

**EMPRESA NACIONAL DE ENERGIA ELECTRICA
ENEE
TEGUCIGALPA - HONDURAS**

EL CAJON PROJECT



ECOLOGY LIMNOLOGY AND FISHERIES PROGRAM

**by
Charles R. Goldman
and
Peter D. Vaux**

**FINAL REPORT
VOLUME 1 (Appendices)**

1984

**ECOLOGICAL RESEARCH ASSOCIATES
2094 ALTA LOMA ST.
DAVIS, CALIFORNIA 95616**

**MOTOR-COLUMBUS
CONSULTING ENGINEERS INC.
CH-5401 BADEN/SWITZERLAND**

TABLE OF CONTENTS

	<u>Page</u>
Appendix 1. Location of stations sampled for the water quality monitoring program.....	A1-373
Appendix 2. River Water Quality.....	A2-374
Appendix 3. Zooplankton Community Structure, L. Yure and L. de Yojoa.....	A3-415
Appendix 4. L. Yure and L. de Yojoa Phytoplankton Counts.....	A4-439
Appendix 5. Invertebrate Community of Q. El Cajon, 1979-1980.....	A5-449
Appendix 6. The Rio Tamalito Diversion Project --- environmental impact study.....	A6-456
Appendix 7. Reservoir system management for water quality.....	A7-466
Appendix 8. Methods for phytoplankton identification and enumeration. El Cajón project.....	A8-473
Appendix 9. Water chemistry methodology used in the limnology program.....	A9-495
Appendix 10. Depth profiles of oxygen, temperature, conductivity, primary productivity and light, L. Yure and L. de Yojoa.....	A10-512

Appendix 1.

Location of stations sampled for the water quality monitoring program.

(Station #,
Fig. 4.1)

1. R. Sulaco; where road from Minas de Oro to Victoria crosses the river.
2. R. Humuya; near Comayagua, at San Pedro Sula-Tegucigalpa road bridge.
3. R. Chiquito; 100m downstream from Comayagua- La Libertad road bridge.
4. R. Humuya; 20m upstream from La Libertad- Ojos de Agua road bridge.
5. R. Humuya; 20m upstream from its confluence with the R. Yure.
6. R. Yure; 20m upstream from its confluence with the R. Humuya.
7. R. Yure; near village of Yure, 100m upstream from where Victoria- Cancía road crosses near the river.
8. R. Humuya and R. Sulaco; about 200m upstream from their confluence.
9. R. Humuya at El Cajón; from 1979- January 1981, samples were collected from below the dam site. After January 1981, sampling location was moved to near the former ENEE camp, above the dam site.
10. R. Humuya (=R. Comayagua); near Santa Rita, at rail bridge.
11. R. Ulúa; at San Manuel cooperative plantation.
12. R. Ulúa; at El Progreso- San Pedro Sula road bridge.
13. R. Ulúa; near Guanacastales, at rail bridge.

Appendix 2: River Water Quality.

Table A2.1

R. Sulaco at Victoria

Date	1/XI/79	3/XII/79	7/I/80	4/II/80	3/III/80	7/IV/80	5/V/80
Temp. (°C)	26.0	23.0	22.0	21.1	22.5	24.8	26.0
O ₂ (dissolved)(mg/l)	-	8.6	8.2	8.3	8.4	8.2	7.8
Conductivity (μmho/cm)	263	254	237	268	282	291	278
pH	7.9	7.5	7.25	7.75	7.45	7.15	6.95
Alkalinity (mg/l CaCO ₃)	-	123.2	120	131.1	131	132.5	82.3
Turbidity (N.T.U.)	-	22	6	2.7	2.5	1.7	3250
Suspended Solids (mg/l)	58.3	66.0	34.5	1.2	6.4	4.0	3583.3
% S.S. combustible	20	8	19	33	81	25	10
Total - P (μg/l)	55	26	22	14	10	10	516
PO ₄ - P (μg/l)	-	17	16	10	6	6	74
NO ₃ - N (μg/l)	-	30	30	94	26	8	74
NH ₄ - N (μg/l)	2	12	103	2	2	4	108
Fe (mg/l)	.34	.73	.42	.08	.05	.03	4.22
Si (mg/l)	8.0	9.8	7.7	10.4	10.3	12.9	10.6
Mg (mg/l)	-	12.6	8.0	6.6	6.2	6.3	11.5
Ca (mg/l)	-	31.2	32.3	34.7	34.5	35.2	3.0
Na (mg/l)	-	8.0	6.9	7.7	8.5	8.6	7.2
K (mg/l)	-	2.2	1.8	1.6	1.6	1.6	-
Flow (m ³ /s)	-	-	6.85	4.35	3.62	2.73	-

Date	2/VI/80	30/VI/80	4/VIII/80	1/IX/80	6/X/80	3/XI/80	1/XII/80
Temp. (°C)	25.9	27.0	23.9	27.3	23.9	25.0	23.0
O ₂ (dissolved)(mg/l)	7.9	7.8	8.8	7.6	8.1	-	8.2
Conductivity (μmho/cm ²)	218	218	175	249	181	177	226
pH	7.3	7.25	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	99.7	109.2	76.4	102.5	94.0	85.3	106.0
Turbidity (N.T.U.)	430	20	130	6.0	88	55	45.0
Suspended Solids (mg/l)	580	23.2	214.0	14.8	112.5	56.0	4.4
% S.S. combustible	9	17	13	61	12	9	0
Total - P (μg/l)	192	22	82	11	70	40	13
PO ₄ - P (μg/l)	46	14	16	0	18	19	6
NO ₃ - N (μg/l)	65	34	32	93	-	126	31
NH ₄ - N (μg/l)	23	10	6	2	22	4	8
Fe (mg/l)	6.18	.33	3.07	.23	1.55	.82	.16
Si (mg/l)	13.9	5.2	9.9	7.6	5.4	12.6	10.2
Mg (mg/l)	7.6	4.7	4.1	4.8	3.5	4.4	4.8
Ca (mg/l)	8.4	25.4	9.3	52.6	28.1	34.2	37.8
Na (mg/l)	9.4	6.3	4.9	6.7	4.6	5.6	6.1
K (mg/l)	5.8	2.2	2.8	2.0	2.3	2.6	1.5

Table A2.1 (cont.)

370

Date	5/I/81	2/II/81	2/III/81	3/IV/81	5/V/81	2/VI/81	13/VII/81
Temp. (°C)	20.1	24.0	27.0	27.0	27.0	26.0	22.5
O ₂ (dissolved)(mg/l)	8.9	-	-	-	-	8.2	8.2
Conductivity (μmho/cm)	225	248	238	249	241	185	120
pH	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	100.2	-	119	-	117	87	-
Turbidity (N.T.U.)	4.6	30	4.2	-	26	1476	-
Suspended Solids (mg/l)	6.0	46.5	7.0	49.3	-	2034	-
% S.S. combustible	50	10	50	17	-	10	-
Total - P (μg/l)	32	19	6	14	14	404	458
PO ₄ - P (μg/l)	8	4*	5	2	2*	60	27
NO ₃ - N (μg/l)	30	15*	10	10	5*	44	34
NH ₄ - N (μg/l)	16	20	20	26	15	66	-
Fe (mg/l)	.09	.05	.10	.08	.26	2.97	3.49
Si (mg/l)	8.4	7.6	9.5	8.0	5.3	16.9	12.8
Mg (mg/l)	4.8	-	6.0	-	6.2	-	-
Ca (mg/l)	34.8	-	41.6	-	49.4	-	-
Na (mg/l)	6.0	-	7.4	-	8.3	-	-
K (mg/l)	1.5	-	2.0	-	2.5	-	-
Flow (m ³ /s)	-	13.71	11.68	-	13.24	-	-

Table A2.2

R. Humuya at Comayagua

			8	56	63	98	126	154
Date	30/X/79	4/XII/79	8/I/80	5/II/80	4/III/80	8/IV/80	6/V/80	3/VI/80
Temp. (°C)	26.2	24.5	23.8	24.5	21.2	25.2	25.5	25.7
O ₂ (dissolved)(mg/l)	-	6.9	7.9	7.8	10.0	8.4	6.1	6.4
Conductivity (µmho/cm)	168	-	355	395	473	462	323	310
pH	7.25	7.6	5.45	7.60	7.35	7.50	7.05	7.35
Alkalinity (mg/l CaCO ₃)	-	106	148	157.5	185	179.4	122.7	96.0
Turbidity (N.T.U.)	-	14	10	19	11	6.9	36	128
Suspended Solids (mg/l)	78.8	50.8	51.2	18.4	11.6	11.9	37.3	130.7
% S.S. combustible	11	13	19	27	26	27	26	27
Total - P (µg/l)	120	57	62	110	92	70	150	216
PO ₄ - P (µg/l)	-	55	38	69	64	46	108	60
NO ₃ - N (µg/l)	-	14	14	76	45	13	31	57
NH ₄ - N (µg/l)	12	24	145	2	0	8	4	28
Fe (mg/l)	.69	.41	.80	.52	.25	.16	.42	1.75
Si (mg/l)	20.6	17.0	14.6	27.0	29.0	36.3	25.6	21.5
Mg (mg/l)	2.8	5.0	9.4	7.0	6.6	7.5	4.6	5.0
Ca (mg/l)	7.2	9.8	19.3	23.2	26.2	29.7	10.2	10.2
Na (mg/l)	10.6	17.8	24.0	22.8	15.8	23.2	21.6	21.1
K (mg/l)	5.6	7.0	9.1	8.9	6.4	9.8	10.0	10.2
Flow (m ³ /s)	-	2.56	1.42	1.25	-	-	4.82	4.59

	182	217	265	280	308	337	370
Date	1/VII/80	5/VIII/80	2/IX/80	7/X/80	4/XI/80	3/XII/80	7/I/81
Temp. (°C)	25.0	24.5	25.6	22.3	24.0	24.0	21.0
O ₂ (dissolved)(mg/l)	6.8	8.2	7.4	9.7	8.6	9.4	8.7
Conductivity (µmho/cm)	290	213	235	180	237	297	308
pH	7.5	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	91.2	40.8	87.6	49.2	78.0	89.0	115.8
Turbidity (N.T.U.)	25	408	24.0	69.5	27.0	68.0	22.0
Suspended Solids (mg/l)	44.0	352.0	11.0	60.0	15.5	32.0	17.5
% S.S. combustible	19	17	16	12	16	14	31
Total - P (µg/l)	56	124	53	65	50	54	93
PO ₄ - P (µg/l)	51	34	32	32	38	34	50
NO ₃ - N (µg/l)	119	12	75	-	52	6	22
NH ₄ - N (µg/l)	12	8	5	20	4	20	27
Fe (mg/l)	.72	3.19	.24	1.08	.49	.57	.36
Si (mg/l)	10.0	13.0	22.0	12.4	22.8	21.0	23.4
Mg (mg/l)	3.9	1.5	4.0	1.9	3.8	5.0	5.1
Ca (mg/l)	9.4	1.6	30.0	12.2	27.5	35.6	37.3
Na (mg/l)	14.2	7.2	18.1	7.0	14.6	21.3	22.0
K (mg/l)	7.0	6.5	7.5	4.6	5.8	7.6	7.8
Flow (m ³ /s)	7.35	-	3.93	-	-	-	3.22

Table A2.3

R. Chiquito

			8	36	62	98	126	154
Date	30/X/79	4/XII/79	8/I/80	5/II/80	4/III/80	8/IV/80	6/V/80	3/VI/80
Temp. (°C)	28.1	23.8	25.0	22.9	28.0	27.9	27.0	27.5
O ₂ (dissolved)(mg/l)	-	6.8	12.6	7.9	10.2	9.0	8.1	8.2
Conductivity (µmho/cm)	230	204	172	197	204	232	245	196
pH	7.15	6.75	8.2	8.35	7.85	7.45	7.45	7.15
Alkalinity (mg/l CaCO ₃)	-	70	79.5	92.5	110	118.1	110.0	89.8
Turbidity (N.T.U.)	-	68	12	12	22	8	14	34
Suspended Solids (mg/l)	69.2	188.7	40.3	17.8	40.6	23.7	22.3	42.3
% S.S. combustible	16	8	19	19	48	35	44	19
Total - P (µg/l)	101	73	47	48	293	141	168	74
PO ₄ - P (µg/l)	-	36	33	29	219	124	107	156
NO ₃ - N (µg/l)	-	83	102	133	32	26	48	48
NH ₄ - N (µg/l)	73	30	189	0	474	147	157	58
Fe (mg/l)	.53	1.79	1.15	.54	.40	.35	.20	.48
Si (mg/l)	8.8	8.9	8.6	11.4	10.6	13.1	11.8	10.8
Mg (mg/l)	6.6	7.9	8.0	6.7	6.6	7.6	6.6	6.2
Ca (mg/l)	18.4	8.2	14.2	18.4	24.7	26.6	24.6	25.0
Na (mg/l)	4.6	3.7	4.1	4.4	7.6	6.6	5.5	5.0
K (mg/l)	1.1	1.6	0.9	0.9	1.8	1.4	1.2	1.2
Flow (m ³ /s)	1.16	2.75	1.03	1.35	.46	.55	.80	1.12

		182	217	245	280	308	338	341
Date	1/VII/80	5/VIII/80	2/IX/80	7/X/80	4/XI/80	4/XII/80	7/I/81	
Temp. (°C)	25.0	26.0	27.0	22.1	24.1	23.0	21.0	
O ₂ (dissolved)(mg/l)	8.6	8.6	8.6	7.8	8.2	9.4	8.2	
Conductivity (µmho/cm)	280	367	202	208	202	179	173	
pH	7.65	-	-	-	-	-	-	
Alkalinity (mg/l CaCO ₃)	97.0	98.1	100.0	79.3	86.1	116.0	78.0	
Turbidity (N.T.U.)	18	17	10.2	164.0	15	103.6	28	
Suspended Solids (mg/l)	24.7	33.0	16.3	158.0	14.0	28.0	32.7	
% S.S. combustible	38	48	47	9	28	32	37	
Total - P (µg/l)	180	99	125	119	89	85	109	
PO ₄ - P (µg/l)	126	64	84	19	74	82	74	
NO ₃ - N (µg/l)	132	56	152	-	186	74	98	
NH ₄ - N (µg/l)	422	69	15	22	108	172	174	
Fe (mg/l)	.43	.89	.26	3.82	.27	.23	.54	
Si (mg/l)	5.4	9.6	10.8	7.6	11.3	10.8	10.2	
Mg (mg/l)	6.6	6.4	6.6	5.7	5.6	5.8	5.1	
Ca (mg/l)	24.4	17.8	49.5	22.2	30.0	30.3	24.9	
Na (mg/l)	5.5	4.9	6.0	3.4	4.8	4.8	4.0	
K (mg/l)	1.2	1.1	1.2	1.8	.8	1.0	1.0	
Flow (m ³ /s)	.76	1.18	.31	4.15	1.66	1.25	1.74	

