		0	
<i>E. sp.</i>	20 - 25	p		0		0		0		0		30		0	
<i>F. Gomphonemaceae</i>															
<i>Didymosphenia geminata</i>	110 - 130	p		0		0		0		0		15		0	
<i>Gomphonemaceae</i>	to 45	15		0		0		35		80		15		110	
	45- 70	310		360		1 120		4 080		40		15		210	
	70- 110	60		0		32		60		0		10		60	
<i>Gomphonema olivaceum</i>	to - 30	30,880		1,660		1,660		5 680		1,800		4 480		9,960*	
	30- 45	6,480		410		880		640		180		810		1,280	
<i>Naviculaceae</i>															
<i>Diploneis spp.</i>	to 20	25		0		p		0		p		0		35	
<i>Frustulia rhomboides</i>	85 - 90	0		0		0		0		0		0		0	
<i>Navicula subg. Navicula</i>	10 - 40	35		0		80		40		20		0		10	
<i>Navicula spp.</i>	to 30	190		35		20		4		p		0		85	
<i>Mastigloia sp.</i>	70 - 90	0		0		0		0		0		0		p	
<i>Neldium sp.</i>	to 15	0		0		0		0		0		0		0	
<i>Pinnularia sp.</i>	140 - 145	0		0		0		0		0		0		0	
<i>Surirellales</i>															
<i>Surirella sp.</i>	130 - 140	0		0		0		0		0		0		0	
<i>Nitzschia spp.</i>	15 - 30	60		80		60		0		140		0		40	
Centrales, not arranged in formal taxonomic sequence; size refers to diameter, in microns.															

DIATOMS	SIZE LENGTH MICRONS.	OCTOBER			OCT. NOV.			NOV. DEC.			DEC. JAN.			JAN. FEB.			FEB. MARCH			MARCH - APRIL		
			1			2			3			4			5			6			7	
	to 17																					
C. SPP	to 30		20			0				0					80				180			190
Melosira italica	to 12		0			0				0					0				0			0
M. sp. (large pore)	to 7		80			0				p					0				0			15
M. ? jurgensii	to 25		0			0				0					p				p			10
Stephanodiscus astraea	to 25		20			p				0					0				0			110
* in Cymbellaceae - Amphora	to 25		25			0				0					p				15			65
Amphora ovalis	45 - 50		10			p				0					0				0			110
Chlorophyta	10		34,000			280				0					0				Not recorded			
Scenedesmus						4,680									0							
	25					1,640									0							
Sample # 6 - Gomphonema raised also some Fragilaria strands. 20% increase in Gomphonema if count includes all fields in either compound or dissecting microscope.																						
# 7 Gomphonema a few raised Fragilaria flat.																						

Numbers = count/0.18m²

WEYERHAEUSER CANADA LTD.

PERMIT PE-1199

THOMPSON RIVER MACRO-INVERTEBRATES AT: SavonaPAGE 1 OF 8

SPECIES	SIZE MM	December 18, 1979						January 22, 1980						February, 1980					
		SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Phylum Arthropoda																			
Class Insecta																			
Order Diptera																			
Family Chironomidae	3-7	3	8	8	6	5	10	1	3	1	1	2	3						
larvae	<5	11	16	18	5	9	2	4	2	5	0	2	1	26	42	12	18	28	16
pupae	2-4	0	0	0	0	0	0	1	0	0	0	0	1						
	<6													1	0	0	2	1	0
adult	3-4	0	0	0	0	0	0	1	0	0	0	0	0						
	<5													0	0	1	1	0	0
Subfamily Chironominae	<3													0	2	0	0	0	0
<u>Chironomus (Endochironomus) cf. dispar (Meigen)</u>																			
after Johannsen 1937	3-5	0	2	6	2	8	1	0	1	3	0	0	0						
<u>Chironomus spp</u>	<3	0	0	6	0	1	2	0	2	0	1	0	2						
	3-5	0	0	0	3	1	2	0	1	0	2	0	0						
<u>Tanytarsus (Micropsectra) cf. dives</u>		0	2	0	0	0	2	1	0	3	0	0	0						
after Johannsen																			
<u>Zavrelia (group Stempellina) after Rohlfack 1957</u>																			
	<2																		
Subfamily Diamesinae																			
<u>Diamesa I</u>	<3	2	6	6	1	8	14	6	3	5	1	6	0	24	4	6	30	10	36
	3-5	0	2	2	3	1	1	2	6	1	2	0	1	0	0	2	2	0	0
<u>Diamesa II</u>	5-7	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0
	7-10	0	0	0	0	0	0	2	0	0	1	0	0	0	2	1	0	0	0

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
		<u>Diamesa</u> III	2-5													0	0	0	0
<u>Prodianesa</u> (Kieffer) after Robacki 1957	5-7	0	0	2	0	0	0	0	0	0	0	0	0						
<u>Diamesa</u> pupae	4-5													8	6	16	14	14	16
Subfamily ? <u>Orthocladius</u> type II	2-4																		
Subfamily <u>Orthoclaadiinae</u>																			
⁽¹⁾ <u>Orthocladius</u> (<u>Orthocladius</u>) spp. after Saponis, 1977																			
larvae <3		94	66	56	70	55	28	145	79	245	238	70	132	124	110	62	72	60	40
5														130	140	108	48	66	52
3-7		31	41	62	48	44	2	93	114	104	117	126	78						
⁽²⁾ 7														84	48	84	86	52	48
7-10		2	2	0	1	0	0	8	67	3	15	22	17						
⁽³⁾ <u>Orthocladius</u> (? <u>Orthocladius</u>) type I																			
larvae <2														24	36	20	16	12	12
4		1	6	4	9	1	6	1	3	0	12	6	10	8	12	4	4	0	0
<u>Orthocladius</u> pupae Type I	near <u>O. (O.) obumbratus</u> (Johannsen)													0	0	0	0	0	0
" Type II	near <u>mallochii carlatus</u>													1	1	0	2	1	4
⁽⁴⁾ pupae Type III														0	1	1	0	0	0
" Type IV														0	0	1	0	0	0
" Type V	<u>O. (O.) appersoni</u> (Saponis 1977)													0	0	0	1	0	0
⁽⁵⁾ <u>Orthocladius</u> (<u>Euorthocladius</u>) Type I	of Thienemann) after Saponis													196	220	184	200	196	120
<3		41	28	16	18	38	22							58	14	60	66	44	24
5																			

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	7													30	34	36	22	28	64
	2-5																		
(6) <u>Orthocladius</u> (<u>Euorthocladius</u>) of <u>Soponis</u>	0.6-4													52	92	30	62	36	12
pupae of <u>O.</u> (<u>Euorthocladius</u>) type I of <u>Thienemohn</u>	4-5													1	7	1	1	4	2
<u>O.</u> (<u>Euorthocladius</u>) type II of <u>Thienemohn</u>	4-6													1	0	0	0	0	0
<u>Psectrocladius</u> (after <u>Roback 1957</u>) <2														2	4	0	2	8	0
<u>EuKiefferiellii</u> (= <u>Nanocladius</u> of <u>Soether</u>) after <u>Roback 1957</u>	<3													0	2	0	4	6	8
Subfamily <u>Pelopiinae</u>																			
<u>Pentaneura</u> (includes group <u>carnea</u> of <u>Roback 1957</u>)	<3	4	6	2	3	0	0	5	4	13	9	12	4	12	8	12	16	16	28
	3-7	1	2	4	0	1	0	6	1	4	17	10	0	14	8	16	8	12	12
Family <u>Simuliidae</u>	<2							0	0	0	0	26	0						
	2-3							0	0	0	0	8	0						
	3-4							0	0	0	0	0	0						
	4-6							0	0	0	0	1	0						
Family <u>Tipulidae</u>																			
<u>Antocha saxicola</u>	4-6																		
	6-8																		