Table A2.4

R. Humuya at Ojos de Agua

			8	23	78	126	154
Date	30/X/79	4/XII/79	8/I/80	4/III/80	8/IV/80	6/V/80	3/VI/80
Temp. (°C)	26.4	24.6	24.2	25.2	27.1	29.9	29.4
O ₂ (dissolved)(mg/l)	-	8.6	7.9	9.1	8.3	8.6	6.6
Conductivity (µmho/cm)	239	152	213	244	315	276	239
pH	7.55	6.2	7.85	8.30	7.75	7.35	7.25
Alkalinity (mg/l CaCO ₃)	-	70	86.2	103.5	124.3	103.1	95.0
Turbidity (N.T.U.)	-	58	8	5.3	4.2	35	104
Suspended Solids (mg/l)	67.4	90.7	30.3	10.8	8.8	46.3	166.3
% S.S. combustible	15	8	19	52	16	42	11
Total - P (µg/l)	91	52	27	26	23	86	121
PO ₄ - P (µg/l)	-	37	12	17	12	14	70
NO ₃ - N (µg/l)	-	93	27	18	2	8	56
NH ₄ - N (µg/l)	10	12	148	0	2	7	10
Fe (mg/l)	.74	1.20	.47	.12	.11	.44	1.06
Si (mg/l)	14.0	9.6	7.0	14.2	19.4	17.9	18.2
Mg (mg/l)	4.3	5.0	6.5	5.1	6.4	5.7	5.0
Ca (mg/l)	15.4	9.8	21.8	23.7	27.6	17.2	14.0
Na (mg/l)	8.1	7.2	9.0	13.6	18.4	15.3	12.1
K (mg/l)	3.5	3.0	2.8	3.5	5.0	4.6	5.0
Flow (m ³ /s)	-	-	6.59	2.77	3.16	6.15	-

Date	1/VII/80	5/VIII/80	2/IX/80	7/X/80	4/XI/80	2/XII/80	7/I/81
Temp. (°C)	27.6	25.5	28.2	23.4	24.8	22.8	23.0
O ₂ (dissolved)(mg/l)	8.2	8.2	8.2	10.7	8.4	8.8	9.6
Conductivity (µmho/cm)	299	165	202	207	410	264	210
pH	7.70	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	84.7	68.5	76.1	71.0	94.0	88.0	87.1
Turbidity (N.T.U.)	24	224	22.0	104	34	15.4	7.6
Suspended Solids (mg/l)	21.6	358.0	19.8	115.3	31.0	11.3	8.8
% S.S. combustible	15	13	15	14	29	18	23
Total - P (µg/l)	48	165	36	100	38	26	42
PO ₄ - P (µg/l)	44	39	20	30	26	18	22
NO ₃ - N (µg/l)	108	25	88	-	142	49	73
NH ₄ - N (µg/l)	4	18	10	19	5	14	20
Fe (mg/l)	.54	4.38	.26	.89	.24	.22	.20
Si (mg/l)	10.1	15.8	15.8	15.1	18.2	14.4	12.7
Mg (mg/l)	3.8	3.6	4.5	2.6	4.0	4.2	3.9
Ca (mg/l)	13.0	5.2	51.2	19.5	35.7	34.8	27.3
Na (mg/l)	9.6	8.2	10.7	5.8	7.9	9.2	8.8
K (mg/l)	4.2	6.1	4.4	3.5	3.4	3.0	2.9
Flow (m ³ /s)	-	-	-	-	-	-	-

Table A2.5

R. Humuya at Yure confluence

Date	5/XI/79	10/XII/79	14/I/80	11/II/80	10/III/80	15/IV/80	12/V/80	9/VI/80
Temp. (°C)	24.8	25.4	26.0	28.0	28.9	25.1	30.1	25.9
O ₂ (dissolved)(mg/l)		7.8	12.1	7.4	8.9	8.1	7.3	7.1
Conductivity (µmho/cm)	246	218	239	255	284	417	280	235
pH	7.75	7.4	8.10	8.10	8.05	7.75	7.15	7.50
Alkalinity (mg/l CaCO ₃)	-	87.0	98	115	104.8	118.8	113	85
Turbidity (N.T.U.)	-	8	3.8	2.3	1.9	11	21	200
Suspended Solids (mg/l)	50.1	40.0	21.4	2.0	2.8	19.2	29.6	238.0
% S.S. combustible	22	20	21	0.0	44	25	38	10
Total - P (µg/l)	42	35	16	20	18	36	54	154
PO ₄ - P (µg/l)	-	25	11	14	12	16	10	64
NO ₃ - N (µg/l)	-	64	4	66	14	18	6	56
NH ₄ - N (µg/l)	8	37	116	0	0	1	0	14
Fe (mg/l)	.16	.19	.16	.11	.04	.20	.22	2.31
Si (mg/l)	-	16.4	7.8	12.0	13.4	17.2	19.4	16.4
Mg (mg/l)	4.7	6.4	7.2	5.2	5.8	6.3	5.5	5.1
Ca (mg/l)	18.2	13.6	26.8	27.5	23.2	26.9	17.1	9.1
Na (mg/l)	9.6	9.4	10.2	13.3	16.2	17.8	15.1	9.7
K (mg/l)	3.4	3.0	3.0	3.4	3.9	5.2	4.9	5.5
Flow (m ³ /s)	-	-	-	1.75	3.60	2.60	2.60	-

Date	7/VII/80	11/VIII/80	8/IX/80	13/X/80	10/XI/80	9/XII/80	13/I/81
Temp. (°C)	26.3	27.1	28.1	23.1	23.3	24.2	20.5
O ₂ (dissolved)(mg/l)	7.9	8.0	8.1	8.0	8.5	8.9	9.1
Conductivity (µmho/cm)	226	362	498	224	205	245	250
pH	7.75	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	107.4	73.8	107.3	65.8	79.0	94.8	93.8
Turbidity (N.T.U.)	152	130	27	75	37	6.4	3.8
Suspended Solids (mg/l)	718.8	140.5	28.7	73.0	46.7	7.5	-
% S.S. combustible	10	3	16	11	6	10	-
Total - P (µg/l)	236	108	43	73	50	14	34
PO ₄ - P (µg/l)	44	40	19	5	28	17	18
NO ₃ - N (µg/l)	104	44	130	-	187	62	15
NH ₄ - N (µg/l)	30	11	0	15	6	14	20
Fe (mg/l)	3.09	.66	.25	1.58	.66	.14	.10
Si (mg/l)	7.9	15.2	15.2	11.7	16.4	15.7	12.8
Mg (mg/l)	7.8	3.5	5.0	2.1	4.0	4.4	4.4
Ca (mg/l)	8.9	8.0	41.5	15.4	37.2	35.0	32.2
Na (mg/l)	11.4	7.4	11.2	6.0	7.5	9.6	9.6
K (mg/l)	8.1	4.1	4.2	2.6	3.0	3.1	3.0
Flow (m ³ /s)	-	-	21.46	-	-	25.33	-

Table A2.6

R. Humuya at Sulaco confluence

				15	63	70	106	133
Date	21/IX/79	6/XI/79	11/XII/79	15/I/80	12/II/80	11/III/80	16/IV/80	13/V/80
Temp. (°C)	-	25.5	25.4	25.0	26.5	27.1	23.6	29.7
O ₂ (dissolved)(mg/l)	-	-	8.0	7.9	7.6	8.0	9.1	7.6
Conductivity (µmho/cm)	-	230	196	260	250	265	320	297
pH	8.25	7.85	7.85	6.75	7.75	8.7	7.15	7.05
Alkalinity (mg/l CaCO ₃)	-	-	79.0	92.7	101	101.1	119.2	105
Turbidity (N.T.U.)	-	-	8	3.6	2.4	1.7	7.7	12
Suspended Solids (mg/l)	96.8	51.7	21.6	4.6	2.6	3.0	14.2	15.3
% S.S. combustible	15	25	20	-	77	53	31	32
Total - P (µg/l)	59.8	44	34	18	30	24	28	34
PO ₄ - P (µg/l)	68	-	26	13	14	13	12	10
NO ₃ - N (µg/l)	-	-	68	3	70	12	18	11
NH ₄ - N (µg/l)	6	8	37	134	2	0	1	0
Fe (mg/l)	0.62	0.26	0.22	0.17	0.04	0.04	0.15	0.15
Si (mg/l)	12.8	12.8	9.6	9.2	10.7	13.5	17.1	18.1
Mg (mg/l)	3.0	4.4	5.1	6.5	4.8	5.2	6.0	4.9
Ca (mg/l)	11.6	17.3	14.0	23.1	24.2	24.3	26.8	17.3
Na (mg/l)	6.6	9.0	8.6	9.8	12.8	14.2	17.5	14.8
K (mg/l)	3.0	3.2	2.9	3.0	3.5	3.8	5.0	4.5
Flow (m ³ /s) *	57.8	33.4	28.3	14.5	8.8	5.6	5.6	4.4

		161	189	224	237	247	255	342	379
Date	10/VI/80	8/VII/80	12/VIII/80	9/IX/80	14/X/80	11/XI/80	8/XII/80	14/I/81	
Temp. (°C)	29.0	27.2	25.3	26.7	24.4	23.0	24.2	21.0	
O ₂ (dissolved)(mg/l)	-	8.2	10.9	8.1	9.4	9.0	8.5	9.2	
Conductivity (µmho/cm)	202	353	159	213	208	211	227	240	
pH	7.35	7.15	-	-	-	-	-	-	
Alkalinity (mg/l CaCO ₃)	76.8	85.7	67.2	92.2	67.1	75.5	90.3	84.8	
Turbidity (N.T.U.)	96	570	1008	366	54	26	3.4	3.5	
Suspended Solids (mg/l)	166.0	745.0	1166.0	620.0	60.8	23.1	9.3	-	
% S.S. combustible	10	12	10	14	8	15	4	-	
Total - P (µg/l)	114	229	291	184	67	42	20	35	
PO ₄ - P (µg/l)	46	58	29	24	2	28	14	18	
NO ₃ - N (µg/l)	62	91	68	74	-	166	38	22	
NH ₄ - N (µg/l)	7	41	28	10	17	2	13	20	
Fe (mg/l)	2.08	3.04	1.16	3.48	1.90	0.42	0.15	0.10	
Si (mg/l)	15.7	9.8	12.6	16.7	19.6	16.3	15.4	13.2	
Mg (mg/l)	4.4	6.4	6.6	-	0.7	-	4.2	4.0	
Ca (mg/l)	9.6	5.8	2.2	-	4.7	-	34.8	28.2	
Na (mg/l)	9.1	9.6	7.0	-	3.5	-	9.6	9.0	
K (mg/l)	4.4	8.8	6.8	-	2.0	-	3.1	3.0	
Flow (m ³ /s) *	21.5	27.7	69.0	59.6	78.3	57.8	27.7	19.1	

Table A2.6 (cont.)

	393	406	421	441	449	477	492	505
Date	28/I/81	10/II/81	25/II/81	11/III/81	25/III/81	22/IV/81	7/V/81	20/V/81
Temp. (°C)	25.0	27.5	24.0	28.5	26.6	26.4	28.0	29.0
O ₂ (dissolved)(mg/l)	8.8	-	-	-	-	-	-	9.0
Conductivity (µmho/cm)	250	263	207	256	232	245	267	261
pH	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	95.8	89.9	76.0	94.6	91.7	95	92	100.0
Turbidity (N.T.U.)	3.8	4.3	6.3	3.2	15.7	11	8.4	4.2
Suspended Solids (mg/l)	6.9	-	7.6	5.5	19.5	8.3	12.8	12.0
% S.S. combustible	25	-	44	27	15	56	20	4.0
Total - P (µg/l)	10	36	43	24	46	22	18	13
PO ₄ - P (µg/l)	6	18	34	16	34	11	6	6
NO ₃ - N (µg/l)	8	6	64	10	38	14	4	5
NH ₄ - N (µg/l)	26	17	24	25	28	19	18	19
Fe (mg/l)	0.11	0.22	0.16	0.15	0.18	0.16	0.12	0.12
Si (mg/l)	14.1	6.9	14.8	9.6	15.7	12.0	14.6	13.6
Mg (mg/l)	5.2	-	4.2	-	-	4.8	5.6	5.0
Ca (mg/l)	34.5	-	27.4	-	-	34.7	37.7	36.6
Na (mg/l)	9.4	-	10.4	-	-	12.8	15.8	15.5
K (mg/l)	2.2	-	3.9	-	-	3.9	4.6	4.4
Flow (m ³ /s) *	12.3	11.0	14.5	8.4	8.4	6.4	9.7	3.9

	522	539	546	554	562	568	572	583
Date	6/VI/81	23/VI/81	30/VI/81	8/VII/81	16/VII/81	22/VII/81	31/VII/81	6/VIII/81
Temp. (°C)	24.8	25.0	23.5	26.8	24.5	24.2	23.2	23.5
O ₂ (dissolved)(mg/l)	7.7	-	8.5	7.8	8.4	7.9	6.7	8.0
Conductivity (µmho/cm)	166	125	268	191	168	166	188	218
pH	-	-	-	-	-	7.8	-	-
Alkalinity (mg/l CaCO ₃)	84.6	55.5	48.2	68.0	55	65	61	77
Turbidity (N.T.U.)	1344	1220	100	37	70	176	142	36
Suspended Solids (mg/l)	2170	1804	725	24.9	81.5	1164	173.0	24.3
% S.S. combustible	9	4	9	23	10	9	1	21
Total - P (µg/l)	408	164	92	140	107	332	138	-
PO ₄ - P (µg/l)	71	51	40	46	52	43	34	-
NO ₃ - N (µg/l)	73	44	116	46	38	32	43	-
NH ₄ - N (µg/l)	60	60	26	-	-	-	-	-
Fe (mg/l)	2.11	2.93	1.10	0.62	0.38	4.128	0.96	-
Si (mg/l)	18.0	15.7	16.0	18.2	16.8	15.6	13.9	-
Mg (mg/l)	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-
Flow (m ³ /s) *	54.4	189	154	48.0	69.0	69.0	40.3	32.3

Table A2.6 (cont.)

	589	597	618	638	645	652	659	666
Date	12/VIII/81	20/VIII/81	10/IX/81	30/IX/81	7/X/81	14/X/81	21/X/81	28/X/81
Temp. (°C)	22.5	24.9	24.1	24.0	22.0	24.2	21.5	22.0
O ₂ (dissolved)(mg/l)	9.0	8.3	-	6.4	9.4	8.8	8.6	8.7
Conductivity (μmho/cm)	139	143	156	318	163	208	236	212
pH	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	62	65	70	51	58	57	89	117.5
Turbidity (N.T.U.)	780	250	330	564	186	80	48	1970
Suspended Solids (mg/l)	1410.0	420.0	482.0	1024.0	864.0	96.5	49.3	5320.0
% S.S. combustible	10	11	10	10	8	9	6	10
Total - P (μg/l)	68	218	214	295	263	80	61	284
PO ₄ - P (μg/l)	43	35	63	41	32	36	33	70
NO ₃ - N (μg/l)	35	48	45	56	26	47	51	89
NH ₄ - N (μg/l)	-	-	20	36	20	10	9	109
Fe (mg/l)	2.59	1.55	0.38	2.47	1.78	0.61	0.66	2.50
Si (mg/l)	13.7	15.5	5.3	10.6	13.8	16.6	4.0	23.9
Mg (mg/l)	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-
Flow (m ³ /s) *	136	108	131	140	137	102	63.2	186

	673	680	687	696	701	708	715	
Date	4/XI/81	11/XI/81	18/XI/81	25/XI/81	2/XII/81	9/XII/81	16/XII/81	24/III/82 14/IV/82
Temp. (°C)	20.5	20.0	21.3	21.0	23.0	19.3	19.4	22.8 21.8
O ₂ (dissolved)(mg/l)	9.1	9.0	9.1	9.4	7.8	9.2	9.4	9.4 10.8
Conductivity (μmho/cm)	208	246	244	266	273	276	353	338 305
pH	-	-	-	-	-	-	-	- -
Alkalinity (mg/l CaCO ₃)	83.8	89	92.8	97.0	105	77	86	99 95
Turbidity (N.T.U.)	52	13	10	6.2	5	15	6	3 4
Suspended Solids (mg/l)	52.5	18.7	9.3	8.2	9.8	15.7	23.3	- -
% S.S. combustible	7	14	21	43	23	17	29	- -
Total - P (μg/l)	74	48	46	27	33	42	27	24 22
PO ₄ - P (μg/l)	30	32	24	2	20	30	5	7 5
NO ₃ - N (μg/l)	26	140	32	10	8	34	30	13 13
NH ₄ - N (μg/l)	24	14	13	9	22	25	8	3 40
Fe (mg/l)	.19	.34	.14	.01	.01	.05	.07	.03 .09
Si (mg/l)	11.0	9.5	6.6	10.2	10.6	6.6	11.6	12.6 14.6
Mg (mg/l)	-	-	-	-	-	-	-	- -
Ca (mg/l)	-	-	-	-	-	-	-	- -
Na (mg/l)	-	-	-	-	-	-	-	- -
K (mg/l)	-	-	-	-	-	-	-	- -
Flow (m ³ /s) *	59.6	38.5	28.8	22.4	20.7	35.6	21.5	7.0 5.1

Table A2.7

R. Sulaco at Humuya confluence

Date	11/XII/79	15/I/80	12/II/80	11/III/80	16/IV/80	13/V/80	10/VI/80	8/VII/80	8/XII/80
Temp. (°C)	25.2	24.9	26.1	27.8	24.6	30.0	26.3	27.3	24.4
O ₂ (dissolved)(mg/l)	7.9	7.6	7.7	7.3	8.2	8.4	9.9	7.7	8.8
Conductivity (μmho/cm)	266	309	274	327	293	297	150	349	253
pH	7.55	7.4	7.25	7.10	7.45	7.60	7.25	7.65	-
Alkalinity (mg/l CaCO ₃)	127.0	131.8	133	133.1	135.8	146.5	64.3	92.4	116.9
Turbidity (N.T.U.)	36	4.8	2.7	1.6	1.5	54	222	224	6.0
Suspended Solids (mg/l)	75.4	6.4	5.2	1.8	1.9	112.5	418	289	15.3
% S.S. combustible	14	-	58	44	90	9	11	10	7
Total - P (μg/l)	45	9	21	10	6	56	166	144	14
PO ₄ - P (μg/l)	16	7	7	11	2	20	28	26	6
NO ₃ - N (μg/l)	44	9	78	17	24	26	34	68	54
NH ₄ - N (μg/l)	37	155	6	1	0	0	14	23	16
Fe (mg/l)	.54	.17	.05	.02	.04	.47	4.46	2.73	.21
Si (mg/l)	11.2	9.2	10.2	10.6	12.1	13.3	12.1	7.6	11.1
Mg (mg/l)	11.9	12.0	6.9	6.8	6.7	7.0	5.0	4.9	5.4
Ca (mg/l)	32.0	40.2	36.0	36.9	38.7	32.0	4.8	10.2	41.2
Na (mg/l)	7.7	7.8	8.6	9.2	9.6	9.8	6.4	7.0	7.2
K (mg/l)	2.3	1.7	1.7	1.8	1.8	3.3	6.1	4.4	1.8
Flow (m ³ /s) *	53.2	22.6	15.8	11.6	8.9	10.2	-	40.9	36.5

Date	14/I/81	28/I/81	10/II/81	25/II/81	11/III/81	25/III/81	22/IV/81	7/V/81	20/V/81
Temp. (°C)	21.5	24.0	26.4	24.0	28.3	26.2	26.2	29.0	29.4
O ₂ (dissolved)(mg/l)	8.9	8.8	-	-	-	-	-	-	9.5
Conductivity (μmho/cm)	266	267	259	262	261	270	243	254	252
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	128.2	125.2	121.7	125.8	124.8	137	111	126	125
Turbidity (N.T.U.)	3.8	3.3	1.9	33.0	2.8	3.8	18	6	6
Suspended Solids (mg/l)	4.3	5.7	10.6	32.5	5.3	6.0	19.0	15.5	12.3
% S.S. combustible	12	20	8	28	25	43	32	27	14
Total - P (μg/l)	27	24	8	23	2	8	19	18	7
PO ₄ - P (μg/l)	6	24	4	10	2	3	2	2	4
NO ₃ - N (μg/l)	16	23	14	33	14	6	8	11	11
NH ₄ - N (μg/l)	22	18	22	26	20	22	20	20	22
Fe (mg/l)	.12	.11	.10	.34	.18	.06	.23	.15	.14
Si (mg/l)	9.6	9.6	7.2	11.1	7.5	7.2	8.3	8.2	8.0
Mg (mg/l)	5.4	5.1	-	6.2	-	-	5.8	6.3	6.4
Ca (mg/l)	42.3	34.4	-	40.3	-	-	44.1	47.2	42.7
Na (mg/l)	7.0	9.5	-	7.8	-	-	8.6	9.2	9.5
K (mg/l)	1.6	2.4	-	2.9	-	-	2.5	2.4	2.2
Flow (m ³ /s) *	25.6	19.9	17.9	19.9	14.5	12.4	15.2	14.5	9.3

Table A2.7 (cont.)

Date	21/X/81	28/X/81	25/XI/81	2/XII/81	16/XII/81
Temp. (°C)	22.0	23.6	20.5	23.3	20.0
O ₂ (dissolved)(mg/l)	8.7	10.9	9.3	8.8	8.6
Conductivity (µmho/cm)	296	212	300	293	259
pH	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	134.7	105.3	132.9	109	132
Turbidity (N.T.U.)	42	258	5.2	5	7
Suspended Solids (mg/l)	49.7	366	8.3	12.0	20.3
% S.S. combustible	8	14	27	17	21
Total - P (µg/l)	31	99	14	10	14
PO ₄ - P (µg/l)	10	21	9	1	8
NO ₃ - N (µg/l)	45	75	6	8	6
NH ₄ - N (µg/l)	10	15	16	10	5
Fe (mg/l)	.31	.87	.03	.01	.45
Si (mg/l)	7.4	9.4	6.4	6.2	6.3
Mg (mg/l)	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-
Na (mg/l)	-	-	-	-	-
K (mg/l)	-	-	-	-	-
Flow (m ³ /s) *	67.9	97.2	33.2	29.9	28.2

Table A2.8

R. Humuya at El Cajón

Date	21/IX/79	22/IX/79	11/X/79	19/X/79	25/X/79	2/XI/79	9/XI/79	16/XI/79	23/XI/79
Temp. (°C)	26.7	27.9	24.1	25.8	25.5	27.0	24.3	20.9	25.2
O ₂ (dissolved)(mg/l)	-	-	-	-	-	-	-	-	8.4
Conductivity (µmho/cm)	160	206	209	216	222	245	257	233	264
pH	-	8.15	8.65	8.35	7.9	8.35	7.95	6.45	7.45
Alkalinity (mg/l CaCO ₃)	-	-	-	-	-	-	-	-	119
Turbidity (N.T.U.)	-	-	-	-	-	-	-	-	16
Suspended Solids (mg/l)	181.4	640.2	2007.1	555.9	206.5	82.4	46.6	205.7	100.0
% S.S. combustible	14	11	7	9	7	20	24	10	20
Total - P (µg/l)	92	232	512	156	84	64	46	80	23
PO ₄ - P (µg/l)	-	-	-	-	-	-	-	-	-
NO ₃ - N (µg/l)	-	-	-	-	-	-	-	-	-
NH ₄ - N (µg/l)	10	21	52	22	38	1	28	17	0
Fe (mg/l)	1.28	2.53	2.56	2.61	2.22	.41	.37	1.18	.26
Si (mg/l)	12.0	-	12.2	13.4	12.0	12.3	6.8	5.2	10.0
Mg (mg/l)	5.0	7.0	8.0	5.8	5.4	6.2	6.2	6.2	6.1
Ca (mg/l)	20.0	17.4	9.1	9.7	14.6	25.4	27.5	27.6	28.0
Na (mg/l)	7.8	8.8	9.6	9.0	8.2	8.2	8.3	7.2	8.3
K (mg/l)	3.4	6.6	16.4	8.2	4.7	2.7	2.6	4.0	2.4
Flow (m ³ /s) *	184.8	234.4	1397.8	283.3	210.4	114.2	101.4	150.3	84.2

Date	30/XI/79	7/XII/79	14/XII/79	19/XII/79	27/XII/79	3/I/80	10/I/80	18/I/80	24/I/80
Temp. (°C)	24.5	26.5	25.9	25.5	24.1	24.7	25.2	25.9	24.8
O ₂ (dissolved)(mg/l)	8.1	8.0	7.8	8.0	8.3	7.8	7.8	7.7	8.0
Conductivity (µmho/cm)	253	234	237	252	247	253	164	268	266
pH	7.8	7.6	7.25	8.15	7.85	7.95	7.25	7.55	7.75
Alkalinity (mg/l CaCO ₃)	149	105	109	142	112	125	116	121	123
Turbidity (N.T.U.)	174	39	19	225	14	5	6	6	4.5
Suspended Solids (mg/l)	253.2	85.2	51.2	353.2	52.6	20.1	34.2	5.0	8.6
% S.S. combustible	10	12	13	8	12	22	17	-	22
Total - P (µg/l)	75	50	24	66	14	14	13	14	12
PO ₄ - P (µg/l)	38	21	23	27	18	10	9	7	8
NO ₃ - N (µg/l)	40	100	33	48	28	10	7	14	14
NH ₄ - N (µg/l)	16	29	10	10	28	116	91	64	11
Fe (mg/l)	1.19	.66	.31	1.31	.21	.23	.20	.19	.15
Si (mg/l)	10.2	12.6	6.8	8.5	10.4	9.2	8.6	10.2	10.2
Mg (mg/l)	7.8	8.0	7.7	10.8	8.3	9.0	9.4	5.6	6.0
Ca (mg/l)	32.2	20.8	23.5	32.5	29.0	32.2	33.4	33.4	33.1
Na (mg/l)	8.4	7.9	8.1	7.8	7.9	8.6	8.4	9.2	9.6
K (mg/l)	4.6	2.6	2.6	5.4	2.2	2.3	2.2	2.3	2.4
Flow (m ³ /s) *	87.9	80.3	74.2	108.0	58.2	46.1	47.1	36.7	32.0

Table A2.8 (cont.)

	35	38	46	52	55	75	78	80	82
Date	2/11/80	8/11/80	15/11/80	22/11/80	29/11/80	7/11/80	14/11/80	21/11/80	27/11/80
Temp. (°C)	26.2	22.7	27.2	26.5	27.8	28.8	28.7	26.9	28.5
O ₂ (dissolved)(mg/l)	8.2	8.3	7.4	7.4	7.9	7.2	8.6	7.5	7.9
Conductivity (µmho/cm)	278	283	274	279	269	267	309	285	278
pH	7.9	7.3	7.65	7.75	7.60	6.75	7.65	6.30	7.45
Alkalinity (mg/l CaCO ₃)	124.5	125.4	128	132	129.7	124	123.8	125.6	121.8
Turbidity (N.T.U.)	3.8	2.6	2.4	2.6	1.8	1.8	2.2	2.0	2.0
Suspended Solids (mg/l)	6.0	2.4	2.6	1.0	3.2	6.6	4.2	3.0	3.7
% S.S. combustible	0	17	38	100	62	67	14	47	42
Total - P (µg/l)	16	16	17	7	12	15	16	16	14
PO ₄ - P (µg/l)	4	11	10	7	6	10	6	4	2
NO ₃ - N (µg/l)	7	4	4	0	14	11	16	0	43
NH ₄ - N (µg/l)	0	2	3	0	0	0	0	0	3
Fe (mg/l)	.11	.15	.12	.05	.03	.03	.05	.05	.04
Si (mg/l)	11.8	17.8	11.8	12.2	12.0	11.0	12.4	13.1	11.8
Mg (mg/l)	6.4	4.6	6.4	6.6	6.8	6.2	6.6	-	7.1
Ca (mg/l)	32.7	10.4	34.1	33.1	31.6	32.8	31.6	-	29.5
Na (mg/l)	9.8	9.6	9.6	10.0	11.1	10.3	11.0	-	12.1
K (mg/l)	2.4	3.8	2.4	2.6	2.6	2.5	2.6	-	2.8
Flow (m ³ /s) *	26.6	26.0	22.9	20.7	20.9	18.9	15.8	14.9	13.9

Date	5/IV/80	10/IV/80	16/IV/80	25/IV/80	1/V/80	8/V/80	16/V/80	22/V/80	30/V/80
Temp. (°C)	29.0	27.0	25.3	26.0	30.2	30.4	29.6	30.8	28.8
O ₂ (dissolved)(mg/l)	8.7	8.5	8.1	8.6	8.3	7.2	8.6	7.8	7.2
Conductivity (µmho/cm)	277	280	615	272	251	253	301	265	241
pH	7.30	7.25	7.15	7.40	7.25	7.05	8.25	7.3	7.3
Alkalinity (mg/l CaCO ₃)	124.8	125.0	129.7	120.8	114.6	117.8	136	131.9	117
Turbidity (N.T.U.)	5.7	2	5.5	10	12	100	38	28	312
Suspended Solids (mg/l)	10.0	4.9	8.0	21.7	11.6	113.7	36.5	26.4	342.0
% S.S. combustible	23	28	41	18	36	16	22	17	11
Total - P (µg/l)	17	14	20	30	22	80	36	26	162
PO ₄ - P (µg/l)	6	1	7	10	3	31	14	6	56
NO ₃ - N (µg/l)	6	0	12	24	15	77	20	10	67
NH ₄ - N (µg/l)	0	0	0	0	8	6	0	9	33
Fe (mg/l)	.09	.04	.13	.25	.09	.99	.45	.34	4.08
Si (mg/l)	14.9	14.3	15.0	13.1	12.3	14.8	13.7	14.3	13.7
Mg (mg/l)	6.5	6.5	6.7	6.0	5.5	6.2	6.8	6.8	6.7
Ca (mg/l)	30.3	32.4	37.6	26.8	25.5	16.2	24.6	23.5	9.9
Na (mg/l)	12.6	12.6	13.0	10.6	10.0	10.2	12.6	12.6	9.1
K (mg/l)	2.8	2.8	3.1	2.8	2.8	4.9	3.6	3.4	5.5
Flow (m ³ /s) *	13.0	13.0	14.5	14.8	13.9	20.1	13.1	-	-

Table A2.8 (cont.)