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Order Ephemeroptera (after Needham et al)																			
Family Baetidae	< 2													5	6	6	12	8	8
<u>Ameletus</u>	2-3	0	0	0	0	0	0	0	0	0	1	0	1						
<u>Baetis</u> Leach	< 2	0	0	0	0	0	0	11	0	0	0	9	2						
	2-3	1	0	0	0	0	0	8	0	0	0	23	5	7	8	12	22	18	16
	3-4	0	0	0	0	0	0	5	0	0	0	13	7	1	8	9	12	10	12
	4-5	0	0	0	0	0	0	0	0	0	0	6	0	0	4	6	4	6	8
<u>Ephemerella</u> probably <u>E. grandis</u> (Eaton)																			
	(?) < 2	0	0	0	0	0	0	109	4	9	23	318	73	122	144	152	132	136	92
	2-4	0	0	0	0	0	0	1	1	0	1	102	2	1	1	2	0	2	0
	4-6	0	0	0	0	0	0	2	1	3	1	18	4	0	0	3	1	15	7
	6-8	0	0	0	0	0	0	1	0	0	0	5	0	0	3	9	2	12	2
	8-10													0	0	0	1	0	0
<u>Ephemerella</u> sp.	< 2	7	4	2	3	2	10	0	0	0	0	0	0						
	2-4	0	0	1	0	0	0	0	0	0	0	0	0						
<u>Paraleptophlebia</u> Lestage	3-4													0	1	0	0	0	0
Family Heptageniidae																			
<u>Rhithrogena</u> (Eaton)	< 2																		
	2-4																		
	4-6																		
Order Plecoptera																			
Family Perlidae																			
<u>Perla</u> (claasen)	3-4													0	0	1	0	0	0

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
<i>Arcynopteryx parallela</i> (Classen)	10-12																		
	12-14																		
	14-16																		
	16-18																		
	18-20																		
	20-25													0	0	0	0	1	0
Order Trichoptera (after Wiggins, mainly)																			
pupae	6-8																		
Family Glossosomatidae																			
<i>Glossosoma</i> (Oertis)	2-4							0	1	0	0	0	0	0	0	0	0	0	0
	4-6							0	1	2	0	1	5	1	2	1	1	1	0
Family Hydropsychidae																			
<i>Cheumatopsyche</i> (Wallengren)	2-4							0	0	0	0	1	1	0	1	0	1	0	0
	4-6							0	0	0	0	0	0	1	0	0	0	1	0
	6-8							0	0	0	0	0	0	0	0	0	0	0	1
	8-10							0	0	0	0	0	0	0	0	0	0	1	0
	10-12							0	0	0	0	0	0	0	0	0	0	0	0
<i>Hydropsyche</i> (Pictet)	2-4							0	0	0	0	0	1	0	0	0	0	0	0
	4-6							0	0	0	0	0	1	0	0	0	0	0	0
	6-8													0	0	0	0	0	1
	8-10													0	0	0	0	0	1

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Family Brachycentridae																			
<i>Brachycentrus</i> sp	6-8																		
Family Hydroptilidae																			
<i>Hydroptila</i> (after Wiggins)	2-3	5	6	4	2	1	4	1	0	0	0	0	0	3	0	0	0	0	0
Family Leptoceridae																			
<i>Qecetis avara</i> (Ross)	2-3																		
	3-4	0	0	0	0	0	2	0	0	0	0	0	0						
Class Crustacea																			
Order Copepoda																			
Calanoida (Suborder)																			
<i>Diaptomus ashlandi</i> (Marsh)	< 1.2	11	40	24	9	8	16	73	52	2	24	126	33	42	32	38	26	22	4
Cyclopoida (Suborder)																			
<i>Cyclops bicuspidatus thomasi</i> (Forbes)																			
	< 1.0													36	48	40	56	40	8
<i>Cyclops</i> sp.	< 0.7	2	14	10	1	2	18	18	5	0	4	30	3						
<i>Macrocyclops albidus</i> (Jurine)	1 to 1.7	5	4	16	3	5	4	2	2	7	8	26	6	0	4	0	0	2	0
Harpacticoida (Suborder)	< 0.8	7	8	12	1	0	4	1	2	0	5	16	2						
Order Cladocera	< 0.3																		
Family Bosminidae	< 0.5	1	0	2	0	0	0	1	0	0	1	6	1						
<i>Bosmina</i>	1													2	0	0	0	0	0
Family Chydoridae	< 0.5													2	0	0	0	0	0
Family Daphniidae	< 0.8	0	0	0	0	2	4												

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
<i>Daphnia ephippia</i>	<1.0	4	6	2	1	0	2	1	0	2	0	14	0	0	4	0	4	4	12
Class Arachnoidea																			
Order Hydracarina																			
Family Atractideidae																			
<i>Atractides</i> sp (Koch)	<0.5	0	0	0	0	2	0												
Family Sperchonidae																			
<i>Sperchon</i> sp (Kramer)	<1.1	0	1	0	0	0	0												
Phylum Annelida																			
Class Oligochaeta																			
Type I	2-4	20	26	32	12	20	28	73	65	89	90	42	33	82	170	188	132	102	120
Type II	<13	0	2	0	1	0	2	0	0	1	0	1	0	1	0	0	0	0	1
Type III (possibly same as I)														6	12	16	0	10	0
Egg in gel case	<5																		
Class Hirudinae																			
Family Piscicolidae																			
Family Piscicolidae																			
Family Piscicolidae																			
Phylum Nemata	<25	3	4	4	2	1	0	2	1	3	3	1	3	1	6	5	1	3	2
Phylum - unknown-eggs in gelatinous case																			
	approx. 2	9	16	8	16	9	8	14	5	2	4	9	8	1	5	4	6	10	4

TABLE X

Numbers = count/0.18m²

WEYERHAEUSER CANADA LTD.

PERMIT PE-1199

THOMPSON RIVER MACRO-INVERTEBRATES AT: WalhachinPAGE 1 OF 8

SPECIES	SIZE MM	December 18, 1979						January 22, 1980						February 28, 1980					
		SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	N/A	2	3	4	5	6	1	2	3	4	5	6
Phylum Arthropoda																			
Class Insecta																			
Order Diptera																			
Family Chironomidae	3-7																		
larvae	<5													18	36	22	40	20	32
pupae	2-4	0	0	0	1	1	2		0	0	0	0	1						
adult	<6													1	2	0	0	0	2
	3-4																		
	<5													1	3	0	0	1	0
Subfamily Chironominae	<3													2	0	0	0	4	2
<u>Chironomus (Endochironomus) cf. dispar (Meigen)</u>																			
after Johannsen 1937	3-5	0	0	0	0	4	0		0	0	0	0	0						
<u>Chironomus spp</u>	<3	0	8	0	0	4	0		0	8	0	0	6						
	3-5	0	0	4	0	8	0		0	8	0	4	0						
<u>Tanytarsus (Micropsectra) cf. dives</u>																			
after Johannsen		6	2	8	16	8	4		8	16	16	20	14						
<u>Zavrelia (group Stempellina) after Rohlfack 1957</u>																			
	<2													2	4	8	2	4	0
Subfamily Diamesinae																			
<u>Diamesa I</u>	<3	24	28	12	36	16	52		84	68	40	44	28	36	80	84	58	50	60
	3-5	16	28	38	18	36	16		12	12	8	12	8	0	4	0	6	8	4
<u>Diamesa II</u>	5-7	1	1	2	3	5	1		17	3	5	6	2	0	0	0	0	0	0
	7-10	1	2	2	1	2	4		9	2	5	1	4	0	2	1	0	0	0

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	N/A	2	3	4	5	6	1	2	3	4	5	6
<u>Diamesa III</u>	2-5	0	2	4	0	0	4		8	16	4	8	20	2	0	0	0	4	0
<u>Prodiamesa (Kieffer) after Roback 1957</u>	5-7													0	0	2	0	0	0
<u>Diamesa pupae</u>	4-5													1	0	0	0	1	0
Subfamily ? <u>Orthocladus type II 2-4</u>														0	0	0	0	4	0
Subfamily <u>Orthoclaadiinae</u>																			
(1) <u>Orthocladus (Orthocladus) spp. after Sponis, 1977</u>																			
larvae <3		256	300	288	246	248	64		364	148	296	88	106	196	164	162	132	158	150
5														266	136	172	110	152	108
3-7		136	188	208	138	120	72		256	60	212	128	92						
(2) 7														88	76	82	44	50	62
7-10		30	26	24	22	20	12		68	32	92	60	78						
(3) <u>Orthocladus (?Orthocladus) type I</u>																			
larvae <2														52	40	36	28	8	22
4		0	8	0	0	8	0		16	20	28	28	10	28	18	12	4	2	8
<u>Orthocladus pupae Type I near O. (O.) obumbratus (Johannsen)</u>														0	1	2	0	0	0
" Type II near <u>mallochi carlatus</u>														8	3	3	2	3	1
(4) pupae Type III														1	2	0	0	1	0
" Type IV														0	0	0	0	0	0
" Type V <u>O. (O.) appersoni (Sponis 1977)</u>														0	0	0	0	0	0
(5) <u>Orthocladus (Euorthocladus) Type I of Thienemann) after Sponis</u>																			
<3														164	236	204	148	232	286
5														40	40	56	50	46	32