Date	6/VI/80	12/VI/80	20/VI/80	26/VI/80	3/VII/80	10/VII/80	17/VII/80	25/VII/80	1/VIII/80
Temp. (°C)	26.0	26.4	26.0	26.0	28.9	25.7	27.3	23.9	-
O ₂ (dissolved)(mg/l)	7.8	8.2	8.9	7.6	8.1	7.5	7.0	7.7	-
Conductivity (μmho/cm)	268	275	334	203	236	177	317	133	-
pH	7.40	7.50	7.80	7.3	7.75	7.75	7.80	6.9	-
Alkalinity (mg/l CaCO ₃)	87.0	82.0	91.0	92.8	111.2	82	88.7	-	-
Turbidity (N.T.U.)	960	840	760	68.0	308	376	6.5	-	-
Suspended Solids (mg/l)	794.0	1226.0	967.0	74.0	283.0	474.0	73.0	-	115.0
% S.S. combustible	10	9	10	7	7	11	12	-	17
Total - P (μg/l)	472	296	276	60	136	180	88	196	90
PO ₄ - P (μg/l)	48	40	56	37	18	42	35	36	26
NO ₃ - N (μg/l)	78	65	86	123	74	53	72	43	49
NH ₃ - N (μg/l)	38	26	30	10	18	19	35	2	10
Fe (mg/l)	6.44	5.88	6.38	1.16	1.83	2.68	.14	.74	1.75
Si (mg/l)	19.1	15.1	16.1	7.6	7.9	7.0	11.8	12.7	13.5
Mg (mg/l)	8.3	7.0	9.5	4.4	6.8	5.3	4.4	4.7	4.5
Ca (mg/l)	5.3	5.2	5.9	19.2	16.0	7.7	18.5	5.6	13.3
Na (mg/l)	8.2	6.8	9.2	7.1	8.8	7.1	7.0	6.8	6.8
K (mg/l)	12.4	8.8	8.2	3.4	4.7	5.2	3.2	6.6	3.4
Flow (m ³ /s) *	-	-	-	-	53.2	87.7	80.1	287.0	168.9

Date	8/VIII/80	15/VIII/80	21/VIII/80	27/VIII/80	4/IX/80	12/IX/80	19/IX/80	26/IX/80	2/X/80
Temp. (°C)	26.1	28.1	26.6	28.7	27.3	22.8	24.0	25.7	26.3
O ₂ (dissolved)(mg/l)	8.3	8.5	7.7	7.2	7.1	8.9	8.1	8.7	10.8
Conductivity (μmho/cm)	192	173	169	217	219	114	-	392	310
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	84.5	86.0	92.7	94.8	100.7	66.5	81.0	90.1	97.0
Turbidity (N.T.U.)	104	126.0	402	34	126.0	328	126	232	820
Suspended Solids (mg/l)	107.0	1528.0	488.0	41.0	147.0	1846.6	164.0	287.0	1034.0
% S.S. combustible	7	13	10	13	13	8	8	10	9
Total - P (μg/l)	57	253	192	42	90	356	112	128	268
PO ₄ - P (μg/l)	25	67	25	22	16	26	34	21	32
NO ₃ - N (μg/l)	65	54	50	115	124	85	-	-	-
NH ₄ - N (μg/l)	6	42	32	10	16	41	22	28	46
Fe (mg/l)	.66	1.21	10.56	.62	.96	1.63	1.82	1.31	1.55
Si (mg/l)	12.6	11.9	13.6	14.3	12.2	16.4	10.6	15.4	15.2
Mg (mg/l)	3.0	6.7	-	4.7	-	16.8	3.7	4.6	-
Ca (mg/l)	12.6	4.8	-	38.8	-	56.2	29.5	34.4	-
Na (mg/l)	6.8	7.6	-	8.1	-	11.0	6.4	7.0	-
K (mg/l)	3.1	7.2	-	3.4	-	21.4	3.7	2.9	-
Flow (m ³ /s) *	129.7	100.1	218.2	88.1	66.4	1294.	267.2	116.8	238

Table A2.8 (cont.)

Date	8/X/80	28/I/81	10/II/81	17/II/81	25/II/81	4/III/81	11/III/81	18/III/81
Temp. (°C)	23.0	25.0	27.0	27.0	24.5	28.0	28.5	26.8
O ₂ (dissolved)(mg/l)	8.6	8.5	8.4	-	8.6	-	-	8.0
Conductivity (µmho/cm)	324	256	248	243	235	241	254	248
pH	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	87.0	115.2	108.7	116.5	98.1	112.0	112.5	110
Turbidity (N.T.U.)	184	3.4	4.8	43	22.5	5.3	3.1	4
Suspended Solids (mg/l)	216.0	6.3	6.5	7.0	23.7	9.3	5.7	7.7
% S.S. combustible	10	20	69	52	30	4.3	18	22
Total - P (µg/l)	125	18	18	22	30	26	16	13
PO ₄ - P (µg/l)	25	14	7	8	22	6	8.	10
NO ₃ - N (µg/l)	-	10	30	12	29	11	14	7
NH ₄ - N (µg/l)	20	22	33	34	39	24	20	48
Fe (mg/l)	2.87	.11	.13	.05	.29	.15	.18	.10
Si (mg/l)	10.0	11.0	8.8	11.4	12.2	9.6	9.7	10.4
Mg (mg/l)	3.9	5.3	-	6.0	5.5	-	-	5.7
Ca (mg/l)	31.2	34.5	-	38.8	37.0	-	-	36.1
Na (mg/l)	5.8	9.4	-	9.7	9.4	-	-	10.3
K (mg/l)	3.0	2.2	-	2.6	3.6	-	-	3.1
Flow (m ³ /s) *	289	32.2	28.9	28.8	34.4	25.5	22.9	22.9

Date	25/III/81	1/IV/81	9/IV/81	22/IV/81	29/IV/81	12/V/81	20/V/81	28/V/81	3/VI/81
Temp. (°C)	25.0	-	24.6	28.0	26.2	27.7	30.0	30.0	28.0
O ₂ (dissolved)(mg/l)	-	-	9.0	-	7.0	8.7	9.2	6.0	-
Conductivity (µmho/cm)	253	-	273	238	267	254	254	240	-
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	114	120	109	110	114	104	110	84	84
Turbidity (N.T.U.)	9	5	4	14	4	11	8	306	830
Suspended Solids (mg/l)	15.0	23.0	8.0	13.7	4.7	14.0	8.9	102.0	358.0
% S.S. combustible	33	49	72	41	86	39	13	22	14
Total - P (µg/l)	20	14	16	14	12	18	13	254	420
PO ₄ - P (µg/l)	18	8	8	5	3	6	5	45	74
NO ₃ - N (µg/l)	20	6	6	54	14	8	5	88	73
NH ₄ - N (µg/l)	44	44	26	24	18	25	18	95	100
Fe (mg/l)	.15	.07	.06	.18	.08	.20	.14	.60	2.65
Si (mg/l)	12.0	10.8	11.8	10.2	11.0	10.6	9.3	10.1	15.5
Mg (mg/l)	-	-	-	5.1	5.8	5.7	5.8	-	-
Ca (mg/l)	-	-	-	39.0	41.3	40.3	38.9	-	-
Na (mg/l)	-	-	-	10.6	11.5	11.8	10.7	-	-
K (mg/l)	-	-	-	3.0	2.9	3.2	2.5	-	-
Flow (m ³ /s) *	20.8	-	16.5	21.6	15.4	14.9	13.2	26.3	85.5

Table A2.8 (cont.)

Date	6/VI/81	9/VI/81	12/VI/81	17/VI/81	23/VI/81	30/VI/81	8/VII/81	16/VII/81	22/VII/81
Temp. (°C)	25.0	24.8	25.6	27.0	25.9	25.9	27.0	25.0	25.0
O ₂ (dissolved)(mg/l)	7.4	7.2	7.7	7.9	7.9	8.6	7.7	7.8	8.2
Conductivity (μmho/cm)	219	146	158	158	147	151	231	199	176
pH	-	-	7.6	-	-	-	-	-	7.7
Alkalinity (mg/l CaCO ₃)	84	-	57	70	65	58	84	69	62
Turbidity (N.T.U.)	1288	-	-	588	890	96	39	81	146
Suspended Solids (mg/l)	2940.0	-	-	1026.0	1428.0	682.0	35.7	93.0	1064.0
% S.S. combustible	9	-	-	10	9	11	19	9	9
Total - P (μg/l)	404	70	-	80	135	81	158	110	345
PO ₄ - P (μg/l)	46	-	-	20	30	31	31	38	37
NO ₃ - N (μg/l)	74	-	-	40	70	118	49	52	39
NH ₄ - N (μg/l)	63	126	-	60	41	25	-	-	-
Fe (mg/l)	2.02	3.20	-	2.44	2.98	.51	.32	.65	1.12
Si (mg/l)	17.3	14.6	-	13.4	12.9	13.5	14.7	14.4	12.7
Mg (mg/l)	-	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-	-
Flow (m ³ /s) *	83.4	814		279	646	285	96.3	147	205

Date	31/VII/81	6/VIII/81	12/VIII/81	20/VIII/81	10/IX/81	23/IX/81	30/IX/81	7/X/81	14/X/81
Temp. (°C)	23.8	25.0	24.8	24.5	24.2	24.1	24.0	23.2	23.7
O ₂ (dissolved)(mg/l)	8.1	7.6	8.4	8.2	-	7.8	7.8	8.9	8.6
Conductivity (μmho/cm)	207	239	161	172	157	221	201	187	235
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	82	91	71	76	80	68	70	71	70
Turbidity (N.T.U.)	102	34	564	265	456	464	340	144	75
Suspended Solids (mg/l)	119.5	44.8	903.3	534.8	-	578.0	430.0	612.0	101
% S.S. combustible	1	18	10	10	-	15	11	10	11
Total - P (μg/l)	121	357	172	196	315	328	184	262	68
PO ₄ - P (μg/l)	-	16	31	27	42	43	24	28	28
NO ₃ - N (μg/l)	-	42	32	43	41	55	44	34	46
NH ₃ - N (μg/l)	-	-	-	-	28	34	23	16	16
Fe (mg/l)	.80	.61	1.85	1.69	1.87	2.18	1.89	1.47	.15
Si (mg/l)	13.6	17.2	13.3	12.2	12.4	8.4	13.0	10.6	13.6
Mg (mg/l)	-	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-	-
Flow (m ³ /s) *	96.2	81.8	272	293	371	262	267	318	190

Table A2.8 (cont.)

	202	221	227	246	272	282	283	285	287
Date	21/X/81	28/X/81	4/XI/81	11/XI/81	18/XI/81	25/XI/81	2/XII/81	9/XII/81	16/XII/81
Temp. (°C)	21.2	23.0	21.5	19.9	21.6	21.6	23.2	19.0	20.8
O ₂ (dissolved)(mg/l)	8.3	9.2	8.2	8.6	8.8	8.8	8.9	8.8	9.3
Conductivity (μmho/cm)	262	193	228	243	270	282	292	265	267
pH	-	-	-	8.0	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	112.5	109.8	101.2	110	111.2	119.9	119	100	113
Turbidity (N.T.U.)	42	1560	108	20	92	8.0	5	16	6
Suspended Solids (mg/l)	46.5	3020	125	19.2	9.5	8.3	11.3	20.8	29.6
% S.S. combustible	10	12	8	21	18	21	27	17	18
Total - P (μg/l)	49	321	-	45	48	28	17	34	15
PO ₄ - P (μg/l)	21	38	-	33	14	6	6	17	22
NO ₃ - N (μg/l)	51	48	-	89	28	8	6	22	19
NH ₄ - N (μg/l)	9	37	-	20	12	13	18	30	9
Fe (mg/l)	.46	1.98	-	.16	.08	.05	.01	.09	.04
Si (mg/l)	11.7	8.2	-	5.9	7.7	8.8	8.4	6.4	7.2
Mg (mg/l)									
Ca (mg/l)									
Na (mg/l)									
K (mg/l)									
Flow (m ³ /s) *	131	283	135	86.8	67.5	55.6	50.6	72.1	49.7

	10	20	25	26	4	28	33	32	34
Date	13/I/82	20/I/82	26/I/82	3/II/82	10/II/82	17/II/82	25/II/82	3/III/82	10/III/82
Temp. (°C)	21.0	20.8	20.6	21.0	17.0	23.0	21.1	20.0	20.9
O ₂ (dissolved)(mg/l)	9.4	9.0	8.3	8.9	9.1	8.8	10.2	9.4	9.6
Conductivity (μmho/cm)	254	308	302	297	301	287	268	187	290
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	142	151	118	115	115	114	119	66	190
Turbidity (N.T.U.)	-	6	6	4	15	4	6	20	4
Suspended Solids (mg/l)	-	-	-	-	-	-	-	-	-
% S.S. combustible	-	-	-	-	-	-	-	-	-
Total - P (μg/l)	24	22	24	25	34	20	18	34	22
PO ₄ - P (μg/l)	12	10	12	11	16	10	11	17	7
NO ₃ - N (μg/l)	46	48	40	37	79	42	40	48	18
NH ₄ - N (μg/l)	6	4	4	4	7	5	2	7	60
Fe (mg/l)	.12	.12	.11	-	.23	.12	.12	.15	.08
Si (mg/l)	4.3	4.4	4.0	5.1	4.0	4.0	4.4	3.1	10.5
Mg (mg/l)									
Ca (mg/l)									
Na (mg/l)									
K (mg/l)									
Flow (m ³ /s) *	34.2	34.9	29.5	27.8	38.1	24.8	23.5	37.6	24.8

Table A2.8 (cont.)

	75	132	117	108	105	100	108	113	151
Date	24/III/82	14/IV/82	21/IV/82	28/IV/82	5/V/82	12/V/82	18/V/82	26/V/82	3/VI/82
Temp. (°C)	29.0	21.5	20.4	22.2	27.2	22.0	30.0	23.5	28.0
O ₂ (dissolved)(mg/l)	8.2	10.0	8.2	9.4	9.2	9.4	6.7	8.8	7.6
Conductivity (µmho/cm)	279	315	324	278	252	314	221	202	231
pH	-	-	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	113	113	109	114	103	117	101	68	-
Turbidity (N.T.U.)	4	5	9	7	40	-	196	120	114
Suspended Solids (mg/l)	-	-	-	-	-	-	-	-	-
% S.S. combustible	-	-	-	-	-	-	-	-	-
Total - P (µg/l)	22	27	37	22	113	55	87	207	-
PO ₄ - P (µg/l)	7	3	4	5	30	12	14	42	-
NO ₃ - N (µg/l)	11	13	12	10	160	26	282	134	52
NH ₃ - N (µg/l)	25	45	44	26	67	45	74	72	119
Fe (mg/l)	.06	.03	.07	.06	1.03	.56	1.68	2.23	1.56
Si (mg/l)	14.6	11.2	11.6	11.0	11.6	13.1	14.5	13.8	14.0
Mg (mg/l)									
Ca (mg/l)									
Na (mg/l)									
K (mg/l)									
Flow (m ³ /s)	18.4	14.9	15.9	13.5	18.2	22.4	20.0	130.4	69.9

	160	196	170	188	208	224	252	235	287
Date	9/VI/82	23/VI/82	29/VI/82	7/VII/82	6/VIII/82	12/VIII/82	9/IX/82	23/IX/82	14/X/82
Temp. (°C)	27.2	26.6	26.0	26.3	25.0	27.0	27.0	26.5	17.8
O ₂ (dissolved)(mg/l)	8.2	7.8	8.2	7.9	8.7	7.2	7.1	-	9.1
Conductivity (µmho/cm)	153	171	205	182	200	222	238	213	248
pH	-	-	-	-	8.4	7.8	-	-	-
Alkalinity (mg/l CaCO ₃)	77	77	84	76	77	95	98	206	97
Turbidity (N.T.U.)	1020	372	68	85	651	104	6	146	708
Suspended Solids (mg/l)	-	-	-	-	-	-	-	-	-
% S.S. combustible	-	-	-	-	-	-	-	-	-
Total - P (µg/l)	515	222	-	81	-	121	103	160	-
PO ₄ - P (µg/l)	79	33	-	36	-	29	28	35	-
NO ₃ - N (µg/l)	109	71	67	80	60	54	68	253	251
NH ₄ - N (µg/l)	57	75	23	27	56	28	6	16	34
Fe (mg/l)	1.65	2.84	1.38	1.84	2.95	1.76	1.27	1.89	.21
Si (mg/l)	17.6	11.8	15.4	14.2	14.3	11.1	15.2	15.8	12.2
Mg (mg/l)									
Ca (mg/l)									
Na (mg/l)									
K (mg/l)									
Flow (m ³ /s)	134.4	260.8	151.6	-	-	-	-	-	-

Table A2.9

Q. El Cajon

028 00 034 048 051 10 22 27

Date	25/X/79	9/XI/79	30/XI/79	14/XII/79	27/XII/79	10/I/80	24/I/80	8/II/80
Temp. (°C)	23.8	21.8	22.7	23.3	21.0	21.5	22.0	19.8
O ₂ (dissolved)(mg/l)	-	-	8.4	8.0	7.3	8.4	8.0	8.6
Conductivity (µmho/cm)	132	175	160	131	127	125	149	181
pH	7.55	7.95	7.85	6.95	7.6	7.35	7.35	8.05
Alkalinity (mg/l CaCO ₃)	-	-	70.5	61.5	5.6	54	54.2	81.7
Turbidity (N.T.U.)	-	-	63	17	16	18	30	6.2
Suspended Solids (mg/l)	23.2	19.8	-	23.2	29.2	25.6	26.6	3.0
% S.S. combustible	9	20	-	22	18	18	15.0	20
Total - P (µg/l)	80	74	100	59	54	61	92	76
PO ₄ - P (µg/l)	-	-	76	58	66	54	78	62
NO ₃ - N (µg/l)	-	-	25	24	24	27	42	32
NH ₄ - N (µg/l)	11	22	2	10	20	85	96	2
Fe (mg/l)	.32	.20	.70	.28	.27	.63	.79	.24
Si (mg/l)	15.6	9.2	13.0	9.3	6.7	15.0	12.6	17.8
Mg (mg/l)	2.9	4.2	4.1	2.8	2.7	2.6	2.8	4.6
Ca (mg/l)	6.7	10.4	6.6	4.6	4.0	3.8	3.9	10.4
Na (mg/l)	8.9	9.2	8.6	8.2	8.1	7.8	8.0	9.6
K (mg/l)	3.7	4.0	4.4	3.6	3.4	3.6	3.8	4.2

53 55 80 100 115 128 142 157

Date	22/II/80	7/III/80	21/III/80	10/IV/80	25/IV/80	8/V/80	22/V/80	6/VI/80
Temp. (°C)	22.8	25.0	25.9	28.8	26.0	29.3	27.5	26.1
O ₂ (dissolved)(mg/l)	8.5	7.4	7.7	8.5	9.2	7.8	9.4	6.7
Conductivity (µmho/cm)	216	238	337	507	332	330	271	379
pH	7.45	7.20	7.20	7.45	7.20	7.25	7.35	7.45
Alkalinity (mg/l CaCO ₃)	93	117.1	168	267.3	154.2	159.1	116.1	103.3
Turbidity (N.T.U.)	4.8	2.7	1.9	3	1.8	2.2	49	336
Suspended Solids (mg/l)	15.4	6.6	1.4	4.0	1.9	7.0	44.5	295.9
% S.S. combustible	4	64	57	25	30	39	18	14
Total - P (µg/l)	70	74	73	73	63	66	110	165
PO ₄ - P (µg/l)	63	68	60	63	50	58	87	85
NO ₃ - N (µg/l)	11	26	46	3	28	38	97	18
NH ₄ - N (µg/l)	0	3	8	8	4	14	0	8
Fe (mg/l)	.11	.05	.03	.05	.19	.03	.46	2.30
Si (mg/l)	17.6	17.0	18.1	21.5	17.6	18.3	19.1	17.6
Mg (mg/l)	6.2	7.0	11.8	20.6	10.5	12.5	6.9	8.4
Ca (mg/l)	16.0	19.6	31.1	49.4	24.0	27.2	12.6	9.0
Na (mg/l)	10.6	11.6	14.5	20.8	13.8	14.2	13.0	12.3
K (mg/l)	4.2	4.6	5.3	7.0	5.0	5.5	5.3	6.4

Table A2.9 (cont.)

	191	24	177	103	227	21	255
Date	20/VI/80	3/VII/80	17/VII/80	1/VIII/80	15/VIII/80	29/VIII/80	12/IX/80
Temp. (°C)	23.0	24.5	24.6	-	24.0	25.0	22.0
O ₂ (dissolved)(mg/l)	8.2	8.2	7.9	-	8.6	10.2	9.0
Conductivity (μmho/cm)	168	167	95	-	200	110	132
pH	7.10	7.2	7.35	-	7.2	-	-
Alkalinity (mg/l CaCO ₃)	44.0	39.4	36.0	-	31.2	44	24.8
Turbidity (N.T.U.)	82.0	3.4	6.0	-	22	30	94.0
Suspended Solids (mg/l)	54.0	14.0	29.0	-	22.0	11.7	61.7
% S.S. combustible	17	5	19	-	?	17	15
Total - P (μg/l)	106	70	56	98	48	50	74
PO ₄ - P (μg/l)	58	48	44	41	31	32	25
NO ₃ - N (μg/l)	17	22	22	12	7	113	74
NH ₄ - N (μg/l)	7	6	4	6	3	2	6
Fe (mg/l)	1.64	.26	-	1.74	.30	.69	.60
Si (mg/l)	16.0	12.8	15.6	14.1	14.6	17.5	14.4
Mg (mg/l)	2.3	-	1.7	1.4	1.7	1.7	1.8
Ca (mg/l)	3.1	-	2.8	2.0	3.1	4.8	6.6
Na (mg/l)	7.1	-	6.6	5.33	6.4	3.9	6.3
K (mg/l)	3.6	-	3.4	3.2	3.1	3.3	4.1

	269	68	301
Date	26/IX/80	8/X/80	28/X/80
Temp. (°C)	22.9	22.5	24.0
O ₂ (dissolved)(mg/l)	8.3	8.5	8.6
Conductivity (μmho/cm)	237	128	128
pH	-	-	-
Alkalinity (mg/l CaCO ₃)	50.0	28.0	76.1
Turbidity (N.T.U.)	20.0	44.1	18.0
Suspended Solids (mg/l)	7.0	17.3	-
% S.S. combustible	23	21	-
Total - P (μg/l)	71	56	70
PO ₄ - P (μg/l)	48	30	60
NO ₃ - N (μg/l)	-	-	62
NH ₄ - N (μg/l)	10	16	14
Fe (mg/l)	.26	.40	.34
Si (mg/l)	12.3	16.1	19.9
Mg (mg/l)	3.0	1.4	4.6
Ca (mg/l)	15.4	6.8	21.6
Na (mg/l)	7.6	5.9	9.7
K (mg/l)	3.6	2.0	4.0

Table A2.10

R. Humuya at Santa Rita

	283	312	346	343	409	436
Date	10/X/79	8/XI/79	12/XII/79	16/I/80	13/II/80	12/III/80
Temp. (°C)	24.7	24.0	25.1	25.5	27.2	27.3
O ₂ (dissolved)(mg/l)	-	-	7.9	7.9	7.4	7.8
Conductivity (µmho/cm)	291	284	249	300	301	330
pH	8.45	8.15	8.45	8.10	8.4	7.15
Alkalinity (mg/l CaCO ₃)	-	-	139.5	136	142.8	144.0
Turbidity (N.T.U.)	-	-	16	4.2	3.0	3.5
Suspended Solids (mg/l)	2700.0	114.8	63.2	5.8	6.6	5.4
% S.S. combustible	8	19	15	-	48	7
Total - P (µg/l)	851	49	50	12	22	15
PO ₄ - P (µg/l)	-	-	22	8	22	10
NO ₃ - N (µg/l)	-	-	77	21	22	22
NH ₄ - N (µg/l)	56	10	30	112	2	0
Fe (mg/l)	2.73	.45	.60	.18	.12	.11
Si (mg/l)	-	-	6.4	11.2	11.2	10.7
Mg (mg/l)	15.4	6.8	12.8	13.0	7.2	7.0
Ca (mg/l)	13.6	29.0	35.4	41.1	38.0	40.4
Na (mg/l)	9.7	8.2	8.6	9.0	10.0	11.0
K (mg/l)	20.7	2.3	2.4	2.0	2.2	2.3

	478	607	527	565	510	618
Date	23/IV/80	14/V/80	11/VI/80	9/VII/80	13/VIII/80	10/IX/80
Temp. (°C)	25.0	27.6	26.8	26.0	27.2	28.5
O ₂ (dissolved)(mg/l)	8.5	7.0	7.4	8.9	7.9	7.4
Conductivity (µmho/cm)	302	321	214	241	212	203
pH	7.50	7.25	7.2	7.80	-	-
Alkalinity (mg/l CaCO ₃)	137	146.7	90.8	116	100	105.0
Turbidity (N.T.U.)	23	27	236	90	164	1000
Suspended Solids (mg/l)	24.6	35.2	318.3	1337.0	162.0	1292.0
% S.S. combustible	18	20	10	12	15	10
Total - P (µg/l)	26	42	118	342	94	217
PO ₄ - P (µg/l)	12	14	39	54	24	25
NO ₃ - N (µg/l)	47	30	48	50	66	98
NH ₄ - N (µg/l)	6	2	5	60	2	44
Fe (mg/l)	.40	.43	2.76	2.96	1.50	2.08
Si (mg/l)	12.4	15.4	13.2	9.4	11.4	17.6
Mg (mg/l)	6.0	6.8	5.5	13.9	5.3	14.4
Ca (mg/l)	36.5	31.5	10.1	10.8	13.1	53.2
Na (mg/l)	9.4	11.5	8.0	10.3	7.3	11.6
K (mg/l)	2.7	3.0	4.9	9.9	3.3	17.2

Table A2.11

R. Ulúa at San Manuel

Date	10/X/79	8/XI/79	12/XII/79	16/I/80	13/II/80	12/III/80
Temp. (°C)	24.8	23.7	25.0	25.8	28.0	28.0
O ₂ (dissolved)(mg/l)	-	-	8.1	7.7	7.6	6.6
Conductivity (μmho/cm)	407	250	245	265	264	259
pH	8.10	7.95	7.35	7.35	7.15	7.15
Alkalinity (mg/l CaCO ₃)	-	-	112.0	117.5	120.1	116.1
Turbidity (N.T.U.)	-	-	46	23	18	26
Suspended Solids (mg/l)	2473.2	289.2	85.6	35.6	42.8	62.0
% S.S. combustible	8	16	13	-	14	11
Total - P (μg/l)	720	66	66	46	85	75
PO ₄ - P (μg/l)	-	-	24	25	27	34
NO ₃ - N (μg/l)	-	-	84	34	5	12
NH ₄ - N (μg/l)	36	16	36	144	6	20
Fe (mg/l)	2.60	.95	.70	.52	.58	.44
Si (mg/l)	-	-	6.8	12.2	11.1	11.5
Mg (mg/l)	11.9	5.2	7.8	8.3	5.6	5.6
Ca (mg/l)	10.3	17.0	23.8	27.4	29.0	28.4
Na (mg/l)	10.3	8.0	8.1	8.6	9.0	9.6
K (mg/l)	20.2	3.5	3.4	3.0	2.9	3.5

Date	23/IV/80	14/V/80	11/VI/80	9/VII/80	13/VIII/80	10/IX/80
Temp. (°C)	24.9	29.3	27.6	27.2	27.3	26.8
O ₂ (dissolved)(mg/l)	6.5	6.4	7.3	7.4	7.0	7.1
Conductivity (μmho/cm)	511	257	188	217	201	417
pH	7.36	7.05	7.35	7.6	-	-
Alkalinity (mg/l CaCO ₃)	103	125.8	82.0	101	88	102.0
Turbidity (N.T.U.)	32	48	172	282	232	231.0
Suspended Solids (mg/l)	57.1	62.8	232.0	250.7	315.7	368.0
% S.S. combustible	14	19	9	13	8	9
Total - P (μg/l)	53	67	111	153	125	137
PO ₄ - P (μg/l)	29	27	38	34	26	14
NO ₃ - N (μg/l)	55	16	52	53	56	106
NH ₄ - N (μg/l)	4	16	4	54	12	8
Fe (mg/l)	.68	.41	2.19	2.68	2.06	1.84
Si (mg/l)	14.2	13.3	13.3	7.7	12.3	14.1
Mg (mg/l)	4.5	5.3	4.4	6.2	4.7	6.8
Ca (mg/l)	24.1	24.2	10.9	11.4	9.0	48.6
Na (mg/l)	8.0	9.8	7.3	9.6	7.0	9.4
K (mg/l)	3.4	3.7	4.3	6.2	4.6	7.8

Table A2.12

R. Ulu¹ at El Progreso

Date	10/X/79	8/XI/79	12/XII/79	16/I/80	13/II/80	12/III/80
Temp. (°C)	24.8	24.9	26.0	27.7	26.4	28.7
O ₂ (dissolved)(mg/l)	-	-	8.2	7.2	7.8	6.1
Conductivity (μmho/cm)	925	250	269	269	294	290
pH	8.05	7.45	7.05	7.35	7.25	6.75
Alkalinity (mg/l CaCO ₃)	-	-	132.5	126	132.3	132.1
Turbidity (N.T.U.)	-	-	48	25	28	25
Suspended Solids (mg/l)	1819.6	222.2	102.0	78.4	74.2	46.2
% S.S. combustible	8	19	11	-	11	13
Total - P (μg/l)	470	78	88	63	85	138
PO ₄ - P (μg/l)	-	-	56	36	32	81
NO ₃ - N (μg/l)	-	-	72	58	38	14
NH ₄ - N (μg/l)	33	22	34	132	10	2
Fe (mg/l)	2.65	1.40	.93	1.27	1.21	.30
Si (mg/l)	-	-	7.4	11.8	12.0	12.2
Mg (mg/l)	8.2	6.2	11.4	10.4	6.8	6.6
Ca (mg/l)	10.6	20.1	28.0	26.4	29.2	31.9
Na (mg/l)	10.0	8.5	9.2	9.3	9.8	10.5
K (mg/l)	14.8	3.5	3.8	3.2	3.2	3.7