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	N/A	2	3	4	5	6	1	2	3	4	5	6
	7													4	6	0	0	0	2
	2-5	216	212	244	188	336	148		532	608	584	256	418						
(6) <u>Orthocladus</u> (<u>Euorthocladus</u>) of Sopenis																			
	0.6-4													168	128	78	70	78	72
pupae of <u>O.</u> (<u>Euorthocladus</u>) type I of Thienemohn																			
	4-5													0	0	0	1	0	0
<u>O.</u> (<u>Euorthocladus</u>) type II of Thienemohn																			
	4-6																		
<u>Psectrocladius</u> (after Roback 1957) <2														0	0	0	0	0	0
<u>Eukiefferiella</u> (= <u>Nanocladius</u> of Soether)																			
after Roback 1957	<3													0	0	2	0	0	2
Subfamily Pelopiinae																			
<u>Pentaneura</u> (includes group <u>carnea</u> of Roback 1957)																			
	<3	0	2	2	4	16	4		16	12	20	20	14	0	0	2	0	4	6
	3-7	0	6	6	6	24	2		24	16	16	24	8	0	2	2	2	2	2
Family Simuliidae	<2																		
	2-3																		
	3-4																		
	4-6																		
Family Tipulidae																			
<u>Antocha saxicola</u>	4-6	0	0	0	0	0	0		0	0	0	0	0						
	6-8	0	0	1	1	0	0		0	0	0	0	0						

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Order Ephemeroptera (after Needham et al)																			
Family Baetidae	< 2													2	2	1	0	0	0
<u>Ameletus</u>	2-3																		
<u>Baetis</u> Leach	< 2	0	0	0	2	0	0	0	0	8	0	0	0	0	0	0	0	0	
	2-3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3-4	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	1	
	4-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<u>Ephemerella</u> probably <u>E. grandis</u> (Eaton)																			
	(1) < 2												0	2	1	1	1	2	
	2-4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	
	4-6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	
	6-8	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	8-10												0	0	0	0	0	1	
<u>Ephemerella</u> sp.	< 2																		
	2-4																		
<u>Paraleptophlebia</u> Lestage	3-4																		
Family Heptageniidae																			
<u>Rhithrogena</u> (Eaton)	< 2	0	0	0	0	0	0						0	0	1	0	0	0	
	2-4	0	0	2	0	0	0												
	4-6	0	0	1	0	0	0												
Order Plecoptera																			
Family Perlidae																			
<u>Perla</u> (claasen)	3-4												0	1	0	0	1	1	

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	N/A	2	3	4	5	6	1	2	3	4	5	6
<i>Arcynopteryx parallela</i> (Classen)	10-12	0	0	0	0	1	0		0	0	0	0	0						
	12-14	0	0	1	2	2	0		0	0	0	0	0						
	14-16	0	0	1	2	1	0		2	0	1	0	0						
	16-18	0	0	3	1	2	0		2	0	1	0	1	0	0	1	0	0	0
	18-20	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0
	20-25	0	0	0	0	0	0		0	0	0	0	0	1	0	0	0	0	0
Order Trichoptera (after Wiggins, mainly)																			
pupae	6-8													1	1	0	0	0	0
Family Glossosomatidae																			
<i>Glossosoma</i> (Ortis)	2-4	1	2	1	3	0	0		0	0	0	0	0						
	4-6	0	3	1	3	0	0		3	0	8	3	1						
Family Hydropsychidae																			
<i>Cheumatopsyche</i> (Wallengren)	2-4	1	1	3	2	0	0		1	0	0	0	0						
	4-6	0	0	5	0	3	0		0	0	8	3	1						
	6-8	0	0	2	0	0	0		0	1	0	0	3	4	3	3	0	1	1
	8-10	0	1	1	1	0	0		0	0	2	0	2	0	0	0	0	0	1
	10-12	0	2	0	0	0	0		0	0	1	0	0						
<i>Hydropsyche</i> (Pictet)	2-4	0	0	0	1	1	0		0	0	0	0	0	2	1	2	1	1	1
	4-6	0	0	0	2	0	0		3	0	0	0	1	1	0	1	0	0	1
	6-8	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0	0
	8-10	0	0	0	1	0	0							0	0	1	0	0	1

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 THOMPSON RIVER MACRO-INVERTEBRATES AT: Walhachin

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SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
<i>Daphnia ephippia</i>	< 1.0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Class Arachnoidea																			
Order Hydracarina																			
Family Atractideidae																			
<i>Atractides</i> sp (Koch)	< 0.5	0	0	12	16	8	4		16	8	16	12	2	4	4	8	6	6	6
Family Sperchonidae																			
<i>Sperchon</i> sp (Kramer)	< 1.1	2	0	11	5	4	5		24	5	8	9	1	1	1	2	1	2	4
Phylum Annelida																			
Class Oligochaeta																			
Type I	2-4	86	72	58	70	204	60		92	140	164	124	64	72	68	36	70	58	42
Type II	< 13	0	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0
Type III (possibly same as I)														28	36	50	58	40	18
Egg in gel case	< 5	0	1	1	2	4	3		3	0	8	7	4						
Class Hirudinae																			
Family Piscicolidae																			
	< 6	1	0	0	0	1	0												
Phylum Nemata																			
	< 25	12	16	8	28	24	12		32	12	24	24	18	2	6	6	4	12	0
Phylum - unknown-eggs in gelatinous case up to 4mm, 'U' shaped in case																			
	approx. 2													2	0	5	1	6	2

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
<u>Diamesa</u> III	2-5													0	0	0	0	0	0
<u>Prodiamesa</u> (Kieffer) after Roback 1957																			
	5-7	0	0	2	0	0	0	0	0	0	0	0	0						
<u>Diamesa</u> pupae	4-5																		
Subfamily ? <u>Orthocladius</u> type II	2-4													8	6	16	14	14	16
Subfamily <u>Orthocladiinae</u>																			
(1) <u>Orthocladius</u> (<u>Orthocladius</u>) spp. after Soptonis, 1977																			
	larvae <3	94	66	56	70	55	28	145	79	245	238	70	132	124	110	62	72	60	40
	5													130	140	108	48	66	52
	3-7	31	41	62	48	44	2	93	114	104	117	126	78						
	(2) 7													84	48	84	86	52	48
	7-10	2	2	0	1	0	0	8	67	3	15	22	17						
(3) <u>Orthocladius</u> (? <u>Orthocladius</u>) type I																			
	larvae <2													24	36	20	16	12	12
	4	1	6	4	9	1	6	1	3	0	12	6	10	8	12	4	4	0	0
<u>Orthocladius</u> pupae Type I	near 0.(0.) <u>obumbratus</u> (Johannsen)													0	0	0	0	0	0
" Type II	near <u>mallochi carlatus</u>													1	1	0	2	1	4
(4) pupae Type III														0	1	1	0	0	0
" Type IV														0	0	1	0	0	0
" Type V	0.(0.) <u>apersoni</u> (Soptonis 1977)													0	0	0	1	0	0
(5) <u>Orthocladius</u> (<u>Euorthocladius</u>) Type I of Thienemann) after Soptonis														196	220	184	200	196	120
	<3	41	28	16	18	38	22							58	14	60	66	44	24
	5																		