Date	23/IV/80	14/V/80	11/VI/80	9/VII/80	13/VIII/80	10/IX/80
Temp. (°C)	24.9	30.0	27.5	27.0	26.8	26.1
O ₂ (dissolved)(mg/l)	7.7	6.3	7.2	6.4	6.9	6.9
Conductivity (μmho/cm)	422	289	206	229	199	232
pH	7.26	7.10	7.15	7.80	-	-
Alkalinity (mg/l CaCO ₃)	132	137.9	92.0	96	88	196.0
Turbidity (N.T.U.)	37	47	252	184	280	222
Suspended Solids (mg/l)	59.2	71.0	407	384.0	340.0	338.0
% S.S. combustible	14	21	7	12	11	11
Total - P (μg/l)	70	140	130	153	141	131
PO ₄ - P (μg/l)	49	60	42	32	32	19
NO ₃ - N (μg/l)	59	24	59	62	33	110
NH ₄ - N (μg/l)	10	15	14	12	6	12
Fe (mg/l)	.84	.59	3.32	2.30	.40	1.23
Si (mg/l)	15.0	14.0	14.5	7.5	13.1	14.0
Mg (mg/l)	-	6.1	5.8	5.3	4.6	6.9
Ca (mg/l)	-	29.2	9.7	14.3	8.1	51.3
Na (mg/l)	-	9.8	8.0	8.6	7.0	9.9
K (mg/l)	-	3.6	5.4	4.8	4.8	6.6

Table A2.13

R. Ulúa at Guanacastales

Date	10/X/79	8/XI/79	12/XII/79	16/I/80	13/II/80	12/III/80
Temp. (°C)	26.2	24.8	25.9	26.8	27.8	29.8
O ₂ (dissolved)(mg/l)	-	-	8.0	7.5	7.5	7.2
Conductivity (μmho/cm)	206	273	252	272	279	299
pH	8.35	6.85	7.45	7.45	7.40	7.65
Alkalinity (mg/l CaCO ₃)	-	-	116	123	126	126.3
Turbidity (N.T.U.)	-	-	100	51	42	35
Suspended Solids (mg/l)	1610.8	286.4	186.4	105.4	178.6	59.6
% S.S. combustible	9	18	10	-	8	11
Total - P (μg/l)	437	70	98	75	74	84
PO ₄ - P (μg/l)	-	-	48	40	35	42
NO ₃ - N (μg/l)	-	-	96	40	71	11
NH ₄ - N (μg/l)	38	12	18	98	6	26
Fe (mg/l)	2.61	1.27	1.44	1.36	1.25	.46
Si (mg/l)	-	-	5.6	8.2	12.0	12.2
Mg (mg/l)	8.2	6.0	8.1	9.9	6.4	5.9
Ca (mg/l)	7.8	21.0	17.2	24.5	26.0	29.0
Na (mg/l)	9.8	8.6	8.8	9.3	9.7	10.0
K (mg/l)	16.4	3.6	4.8	4.0	3.8	3.7

Date	23/IV/80	14/V/80	11/VI/80	9/VII/80	13/VIII/80	10/IX/80
Temp. (°C)	25.4	32.0	28.0	29.0	27.7	28.0
O ₂ (dissolved)(mg/l)	7.7	6.3	6.4	6.4	6.7	7.1
Conductivity (μmho/cm)	250	272	199	222	196	248
pH	7.00	7.35	7.15	7.45	-	-
Alkalinity (mg/l CaCO ₃)	111	135.4	92.0	107	90	109.5
Turbidity (N.T.U.)	104	44	510	312	240	106
Suspended Solids (mg/l)	292.8	78.7	634.6	369.0	287.1	163.0
% S.S. combustible	10	18	10	10	9	9
Total - P (μg/l)	171	110	198	174	145	104
PO ₄ - P (μg/l)	40	52	53	38	32	23
NO ₃ - N (μg/l)	54	11	67	78	52	102
NH ₄ - N (μg/l)	8	0	12	16	16	1
Fe (mg/l)	.75	.58	5.19	2.58	.43	.62
Si (mg/l)	15.4	13.4	13.2	7.4	13.6	14.4
Mg (mg/l)	5.7	5.0	6.8	6.2	4.6	6.0
Ca (mg/l)	15.6	25.5	9.1	13.7	9.0	48.2
Na (mg/l)	9.9	9.7	8.8	9.4	7.4	9.4
K (mg/l)	6.5	3.5	7.2	5.7	5.1	5.2

Table A2.14

R. Yure at Humuya confluence

	14 62 61 105 132							
Date	15/IX/79	5/XI/79	10/XII/79	14/I/80	11/II/80	10/III/80	15/IV/80	12/V/80
Temp. (°C)	25.8	24.0	24.1	25.2	24.9	27.0	24.0	31.1
O ₂ (dissolved)(mg/l)	-	-	8.2	7.9	8.0	7.8	8.1	8.5
Conductivity (µmho/cm)	100	117	72	124	140	151	262	168
pH	-	8.40	7.65	7.30	7.9	7.30	7.55	7.75
Alkalinity (mg/l CaCO ₃)	-	-	31.0	52	57.8	65.1	68.7	67
Turbidity (N.T.U.)	-	-	9	2.5	2.0	1.6	1.4	2.2
Suspended Solids (mg/l)	56.9	19.9	18.8	7.8	2.8	2.6	4.2	1.9
% S.S. combustible	13	34	9	29	0.0	46	50	33
Total - P (µg/l)	65	31	40	22	28	28	30	26
PO ₄ - P (µg/l)	-	-	16	18	22	26	23	23
NO ₃ - N (µg/l)	-	-	102	8	74	14	3	24
NH ₄ - N (µg/l)	8	4	39	130	1	0	0	3
Fe (mg/l)	.63	.10	.25	.13	.13	.04	.04	.05
Si (mg/l)	14.2	11.9	10.0	11.4	15.2	11.4	17.6	15.9
Mg (mg/l)	1.9	2.0	1.0	2.3	2.4	2.6	2.8	2.6
Ca (mg/l)	5.2	7.2	2.8	6.4	8.6	10.8	12.0	9.0
Na (mg/l)	6.0	6.0	4.9	7.0	8.0	8.6	9.5	9.2
K (mg/l)	3.1	2.7	2.6	2.8	2.9	3.2	3.3	3.2
Flow (m ³ /s)	13.00	2.53	8.06	1.69	.14	.77	1.59	.98

	160 188 203 251 280 314 305 378							
Date	9/VI/80	7/VII/80	11/VIII/80	8/IX/80	13/X/80	10/XI/80	9/XII/80	13/I/81
Temp. (°C)	26.1	25.2	26.4	25.8	23.7	22.9	22.1	19.6
O ₂ (dissolved)(mg/l)	8.2	8.3	8.6	8.5	7.5	8.4	8.9	8.5
Conductivity (µmho/cm)	213	197	132	149	193	97	100	128
pH	7.15	7.65	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	55	40.7	35	45.0	48.4	37.0	41.0	41.5
Turbidity (N.T.U.)	7.2	26	34	12.0	10.0	21	6.2	5.6
Suspended Solids (mg/l)	9.0	14.0	15.8	8.9	5.0	7.7	7.0	1.3
% S.S. combustible	14	14	0	29	7	21	21	33
Total - P (µg/l)	30	34	41	28	31	29	24	36
PO ₄ - P (µg/l)	22	21	26	10	1	20	6	13
NO ₃ - N (µg/l)	36	28	35	53	-	149	38	46
NH ₄ - N (µg/l)	4	0	4	0	14	4	16	18
Fe (mg/l)	.14	.45	.44	.13	.37	.37	.17	.19
Si (mg/l)	14.2	8.7	14.4	15.2	17.2	16.3	13.6	12.3
Mg (mg/l)	2.2	1.6	1.3	2.0	.4	1.6	1.6	1.7
Ca (mg/l)	7.3	4.1	3.0	13.1	2.9	10.8	11.6	11.5
Na (mg/l)	7.6	6.4	5.1	5.3	3.6	5.4	5.7	5.7
K (mg/l)	3.2	3.2	3.0	3.1	2.1	2.8	2.6	2.5
Flow (m ³ /s)	1.94	4.44	11.74	4.67	5.57	14.81	6.03	4.45

Table A2.15

R. Yure at Yure

	304	550	7	37	64
Date	31/X/79	5/XII/79	9/I/80	6/II/80	5/III/80
Temp. (°C)	23.5	22.2	23.4	23.5	23.8
O ₂ (dissolved)(mg/l)	-	7.9	7.4	7.8	8.4
Conductivity (μmho/cm)	57	70	70	68	84
pH	7.55	6.25	8.85	8.25	7.35
Alkalinity (mg/l CaCO ₃)	-	19.3	25	25	27.2
Turbidity (N.T.U.)	-	6.1	2.4	2.4	2.2
Suspended Solids (mg/l)	10.1	35.3	5.2	0.6	6.4
% S.S. combustible	44	2	36	-	34
Total - P (μg/l)	28	15	39	47	56
PO ₄ - P (μg/l)	-	13	31	40	52
NO ₃ - N (μg/l)	-	129	24	94	29
NH ₄ - N (μg/l)	5	0	138	0	0
Fe (mg/l)	.22	.20	.38	.31	.27
Si (mg/l)	9.3	8.8	12.0	11.0	15.0
Mg (mg/l)	0.5	0.5	0.7	0.8	.8
Ca (mg/l)	2.7	1.6	2.8	3.5	4.1
Na (mg/l)	3.6	3.6	3.8	3.9	4.4
K (mg/l)	2.3	2.3	2.1	2.1	2.2
Flow (m ³ /s)	1.61	5.50	1.45	0.81	0.64

	99	127	155	185	217	360	37	504
Date	9/IV/80	7/V/80	4/VI/80	2/VII/80	6/VIII/80	3/IX/80	8/X/80	5/XI/80
Temp. (°C)	23.7	27.0	24.6	25.1	22.5	24.8	22.0	21.5
O ₂ (dissolved)(mg/l)	8.7	8.2	8.6	10.1	10.4	8.6	9.3	8.0
Conductivity (μmho/cm)	95	70	374	116	54	85	57	76
pH	7.15	7.45	7.25	7.65	-	-	-	-
Alkalinity (mg/l CaCO ₃)	37.3	22.0	30.5	32.0	14.2	26.4	22.0	23.0
Turbidity (N.T.U.)	2.5	5.0	7.2	10	120	5.6	21.0	30.0
Suspended Solids (mg/l)	5.0	5.1	8.0	7.5	298.0	1.5	20.7	34.0
% S.S. combustible	40	42	42	10	17	83	26	25
Total - P (μg/l)	72	50	67	32	60	20	24	37
PO ₄ - P (μg/l)	66	40	54	26	12	10	10	21
NO ₃ - N (μg/l)	5	26	29	46	90	116	-	82
NH ₄ - N (μg/l)	1	0	2	3	18	3	17	5
Fe (mg/l)	.20	.33	.26	.43	4.115	.30	.28	.97
Si (mg/l)	15.0	9.3	12.6	10.3	6.2	9.8	10.2	10.1
Mg (mg/l)	1.1	.7	.9	.9	.5	-	.6	1.0
Ca (mg/l)	5.1	3.2	4.7	4.4	.4	-	5.6	8.4
Na (mg/l)	4.8	3.6	4.4	4.2	3.2	-	3.3	3.1
K (mg/l)	2.6	2.2	2.8	2.3	3.4	-	2.3	2.3
Flow (m ³ /s)	1.05	1.29	0.86	0.87	16.48	1.26	4.29	3.68

Table A2.15 (cont.)

	338	12	35	57	58	83	111
Date	4/XII/80	12/I/81	5/II/81	16/II/81	9/III/81	24/III/81	21/IV/81
Temp. (°C)	21.5	18.1	20.4	21.7	22.9	18.9	21.2
O ₂ (dissolved)(mg/l)	8.1	8.8	9.1	-	8.1	8.2	9.1
Conductivity (μmho/cm)	53	115	120	66	82	82	93
pH	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	14.5	34.0	23.8	25.8	32.1	26.2	33.0
Turbidity (N.T.U.)	8.0	48.0	2.5	2.8	2.4	2.3	2.2
Suspended Solids (mg/l)	17.0	6.5	6.9	11.7	-	3.7	-
% S.S. combustible	18	30	10	86	-	18	-
Total - P (μg/l)	13	58	71	42	36	39	-
PO ₄ - P (μg/l)	8	28	38	24	34	35	41
NO ₃ - N (μg/l)	78	50	12	34	73	18	12
NH ₄ - N (μg/l)	12	21	20	25	22	29	-
Fe (mg/l)	.34	.44	.16	.32	.28	.18	.19
Si (mg/l)	11.4	9.8	8.2	12.4	9.8	13.2	12.0
Mg (mg/l)	.6	.8	-	.8	-	-	-
Ca (mg/l)	5.9	7.4	-	7.1	-	-	-
Na (mg/l)	3.3	3.2	-	4.2	-	-	-
K (mg/l)	2.0	2.0	-	2.1	-	-	-
Flow (m ³ /s)	2.95	1.22	0.98	0.92	0.59	0.49	0.47

	131	159	173	188	201	215	250
Date	11/V/81	8/VI/81	22/VI/81	7/VII/81	20/VII/81	4/VIII/81	18/VIII/81
Temp. (°C)	24.1	26.8	22.8	24.8	24.7	23.1	23.7
O ₂ (dissolved)(mg/l)	8.6	8.2	8.0	7.6	7.6	9.2	8.4
Conductivity (μmho/cm)	100	73	112	82	72	75	93
pH	-	-	-	-	7.8	-	-
Alkalinity (mg/l CaCO ₃)	36.0	38.0	25.9	22.3	18.8	26.0	18.5
Turbidity (N.T.U.)	2.2	6.5	22.0	6.2	18.0	5.9	21.0
Suspended Solids (mg/l)	2.33	7.8	22.3	2.7	23.7	6.0	18.8
% S.S. combustible	0	29	9	88	7	5	26
Total - P (μg/l)	62	36	52	80	65	63	44
PO ₄ - P (μg/l)	56	29	30	22	24	11	13
NO ₃ - N (μg/l)	8	22	134	40	38	38	30
NH ₄ - N (μg/l)	23	18	27	-	-	-	-
Fe (mg/l)	.16	.40	.61	.32	.26	.44	.43
Si (mg/l)	14.6	13.8	12.9	10.8	10.9	10.2	8.4
Mg (mg/l)	1.2	-	-	-	-	-	-
Ca (mg/l)	10.2	-	-	-	-	-	-
Na (mg/l)	5.3	-	-	-	-	-	-
K (mg/l)	2.8	-	-	-	-	-	-
Flow (m ³ /s)	1.50	0.98	4.52	2.01	1.61	1.61	3.48

Table A2.15 (cont.)