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Order Ephemeroptera (after Needham et al)																			
Family Baetidae	< 2													5	6	6	12	8	8
<u>Ameletus</u>	2-3	0	0	0	0	0	0	0	0	0	1	0	1						
<u>Baetis</u> Leach	< 2	0	0	0	0	0	0	11	0	0	0	9	2						
	2-3	1	0	0	0	0	0	8	0	0	0	23	5	7	8	12	22	18	16
	3-4	0	0	0	0	0	0	5	0	0	0	13	7	1	8	9	12	10	12
	4-5	0	0	0	0	0	0	0	0	0	0	6	0	0	4	6	4	6	8
<u>Ephemerella</u> probably <u>E. grandis</u> (Eaton)																			
	(7) < 2	0	0	0	0	0	0	109	4	9	23	318	73	122	144	152	132	136	92
	2-4	0	0	0	0	0	0	1	1	0	1	102	2	1	1	2	0	2	0
	4-6	0	0	0	0	0	0	2	1	3	1	18	4	0	0	3	1	15	7
	6-8	0	0	0	0	0	0	1	0	0	0	5	0	0	3	9	2	12	2
	8-10													0	0	0	1	0	0
<u>Ephemerella</u> sp.	< 2	7	4	2	3	2	10	0	0	0	0	0	0						
	2-4	0	0	1	0	0	0	0	0	0	0	0	0						
<u>Paraleptophlebia</u> Lestage	3-4													0	1	0	0	0	0
Family Heptageniidae																			
<u>Rhithrogena</u> (Eaton)	< 2																		
	2-4																		
	4-6																		
Order Plecoptera																			
Family Perlidae																			
<u>Perla</u> (claasen)	3-4													0	0	1	0	0	0

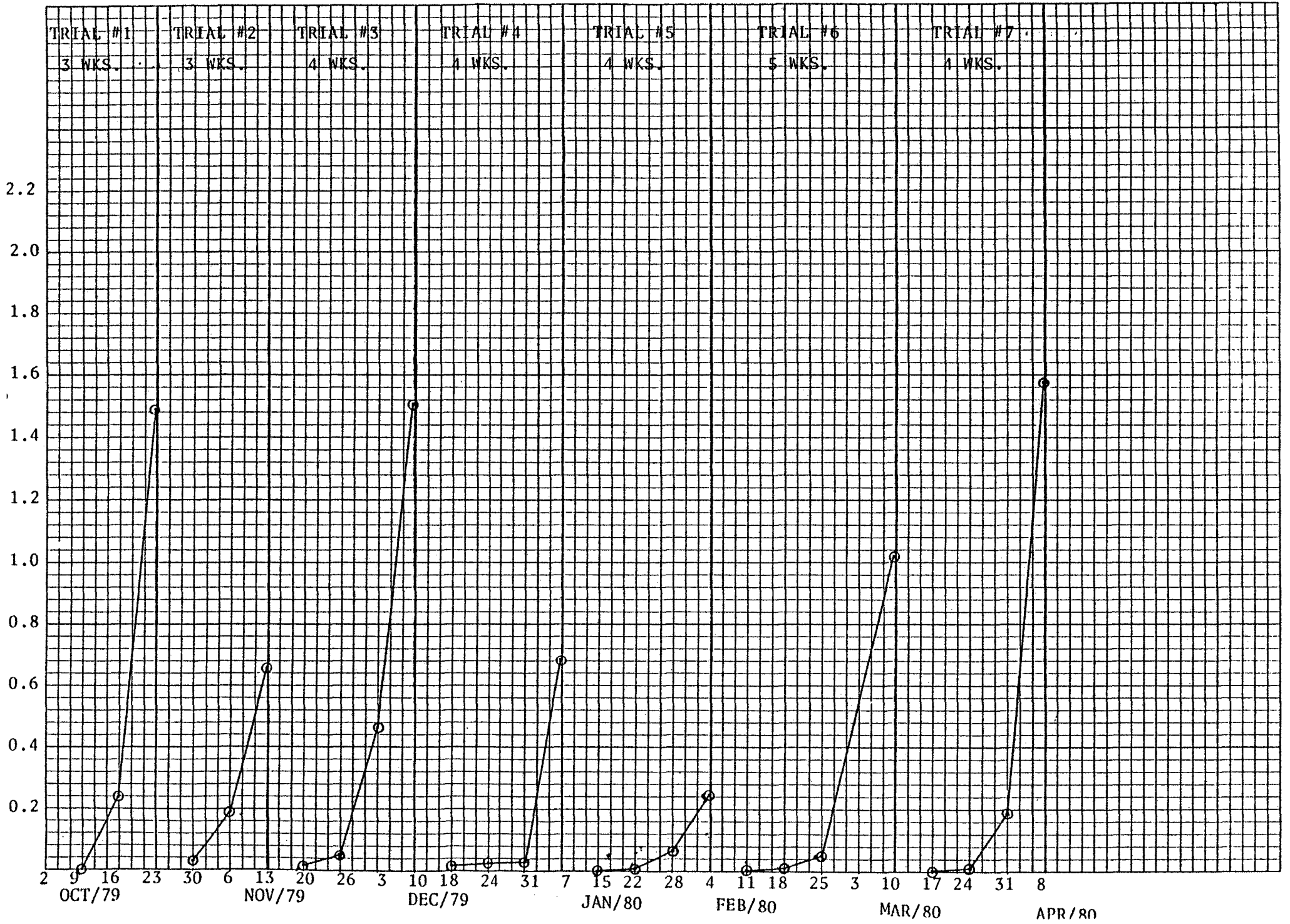
SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
<u>Arcynopteryx parallela</u> (Classen)	10-12																		
	12-14																		
	14-16																		
	16-18																		
	18-20																		
	20-25													0	0	0	0	1	0
Order Trichoptera (after Wiggins, mainly)																			
pupae	6-8																		
Family Glossosomatidae																			
<u>Glossosoma</u> (Ourtis)	2-4							0	1	0	0	0	0	0	0	0	0	0	0
	4-6							0	1	2	0	1	5	1	2	1	1	1	0
Family Hydropsychidae																			
<u>Cheumatopsyche</u> (Wallengren)	2-4							0	0	0	0	1	1	0	1	0	1	0	0
	4-6							0	0	0	0	0	0	1	0	0	0	1	0
	6-8							0	0	0	0	0	0	0	0	0	0	0	1
	8-10							0	0	0	0	0	0	0	0	0	0	1	0
	10-12							0	0	0	0	0	0	0	0	0	0	0	0
<u>Hydropsyche</u> (Pictet)	2-4							0	0	0	0	0	1	0	0	0	0	0	0
	4-6							0	0	0	0	0	1	0	0	0	0	0	0
	6-8													0	0	0	0	0	1
	8-10													0	0	0	0	0	1

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Family Brachycentridae																			
<i>Brachycentrus</i> sp	6-8																		
Family Hydroptilidae																			
<i>Hydroptila</i> (after Wiggins)	2-3	5	6	4	2	1	4	1	0	0	0	0	0	3	0	0	0	0	0
Family Leptoceridae																			
<i>Oecetis ayara</i> (Ross)	2-3																		
	3-4	0	0	0	0	0	2	0	0	0	0	0	0						
Class Crustacea																			
Order Copepoda																			
Calanoida (Suborder)																			
<i>Diaptomus ashlandi</i> (Marsh)	< 1.2	11	40	24	9	8	16	73	52	2	24	126	33	42	32	38	26	22	4
Cyclopoida (Suborder)																			
<i>Cyclops bicuspidatus thomasi</i> (Forbes)	< 1.0													36	48	40	56	40	8
<i>Cyclops</i> sp.	< 0.7	2	14	10	1	2	18	18	5	0	4	30	3						
<i>Macrocyclus albidus</i> (Jurine)	1 to 1.7	5	4	16	3	5	4	2	2	7	8	26	6	0	4	0	0	2	0
Harpacticoida (Suborder)	< 0.8	7	8	12	1	0	4	1	2	0	5	16	2						
Order Cladocera	< 0.3																		
Family Bosminidae	≥ 0.5	1	0	2	0	0	0	1	0	0	1	6	1						
<i>Bosmina</i>	1													2	0	0	0	0	0
Family Chydoridae	≥ 0.5													2	0	0	0	0	0
Family Daphniidae	≥ 0.8	0	0	0	0	2	4												