	7/1X/81	28/1X/81	13/X/81	27/X/81	9/XI/81	23/XI/81	16/XII/81
Temp. (°C)	23.0	24.0	20.5	23.8	21.0	19.7	22.9
O ₂ (dissolved)(mg/l)	8.1	8.5	8.6	8.8	8.6	8.3	-
Conductivity (µmho/cm)	64	87	81	79	59	67	63
pH	-	-	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	20	17	29	25.7	21.0	23.0	25
Turbidity (N.T.U.)	17.0	7.2	19	19.9	4.7	2.5	4.6
Suspended Solids (mg/l)	0.2	8.9	19.0	13.0	4.2	2.3	3.0
% S.S. combustible	29	33	32	12	24	67	56
Total - P (µg/l)	30	24	33	34	34	24	34
PO ₄ - P (µg/l)	20	20	20	24	26	16	22
NO ₃ - N (µg/l)	40	41	56	35	23	60	13
NH ₄ - N (µg/l)	18	34	16	21	16	22	14
Fe (mg/l)	.77	.14	.41	.18	.19	.25	.10
Si (mg/l)	8.3	7.7	8.1	-	8.2	5.2	8.0
Mg (mg/l)	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-
Flow (m ³ /s)	3.83	2.35	3.47	2.45	1.83	1.14	2.10

Table A2.16

Q. Sin Nombre

Date	30/I/80	14/II/80	28/II/80	13/III/80	25/III/80	24/IV/80	15/V/80	5/VI/80	26/VI/80
Flow (m ³ /s)	.41	.64	.54	.50	.32	.38	.39	.08	0.29
Temp. (°C)	20.5	21.2	19.2	28.1	22.6	21.4	23.5	22.4	22.1
O ₂ (dissolved)(mg/l)	7.9	8.3	8.2	6.9	9.3	3.6	9.1	8.7	8.5
Conductivity (μmho/cm)	80	87	80	45	51	49	76	9 9	53
pH	6.45	7.55	6.95	7.80	7.20	7.75	7.70	7.15	7.25
Alkalinity (mg/l CaCO ₃)	14.7	15.9	14.8	16.9	16.8	16.4	16.7	17.2	15.0
Turbidity (N.T.U.)	1.2	1.8	1.2	1.1	.64	1.0	0.7	1.1	1.4
Suspended Solids (mg/l)	.2	1.4	0.4	1.8	7.8	3.3	1.2	3.1	1.2
% S.S. combustible	-	57	50	11	28	71	83	2 7	17
Total - P (μg/l)	9	13	17	28	14	18	12	15	14
PO ₄ - P (μg/l)	16	16	18	8	11	12	8	13	16
NO ₃ - N (μg/l)	312	96	90	40	133	138	202	98	188
NH ₄ - N (μg/l)	64	0	0	4	2	2	1	1	0
Fe (mg/l)	.03	.07	.01	.01	.02	.03	.01	.01	.02
Si (mg/l)	10.2	13.4	10.6	14.0	14.4	13.2	14.0	12.0	4.0
Mg (mg/l)	0.2	0.3	.2	.2	.2	.2	.2	.2	.2
Ca (mg/l)	1.1	1.2	1.3	1.4	1.6	1.6	1.2	1.5	1.3
Na (mg/l)	4.4	4.5	4.7	4.5	4.7	4.2	4.5	4.5	3.8
K (mg/l)	3.0	3.0	2.8	2.5	3.0	3.0	2.9	3.0	2.8

Date	16/VII/80	7/VIII/80	28/VIII/80	18/IX/80	9/X/80	30/X/80	21/XI/80	10/XII/80	8/I/81
Flow (m ³ /s)	0.25	0.59	0.37	0.58	0.31	0.42	0.26	0.22	0.24
Temp. (°C)	21.7	21.0	20.2	21.0	19.7	20.9	19.2	19.7	18.7
O ₂ (dissolved)(mg/l)	8.35	8.7	7.6	8.3	7.9	8.3	8.2	9.5	9.0
Conductivity (μmho/cm)	71	50	293	-	53	47	74	46	56
pH	7.05	6.9	7.7	6.7	7.15	6.8	-	7.75	7.4
Alkalinity (mg/l CaCO ₃)	14.6	16.4	13.8	12.3	14.0	13.6	14.5	13.0	13.1
Turbidity (N.T.U.)	2.1	23	2.5	2.9	1.4	4.6	2.0	1.6	2.7
Suspended Solids (mg/l)	1.3	34.7	2.1	8.4	5.2	4.4	1.3	2.6	3.1
% S.S. combustible	75	7	70	0	8	38	-	62	50
Total - P (μg/l)	11	29	10	10	8	16	8	8	35
PO ₄ - P (μg/l)	9	8	8	8	6	8	8	4	15
NO ₃ - N (μg/l)	194	164	238	-	-	312	270	329	15
NH ₄ - N (μg/l)	0	6	6	14	16	2	9	10	22
Fe (mg/l)	.04	.10	.02	.01	.02	.08	.04	.02	.05
Si (mg/l)	13.7	10.5	11.2	3.2	9.1	11.6	10.2	12.4	11.4
Mg (mg/l)	.2	.4	.2	.2	2.3	.3	.2	.2	.4
Ca (mg/l)	1.4	1.6	3.0	2.2	3.2	2.8	2.6	2.6	15.5
Na (mg/l)	4.2	3.8	4.0	3.8	2.8	3.9	3.8	4.2	4.0
K (mg/l)	3.0	3.2	3.0	2.8	3.2	3.0	2.8	2.9	2.9

Table A2.16 (cont.)

Date	22/I/81	6/II/81	23/II/81	5/III/81	19/III/81	10/IV/81	30/IV/81	21/V/81	11/VI/81
Flow (m ³ /s)	0.23	0.20	0.28	0.22	0.16	0.09	0.12	0.09	0.37
Temp. (°C)	19.0	18.7	18.9	21.4	21.1	18.0	21.3	23.0	21.3
O ₂ (dissolved)(mg/l)	9.2	7.3	9.9	8.1	8.2	8.2	9.2	8.4	8.4
Conductivity (µmho/cm)	81	38	45	47	52	69	77	53	49
pH	6.9	7.1	7.0	7.1	6.8	7.5	7.0	7.1	6.9
Alkalinity (mg/l CaCO ₃)	13.5	10.0	11.2	10.9	12.6	15	14	14.5	12.5
Turbidity (N.T.U.)	1.6	1.3	1.8	1.4	1.1	.74	.54	.9	4.3
Suspended Solids (mg/l)	-	2.0	3.3	4.0	2.3	-	1.0	.7	12.0
% S.S. combustible	-	0	80	6	29	-	0	0	25
Total - P (µg/l)	22	14	15	10	6	12	8	46	13
PO ₄ - P (µg/l)	12	10	9	8	6	12	4	8	10
NO ₃ - N (µg/l)	268	80	121	58	103	264	148	175	158
NH ₄ - N (µg/l)	21	28	20	24	26	18	20	19	26
Fe (mg/l)	.06	.05	.02	.09	.04	.02	.04	.01	.05
Si (mg/l)	13.2	9.4	11.3	9.6	14.2	13.1	11.1	13.2	9.8
Mg (mg/l)	.2	-	.2	-	.3	-	.3	.2	.3
Ca (mg/l)	2.2	-	2.2	-	2.8	-	3.2	3.6	3.2
Na (mg/l)	4.0	-	4.0	-	4.1	-	4.6	4.9	4.2
K (mg/l)	2.8	-	2.9	-	3.3	-	3.1	3.1	3.1

Date	26/VI/81	9/VII/81	28/VII/81	13/VIII/81	9/IX/81	29/IX/81	15/X/81	3/XI/81	13/XI/81
Flow (m ³ /s)	0.47	0.35	0.38	0.84	0.48	0.40	0.45	0.30	0.32
Temp. (°C)	20.2	20.2	20.1	18.5	19.0	18.9	18.6	17.9	16.7
O ₂ (dissolved)(mg/l)	7.6	8.0	8.8	9.6	8.8	9.2	8.9	-	9.1
Conductivity (µmho/cm)	65	47	47	46	49	52	46	49	70
pH	6.3	6.7	7.2	6.6	6.6	-	6.4	7.3	7.3
Alkalinity (mg/l CaCO ₃)	10.5	6.5	11.2	7	8	11.2	7.5	18.5	14.9
Turbidity (N.T.U.)	3.1	2.2	28.0	3.1	7.8	2.0	2.5	1.8	2.7
Suspended Solids (mg/l)	4.5	-	4.0	-	13.0	2.7	-	2.0	.3
% S.S. combustible	33	-	38	-	26	88	-	33	0
Total - P (µg/l)	23	54	26	50	17	10	15	20	14
PO ₄ - P (µg/l)	8	10	4	4	10	6	6	9	9
NO ₃ - N (µg/l)	269	248	214	188	96	260	178	207	139
NH ₄ - N (µg/l)	24	8	24	35	29	14	15	13	13
Fe (mg/l)	.04	.02	.04	.04	.09	.04	.04	.02	.06
Si (mg/l)	10.0	11.6	10.2	7.6	6.3	3.4	5.8	7.4	7.3
Mg (mg/l)	.2	.2	.3	.3	-	-	-	-	-
Ca (mg/l)	2.6	2.6	2.8	2.3	-	-	-	-	-
Na (mg/l)	3.8	4.1	4.5	3.9	-	-	-	-	-
K (mg/l)	3.0	3.0	3.4	3.2	-	-	-	-	-

Table A2.16 (cont.)

Date	4/XII/81	15/XII/81	12/I/82	23/II/82	18/III/82	29/IV/82	27/V/82	22/VI/82	20/VII/82
Flow (m ³ /s)	0.18	0.23	0.18	0.12	0.15	0.09	0.29	0.45	0.25
Temp. (°C)	17.8	16.3	-	17.3	-	24.8	21.4	21.2	20.6
O ₂ (dissolved)(mg/l)	8.7	9.3	-	9.2	-	10.4	10.2	10.0	9.7
Conductivity (μmho/cm)	99	92	-	55	-	51	60	49	53
pH	7.5	6.9	-	6.9	7.9	-	-	-	-
Alkalinity (mg/l CaCO ₃)	19	13.0	14.0	15.0	14.5	19.5	16.0	13.0	14.5
Turbidity (N.T.U.)	2.2	2.2	1.1	.82	1.3	1.2	4.2	2.7	1.4
Suspended Solids (mg/l)	2.6	-	-	-	-	-	-	-	-
% S.S. combustible	31	-	-	-	-	-	-	-	-
Total - P (μg/l)	12	10	12	34	20	22	44	17	18
PO ₄ - P (μg/l)	7	5	10	18	13	9	8	8	10
NO ₃ - N (μg/l)	27	356	534	188	234	188	265	371	199
NH ₄ - N (μg/l)	22	12	6	38	43	34	44	24	22
Fe (mg/l)	.01	.01	.01	.04	.04	.03	.09	.05	.03
Si (mg/l)	7.4	10.8	1.6	12.9	13	13.0	15.2	13.7	12.8
Mg (mg/l)	-	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-	-

Date	18/VIII/82	28/IX/82
Flow (m ³ /s)	0.24	0.24
Temp. (°C)	23.5	23.2
O ₂ (dissolved)(mg/l)	8.2	9.2
Conductivity (μmho/cm)	44	50
pH	-	-
Alkalinity (mg/l CaCO ₃)	10.0	11.6
Turbidity (N.T.U.)	2.1	2.8
Suspended Solids (mg/l)	-	-
% S.S. combustible	-	-
Total - P (μg/l)	14.0	16.0
PO ₄ - P (μg/l)	12.0	10
NO ₃ - N (μg/l)	170	260
NH ₄ - N (μg/l)	8	8
Fe (mg/l)	.04	.04
Si (mg/l)	12.9	13.4
Mg (mg/l)	-	-
Ca (mg/l)	-	-
Na (mg/l)	-	-
K (mg/l)	-	-

Table A2.17

Q. del Cerro

Date	30/I/80	14/II/80	28/II/80	13/III/80	25/III/80	24/IV/80	15/V/80
Flow (m ³ /s)	0.26	1.20	1.39	0.81	0.66	1.40	0.70
Temp. (°C)	20.9	20.8	20.3	22.5	22.1	21.4	24.0
O ₂ (dissolved)(mg/l)	7.0	8.2	8.1	8.3	8.3	8.7	8.3
Conductivity (μmho/cm)	43	42	63	44	43	44	91
pH	7.10	7.95	7.05	7.25	7.35	7.55	7.75
Alkalinity (mg/l CaCO ₃)	14.0	14.0	14.0	15.0	15.4	12.8	15.5
Turbidity (N.T.U.)	1.4	1.7	1.4	1.1	1.0	1.0	1.0
Suspended Solids (mg/l)	1.8	.8	1.8	2.2	2.6	2.2	1.8
% S.S. combustible	-	50	67	27	31	6.4	67
Total - P (μg/l)	7	14	20	20	14	18	12
PO ₄ - P (μg/l)	16	18	18	13	10	9	8
NO ₃ - N (μg/l)	198	80	82	65	120	135	135
NH ₄ - N (μg/l)	135	1	0	2	4	0	0
Fe (mg/l)	.08	.04	.02	.01	.02	.02	.01
Si (mg/l)	10.2	11.1	7.1	13.0	13.8	11.1	13.8
Mg (mg/l)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Ca (mg/l)	0.8	0.8	1.0	1.0	1.1	1.2	0.9
Na (mg/l)	4.1	4.2	4.4	4.2	4.4	3.7	4.2
K (mg/l)	2.5	2.4	2.4	2.5	2.4	2.4	2.4

Date	5/VI/80	26/VI/80	16/VII/80	7/VIII/80	28/VIII/80	18/IX/80	9/X/80	30/X/80	21/XI/80
Flow (m ³ /s)	0.75	0.96	0.70	2.37	1.52	1.42	1.48	1.57	1.27
Temp. (°C)	21.0	21.8	21.6	22.0	20.3	21.3	18.8	20.7	18.7
O ₂ (dissolved)(mg/l)	8.0	8.3	8.2	9.6	8.4	8.2	8.8	8.5	8.4
Conductivity (μmho/cm)	44	36	41	38	38	-	61	40	58
pH	6.5	7.15	6.8	-	7.3	7.3	7.0	6.8	-
Alkalinity (mg/l CaCO ₃)	12.2	11.6	13.1	9.2	11.5	-	10.3	11.0	12.0
Turbidity (N.T.U.)	2.1	1.7	1.5	6.4	3.6	3.1	2.3	4.4	2.6
Suspended Solids (mg/l)	3.4	0.8	1.7	6.9	4.3	6.0	0.8	6.0	1.8
% S.S. combustible	65	0	80	16	25	12	-	26	-
Total - P (μg/l)	13	10	9	10	8	6	10	10	9
PO ₄ - P (μg/l)	10	13	9	8	14	5	6	7	6
NO ₃ - N (μg/l)	114	174	136	166	270	-	-	314	289
NH ₄ - N (μg/l)	1	0	0	1	3	10	17	2	10
Fe (mg/l)	.01	.02	.02	0.04	0.05	0.3	0.03	0.08	0.05
Si (mg/l)	9.0	3.0	13.6	5.6	8.6	3.2	9.8	9.8	9.6
Mg (mg/l)	0.2	0.2	0.2	0.1	0.2	0.2	3.1	0.2	0.2
Ca (mg/l)	0.9	0.9	0.9	0.6	1.8	1.6	23.5	2.0	1.9
Na (mg/l)	3.7	3.3	3.8	3.0	3.6	3.4	7.0	3.5	3.2
K (mg/l)	2.3	2.3	2.5	2.4	2.7	2.4	3.9	2.4	2.2

Table A2.17 (cont.)