SPECIES	SIZE MM	SAMPLE REPLICATE						SAMPLE REPLICATE						SAMPLE REPLICATE					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Daphnia ephippia	<1.0	4	6	2	1	0	2	1	0	2	0	14	0	0	4	0	4	4	12
Class Arachnoidea																			
Order Hydracarina																			
Family Atractideidae																			
Atractides sp (Koch)	<0.5	0	0	0	0	2	0												
Family Sperchonidae																			
Sperchon sp (Kramer)	<1.1	0	1	0	0	0	0												
Phylum Annelida																			
Class Oligochaeta																			
Type I	2-4	20	26	32	12	20	28	73	65	89	90	42	33	82	170	188	132	102	120
Type II	<13	0	2	0	1	0	2	0	0	1	0	1	0	1	0	0	0	0	1
Type III (possibly same as I)														6	12	16	0	10	0
Egg in gel case	<5																		
Class Hirudinae																			
Family Piscicolidae	<6																		
Phylum Nemata	<25	3	4	4	2	1	0	2	1	3	3	1	3	1	6	5	1	3	2
Phylum - unknown-eggs in gelatinous case up to 4mm, 'U' shaped in case	approx. 2	9	16	8	16	9	8	14	5	2	4	9	8	1	5	4	6	10	4

SAVONA CHLOROPHYLL "a"

Figure 1



WALHACHIN CHLOROPHYLL "a"

Figure 2

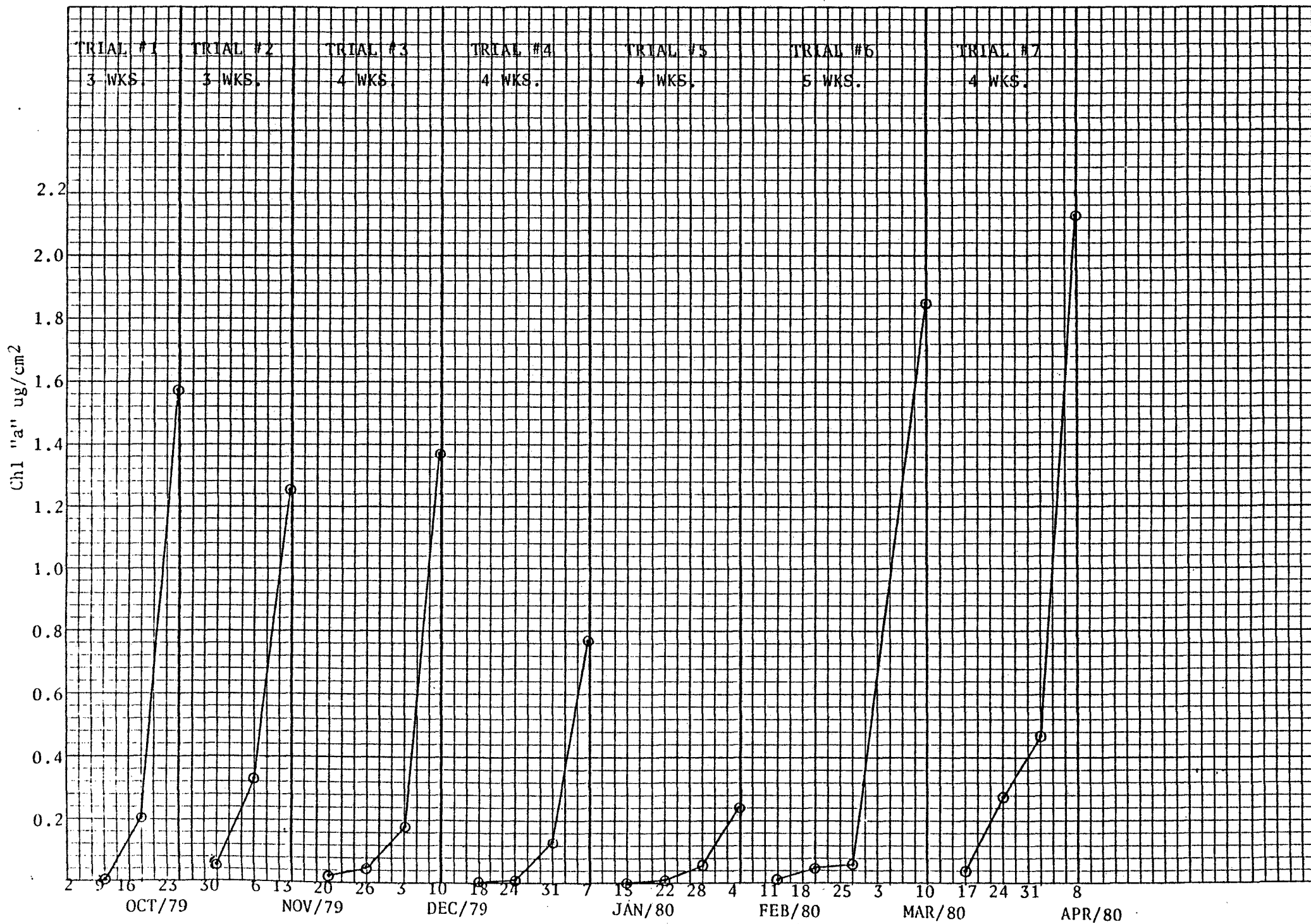


Figure 3

THOMPSON RIVER SURVEY - SAVONA

Algal Community Composition

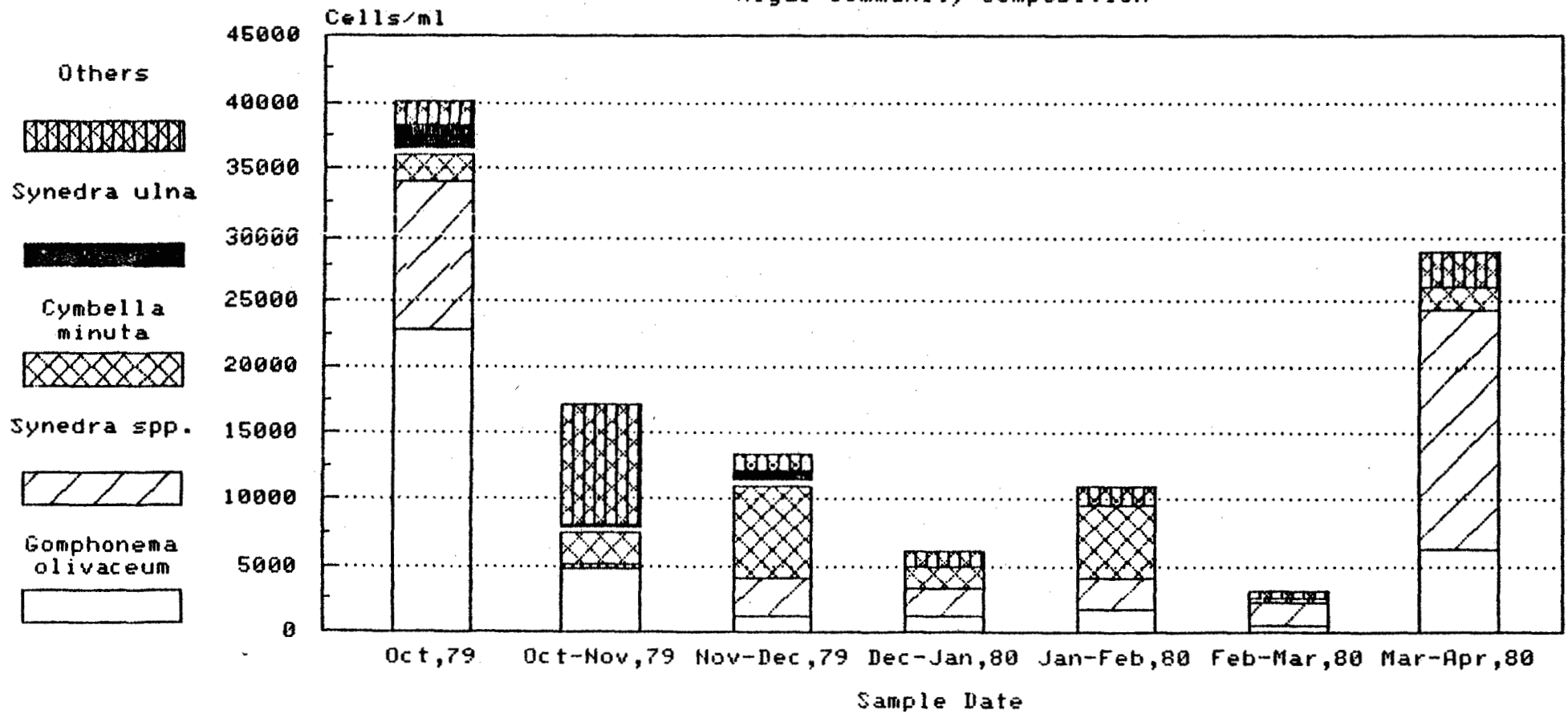


Figure 5

THOMPSON RIVER SURVEY

Algal Abundance - Savona/Walachin

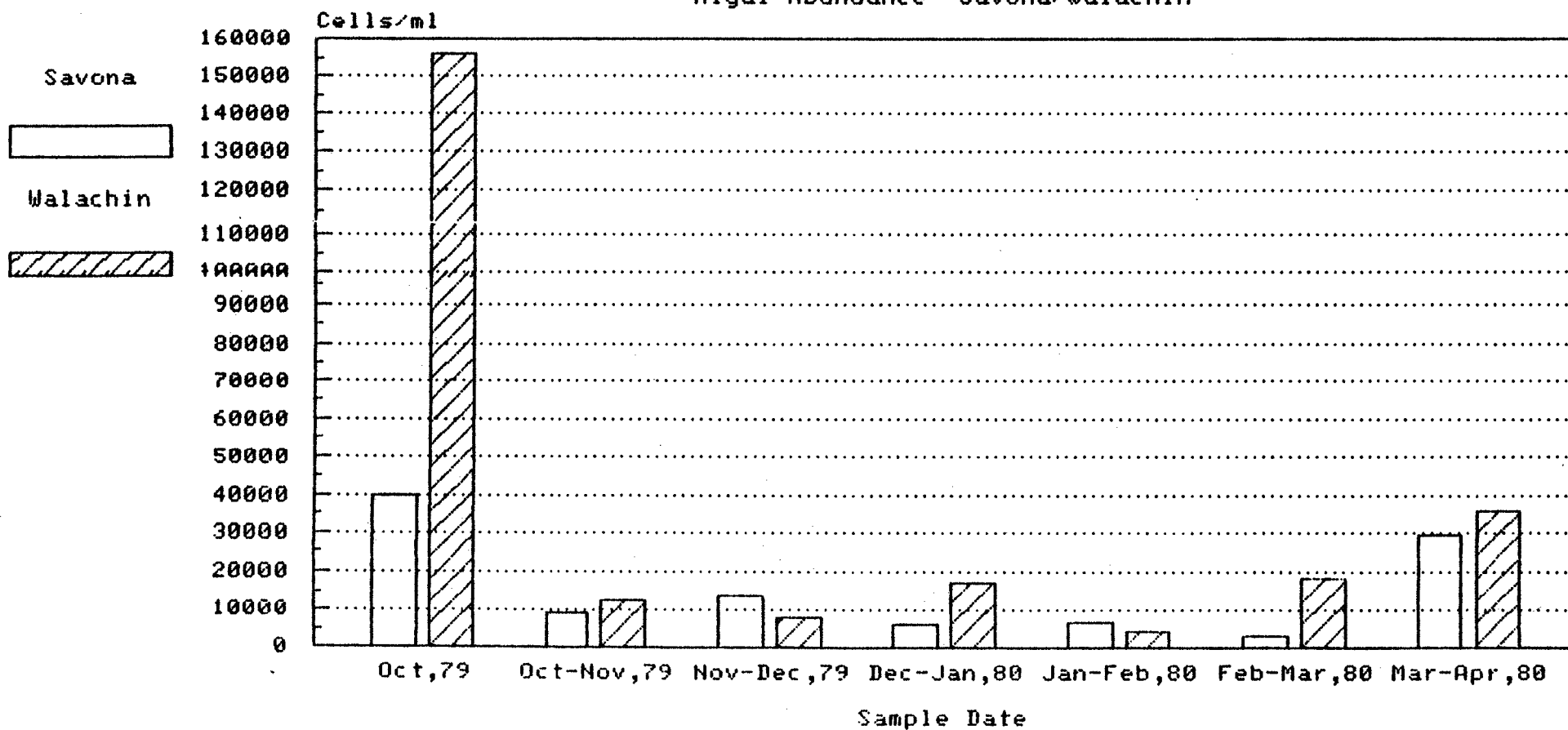


Figure 6

THOMPSON RIVER SURVEY - SAVONA

Invertebrate Community Composition

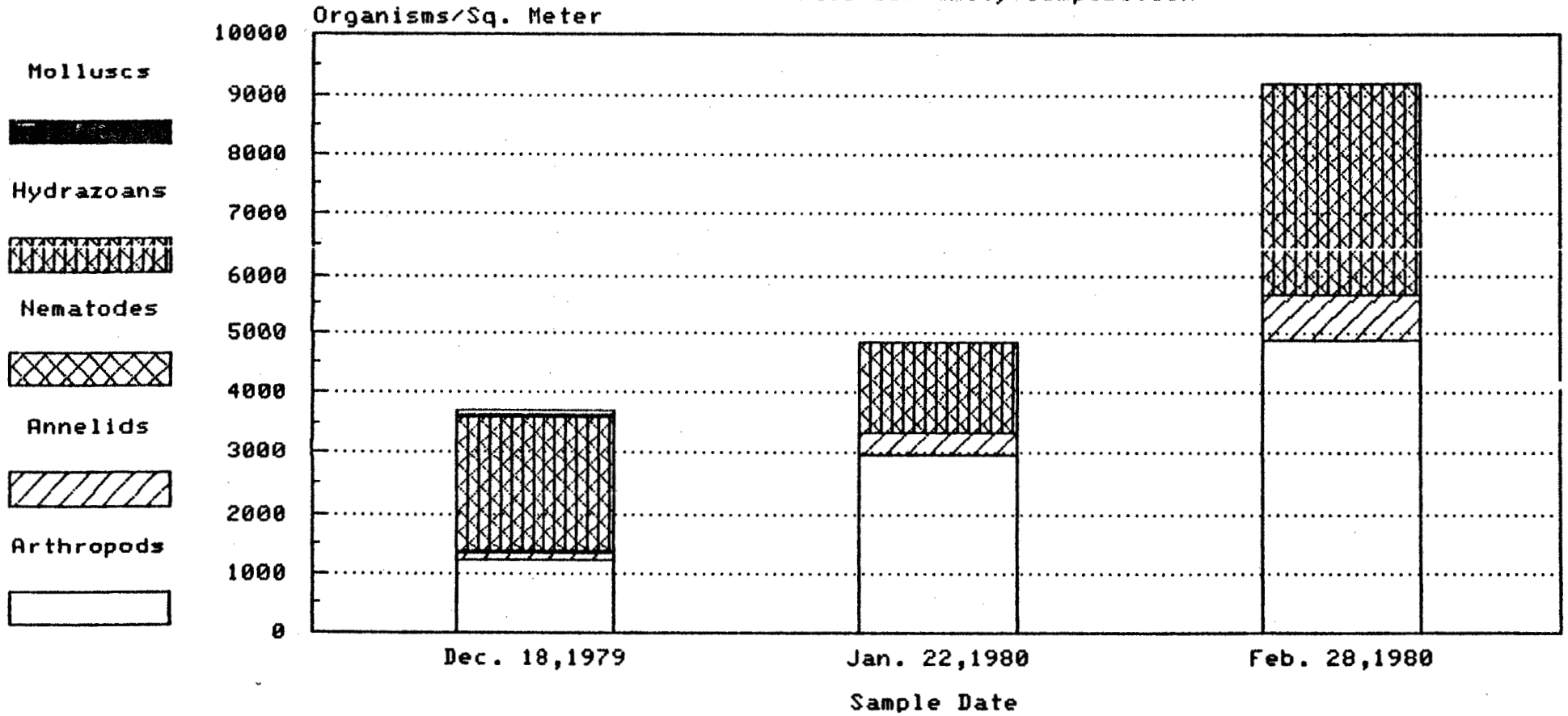


Figure 7

THOMPSON RIVER SURVEY - WALACHIN

Invertebrate Community Composition

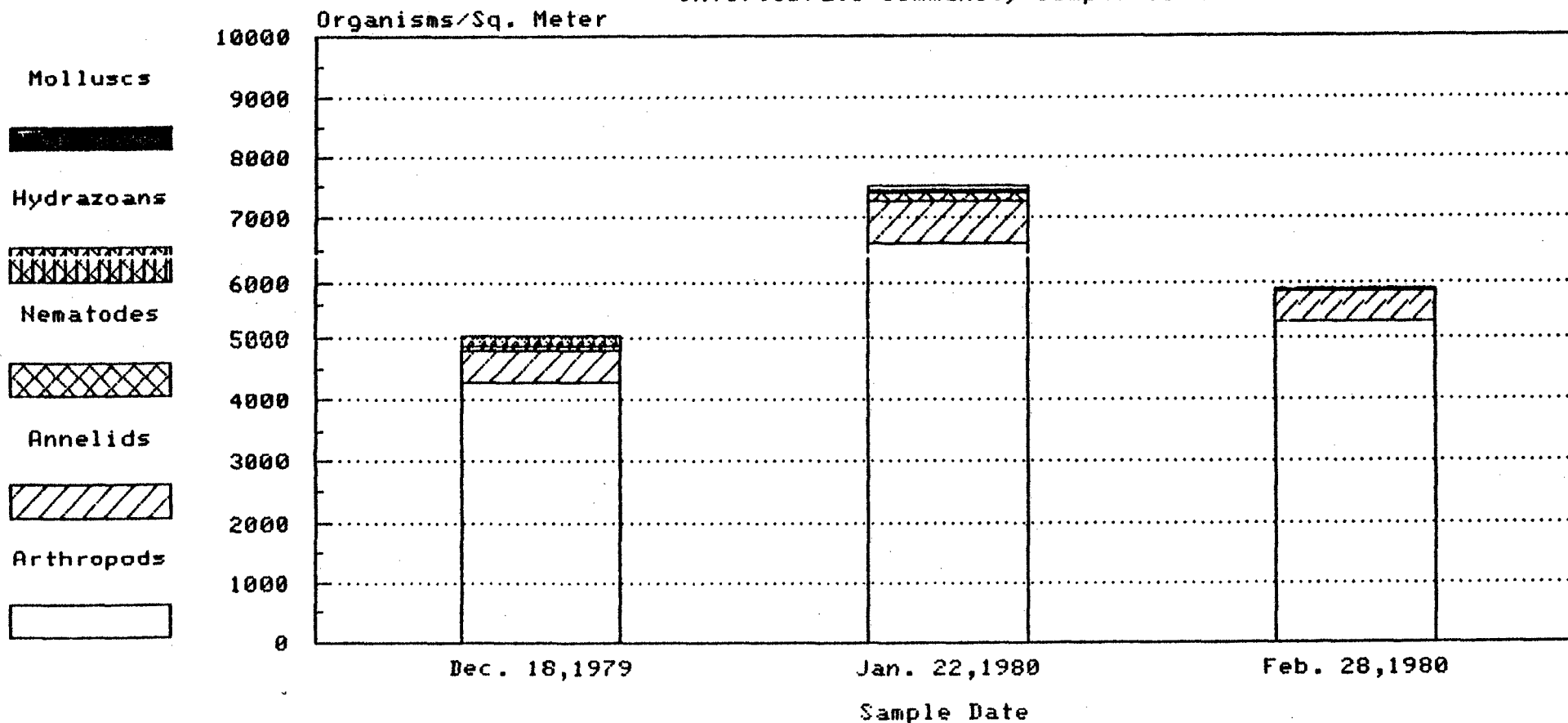


Figure 8

THOMPSON RIVER SURVEY - Dec. 18, 1979
INVERTEBRATE SPECIES - SAVONA

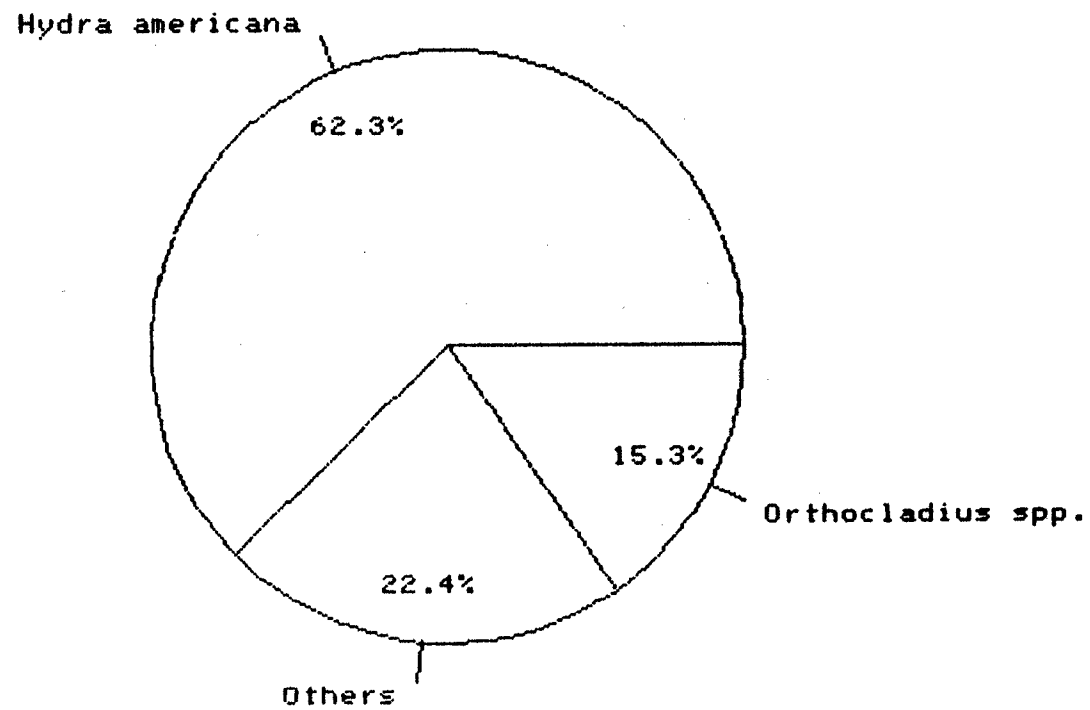


Figure 9

THOMPSON RIVER SURVEY - Jan. 22, 1980

INVERTEBRATE SPECIES - SAVONA

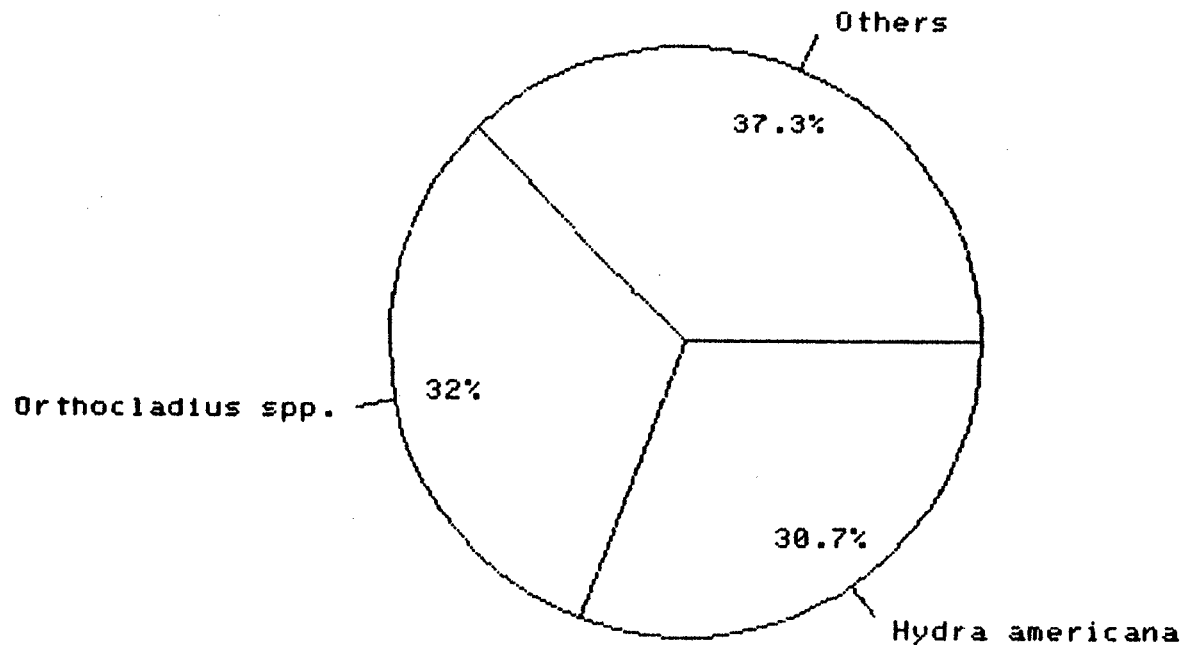
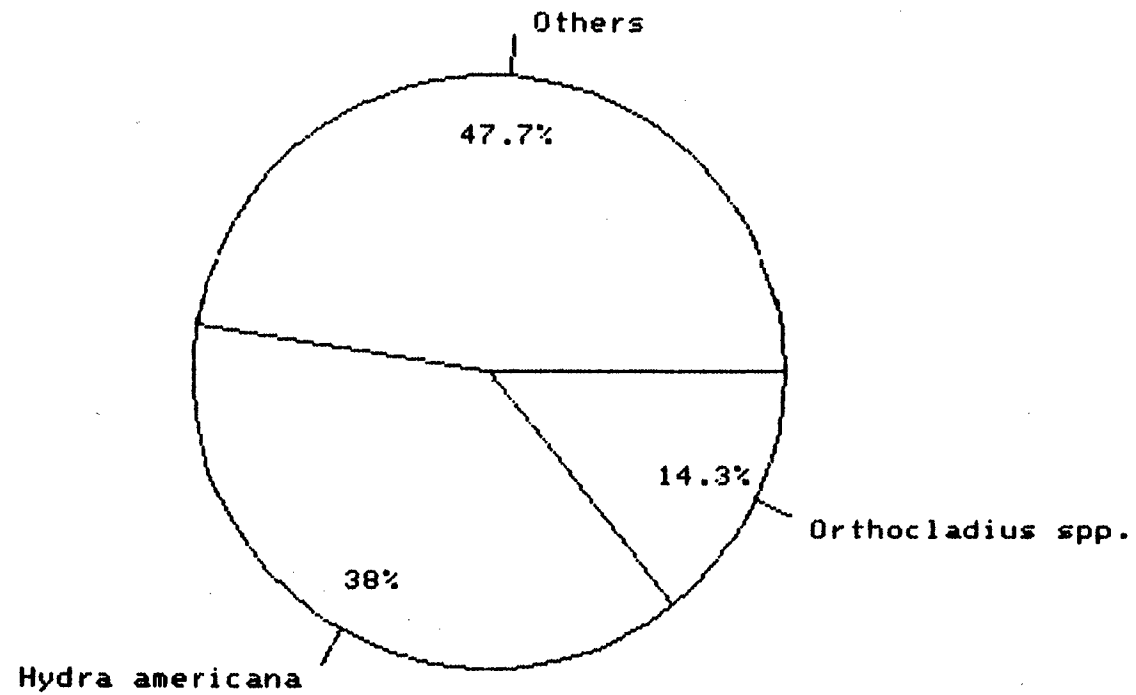


Figure 10

THOMPSON RIVER SURVEY - Feb. 28, 1980
INVERTEBRATE SPECIES - SAVONA



THOMPSON RIVER SURVEY - Dec. 18, 1979

INVERTEBRATE SPECIES - WALACHIN

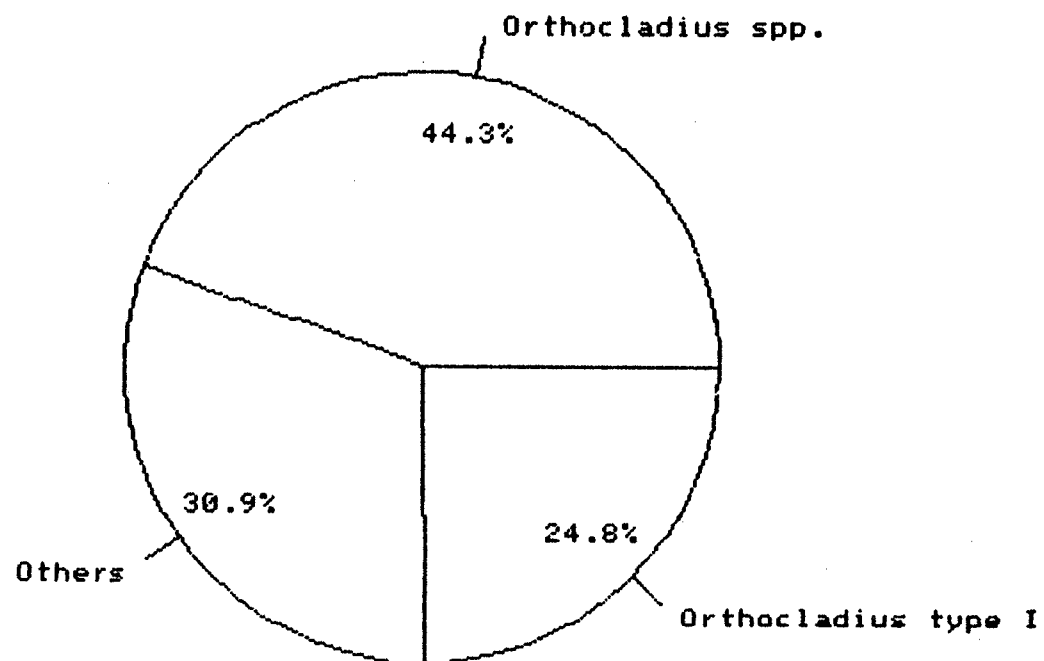
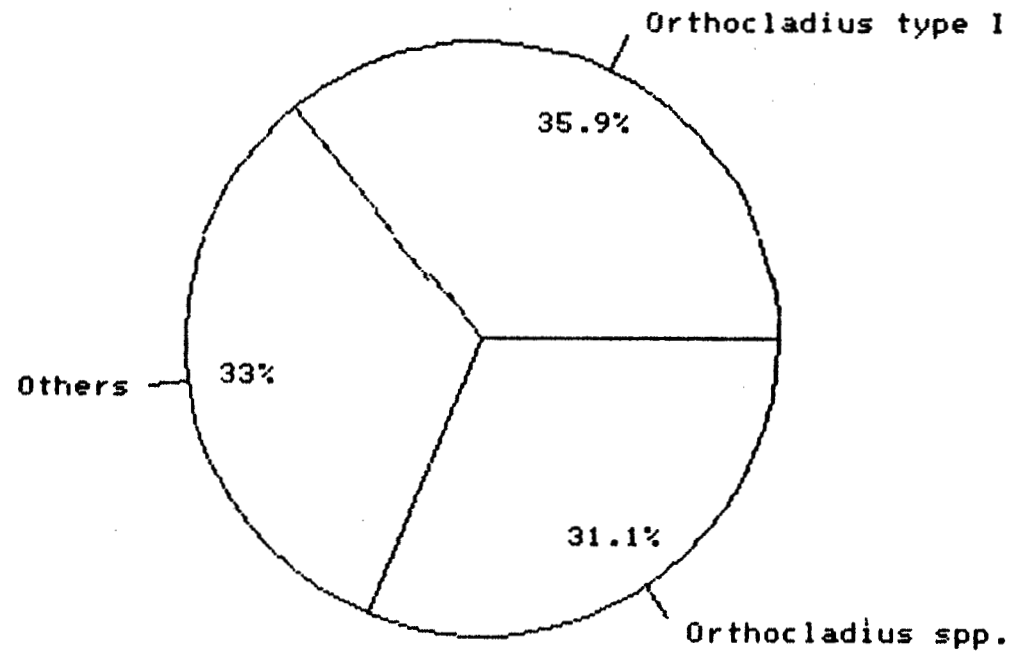


Figure 12

THOMPSON RIVER SURVEY - Jan. 22, 1980

INVERTEBRATE SPECIES - WALACHIN



THOMPSON RIVER SURVEY - Feb. 28, 1980

INVERTEBRATE SPECIES - WALACHIN