Date	10/XII/80	8/I/81	22/I/81	6/II/81	23/II/81	5/III/81	19/III/81	10/IV/81	30/IV/81
Flow (m ³ /s)	0.91	0.86	0.81	0.82	1.39	0.68	0.69	0.29	0.45
Temp. (°C)	19.0	19.0	18.8	18.5	18.4	21.9	20.5	20.1	22.0
O ₂ (dissolved)(mg/l)	8.7	8.4	8.8	9.4	8.9	8.3	8.8	7.3	8.7
Conductivity (μmho/cm)	40	37	46	38	37	43	39	47	45
pH	7.2	-	6.45	7.1	6.8	6.7	6.8	-	-
Alkalinity (mg/l CaCO ₃)	12.0	12.0	12.0	8.8	9.7	9.8	11.8	11.0	12.0
Turbidity (N.T.U.)	1.9	2.2	2.1	1.5	2.9	1.7	1.9	1.0	1.1
Suspended Solids (mg/l)	2.7	2.9	-	1.8	5.3	4.3	3.0	-	2.6
% S.S. combustible	25	62	-	0	69	71	22	-	22
Total - P (μg/l)	7	31	18	18	12	12	8	12	7
PO ₄ - P (μg/l)	4	10	12	8	10	6	8	10	4
NO ₃ - N (μg/l)	262	16	189	67	121	182	60	129	92
NH ₄ - N (μg/l)	13	19	19	18	24	23	24	17	20
Fe (mg/l)	0.03	0.06	0.09	0.06	0.04	0.10	0.05	0.04	0.05
Si (mg/l)	11.4	12.4	12.4	8.4	12.2	9.1	13.8	11.1	10.0
Mg (mg/l)	0.2	0.2	0.2	-	0.2	-	0.3	-	0.2
Ca (mg/l)	2.0	1.8	1.8	-	1.8	-	2.1	-	2.1
Na (mg/l)	3.8	3.5	3.8	-	3.4	-	4.0	-	4.1
K (mg/l)	2.4	2.3	2.3	-	2.3	-	2.7	-	2.4

Date	21/V/81	11/VI/81	25/VI/81	9/VII/81	28/VII/81	13/VIII/81	9/IX/81	29/IX/81	15/X/81
Flow (m ³ /s)	0.36	1.35	1.26	1.01	1.7	-	1.39	1.03	1.82
Temp. (°C)	23.5	20.5	19.7	20.2	20.4	20.0	19.9	19.5	18.5
O ₂ (dissolved)(mg/l)	7.7	8.4	8.2	7.8	9.3	8.9	8.4	8.8	9.4
Conductivity (μmho/cm)	44	41	52	44	42	67	44	47	41
pH	6.7	6.8	6.3	6.4	6.7	6.7	6.5	-	6.4
Alkalinity (mg/l CaCO ₃)	12.7	10.2	9.0	6.0	8.5	6	7	8.9	6.8
Turbidity (N.T.U.)	1.5	2.7	2.3	3.2	3.4	4.2	3.8	3.6	2.9
Suspended Solids (mg/l)	1.2	4.3	4.9	-	5.6	-	6.3	5.3	5.3
% S.S. combustible	0	8	27	-	32	-	26	44	38
Total - P (μg/l)	20	10	23	62	32	64	15	12	14
PO ₄ - P (μg/l)	8	8	7	10	5	6	10	7	7
NO ₃ - N (μg/l)	95	126	180	137	108	137	92	270	86
NH ₄ - N (μg/l)	20	20	20	8	44	40	20	18	8
Fe (mg/l)	0.01	0.04	0.04	0.04	0.05	0.08	0.05	0.06	0.04
Si (mg/l)	13.1	9.8	9.2	11.5	8.4	7.8	9.7	6.6	7.6
Mg (mg/l)	0.2	0.2	0.2	0.2	0.2	0.3	-	-	-
Ca (mg/l)	2.4	2.1	1.8	2.0	1.8	1.8	-	-	-
Na (mg/l)	4.7	3.6	3.4	3.8	3.6	3.5	-	-	-
K (mg/l)	2.6	2.5	2.4	2.7	2.7	2.8	-	-	-

Table A2.17 (cont.)

Date	3/XI/81	12/XI/81	4/XII/81	15/XII/81	12/I/82	23/II/82	18/III/82	29/IV/82	27/V/82
Flow (m ³ /s)	1.06	1.06	0.89	1.00	0.73	0.66	0.65	0.22	1.01
Temp. (°C)	18.3	16.1	17.1	-	-	17.0	-	23.7	21.7
O ₂ (dissolved)(mg/l)	-	9.3	8.8	-	-	10.4	-	9.6	10.0
Conductivity (μmho/cm)	37	42	46	-	-	48	-	46	41
pH	7.2	6.0	6.8	6.8	-	6.9	8.2	7.1	-
Alkalinity (mg/l CaCO ₃)	13.6	12.8	15	10.0	12.8	12.0	13.0	15.5	12.5
Turbidity (N.T.U.)	2.3	2.0	2.1	2.0	1.1	1.2	1.9	1.25	2.0
Suspended Solids (mg/l)	2.0	8.7	-	-	-	-	-	-	-
% S.S. combustible	50	19	-	-	-	-	-	-	-
Total - P (μg/l)	11	10	11	9	18	21	22	13	55
PO ₄ - P (μg/l)	10	10	8	6	14	12	12	8	5
NO ₃ - N (μg/l)	76	70	18	288	353	151	166	122	125
NH ₄ - N (μg/l)	13	8	23	9	6	30	29	30	42
Fe (mg/l)	0.02	0.03	0.01	0.02	0.03	0.03	0.03	0.04	0.07
Si (mg/l)	9.8	5.4	8.5	8.6	1.0	11.5	12.8	15.2	12.7
Mg (mg/l)	-	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-	-

Date	22/VI/82	20/VII/82	18/VIII/82	28/IX/82
Flow (m ³ /s)	2.29	0.69	0.69	0.82
Temp. (°C)	2.04	18.8	22.0	20.8
O ₂ (dissolved)(mg/l)	10.4	9.1	9.0	9.4
Conductivity (μmho/cm ²)	41	46	47	44
pH	-	-	-	-
Alkalinity (mg/l CaCO ₃)	10.0	12.5	10.0	10.0
Turbidity (N.T.U.)	4.7	1.9	2.0	2.5
Suspended Solids (mg/l)	-	-	-	-
% S.S. combustible	-	-	-	-
Total - P (μg/l)	16	14	12	28
PO ₄ - P (μg/l)	6	10	11	8
NO ₃ - N (μg/l)	204	114	186	208
NH ₄ - N (μg/l)	24	8	8	8
Fe (mg/l)	0.06	0.05	0.06	0.07
Si (mg/l)	14.1	12.3	12.7	12.0
Mg (mg/l)	-	-	-	-
Ca (mg/l)	-	-	-	-
Na (mg/l)	-	-	-	-
K (mg/l)	-	-	-	-

Table A2.18

Q. Tepemechin

Date	30/I/80	14/II/80	28/II/80	13/III/80	25/III/80	24/IV/80	15/V/80	5/VI/80	26/VI/80
Flow (m ³ /s)	1.25	1.73	0.80	0.69	0.71	1.03	0.61	0.89	1.03
Temp. (°C)	22.5	22.5	21.5	24.9	23.9	23.1	25.3	22.9	23.5
O ₂ (dissolved)(mg/l)	7.2	7.9	7.9	7.3	7.6	8.2	6.6	8.2	8.0
Conductivity (µmho/cm)	69	71	53	65	66	57	65	58	54
pH	6.95	7.85	7.00	7.55	0.5	7.9	8.35	6.75	7.05
Alkalinity (mg/l CaCO ₃)	20.3	20.9	21.2	21.8	21.9	18.0	21.8	17.7	18.8
Turbidity (N.T.U.)	2.6	2.0	2.4	1.5	0.9	1.2	1.1	2.2	2.3
Suspended Solids (mg/l)	2.6	1.8	2.2	1.4	2.3	2.1	1.9	3.6	3.2
% S.S. combustible	92	22	55	29	50	91	67	22	35
Total - P (µg/l)	18	16	20	24	20	25	16	18	13
PO ₄ - P (µg/l)	18	18	22	17	17	13	13	15	18
NO ₃ - N (µg/l)	132	60	57	40	108	112	52	58	142
NH ₄ - N (µg/l)	0	2	0	4	4	2	2	0	0
Fe (mg/l)	0.09	0.02	0.05	0.03	0.03	0.06	0.02	0.04	0.06
Si (mg/l)	12.4	12.9	11.9	14.0	13.0	12.0	12.5	11.2	5.9
Mg (mg/l)	0.7	0.7	0.6	0.5	0.7	0.6	0.6	0.5	0.6
Ca (mg/l)	2.2	2.4	2.6	2.8	3.2	2.8	2.2	2.4	2.3
Na (mg/l)	4.1	4.2	4.7	4.1	4.4	3.5	4.2	3.6	3.3
K (mg/l)	2.2	2.2	2.2	2.3	2.2	2.1	2.2	2.1	2.1

Date	16/VII/80	7/VIII/80	28/VIII/80	18/IX/80	9/X/80	30/X/80	21/XI/80	10/XII/80
Flow (m ³ /s)	0.95	3.54	2.88	1.39	1.61	2.44	1.43	1.26
Temp. (°C)	23.8	23.0	21.6	22.0	19.2	22.1	20.0	19.7
O ₂ (dissolved)(mg/l)	7.8	8.4	8.3	8.4	8.0	7.9	8.8	9.0
Conductivity (µmho/cm)	75	101	237	-	74	278	51	54
pH	7.55	7.7	6.95	7.6	7.3	7.1	-	7.2
Alkalinity (mg/l CaCO ₃)	21.0	13.1	10.5	14.5	12.8	13.1	16.6	16.0
Turbidity (N.T.U.)	3.8	10	45	12.0	5.4	16.0	5.2	3.8
Suspended Solids (mg/l)	2.7	19.4	72.8	8.2	6.5	23.6	6.4	3.8
% S.S. combustible	13	18	15	17	17	16	-	6
Total - P (µg/l)	16	18	53	14	12	18	10	10
PO ₄ - P (µg/l)	12	12	16	8	2	8	10	7
NO ₃ - N (µg/l)	70	161	296	-	-	226	244	222
NH ₄ - N (µg/l)	0	1	6	12	12	4	10	13
Fe (mg/l)	0.02	0.21	1.77	0.09	0.11	0.30	0.09	0.06
Si (mg/l)	13.6	7.4	8.8	4.4	10.6	10.5	11.4	12.4
Mg (mg/l)	0.6	0.5	2.0	0.6	0.6	1.0	0.6	0.8
Ca (mg/l)	2.5	1.1	4.0	3.4	3.3	3.8	4.4	4.9
Na (mg/l)	3.6	3.1	4.0	3.4	3.2	3.4	3.2	3.8
K (mg/l)	2.1	2.0	3.1	1.9	2.0	2.4	2.0	2.3

Table A2.18 (cont.)

Date	8/1/81	22/1/81	6/11/81	23/11/81	5/111/81	19/111/81	10/IV/81	30/IV/81	21/V/81
Flow (m ³ /s)	1.00	0.65	0.74	1.14	0.74	0.58	0.53	0.44	0.23
Temp. (°C)	20.1	20.5	19.5	20.1	24.0	21.4	21.3	25.5	25.1
O ₂ (dissolved)(mg/l)	8.4	8.5	8.2	10.8	8.4	8.8	8.3	8.0	7.0
Conductivity (µmho/cm)	55	55	72	51	60	96	61	55	65
pH	-	7.1	7.0	7.3	7.2	7.0	7.6	6.9	6.8
Alkalinity (mg/l CaCO ₃)	17.2	17.1	12.8	15.0	14.0	15.4	17	16	18.3
Turbidity (N.T.U.)	2.7	3.3	2.6	3.5	1.4	1.4	1.8	1.2	2.4
Suspended Solids (mg/l)	2.0	-	2.9	6.0	19.3	3.0	-	2.0	0.9
% S.S. combustible	75	-	0	50	28	33	-	12	0
Total - P (µg/l)	33	17	19	14	14	9	18	8	45
PO ₄ - P (µg/l)	13	14	10	10	9	9	2	2	10
NO ₃ - N (µg/l)	53	104	86	99	13	2	90	29	46
NH ₄ - N (µg/l)	17	20	20	26	2	24	16	14	18
Fe (mg/l)	0.07	0.12	0.11	0.07	0.13	0.07	0.06	0.05	0.06
Si (mg/l)	11.5	11.6	9.2	11.8	8.8	13.3	11.8	9.4	2.8
Mg (mg/l)	0.6	0.6	-	0.6	-	0.7	-	0.6	0.8
Ca (mg/l)	4.4	4.2	-	4.1	-	4.9	-	4.8	5.8
Na (mg/l)	3.4	3.6	-	3.4	-	3.8	-	3.8	4.4
K (mg/l)	2.0	2.0	-	2.0	-	2.4	-	2.2	2.4

Date	11/VI/81	25/VI/81	9/VII/81	28/VII/81	13/VIII/81	9/IX/81	29/IX/81	15/X/81	3/XI/81
Flow (m ³ /s)	1.30	1.73	0.83	2.06	-	1.80	1.47	1.88	1.46
Temp. (°C)	23.1	19.8	22.1	22.2	21.2	21.0	21.5	19.9	20.2
O ₂ (dissolved)(mg/l)	7.9	8.3	7.0	8.6	8.8	9.2	9.2	9.5	-
Conductivity (µmho/cm)	53	53	105	59	66	56	56	51	54
pH	7.1	7.5	6.6	7.1	6.8	6.9	-	6.2	7.5
Alkalinity (mg/l CaCO ₃)	14.8	10.0	8.2	13.9	10.0	10.5	14.3	9.5	19.6
Turbidity (N.T.U.)	4.9	3.7	2.8	5.4	7.2	5.6	5.8	4.9	3.1
Suspended Solids (mg/l)	6.6	6.4	-	7.8	-	7.0	9.3	7.5	3.7
% S.S. combustible	5	19	-	23	-	5	29	40	9
Total - P (µg/l)	12	24	55	37	53	20	16	18	13
PO ₄ - P (µg/l)	8	9	13	4	9	15	11	8	10
NO ₃ - N (µg/l)	52	144	56	69	80	94	143	58	83
NH ₄ - N (µg/l)	20	20	6	58	20	24	17	23	18
Fe (mg/l)	1.11	0.09	0.05	0.13	0.15	0.14	0.15	0.12	0.05
Si (mg/l)	10.0	10.4	10.4	10.4	9.3	7.0	2.7	9.8	6.8
Mg (mg/l)	0.6	0.7	0.6	0.7	0.8	-	-	-	-
Ca (mg/l)	4.8	5.2	4.7	4.3	4.2	-	-	-	-
Na (mg/l)	3.5	3.4	3.8	3.6	3.8	-	-	-	-
K (mg/l)	2.2	2.0	2.2	2.2	2.4	-	-	-	-

Table A2.18 (cont.)

Date	12/XI/81	4/XII/81	15/XII/81	12/I/82	23/II/82	18/III/82	29/IV/82	27/V/82	22/VI/82
Flow (m ³ /s)	0.86	1.49	1.10	0.83	0.73	0.58	0.30	0.86	1.90
Temp. (°C)	16.5	17.9	-	-	19.3	-	24.8	22.5	23.3
O ₂ (dissolved)(mg/l)	9.3	8.8	-	-	9.2	-	10.0	10.3	10.0
Conductivity (µmho/cm)	55	57	-	-	62	-	68	56	54
pH	7.2	7.8	6.8	-	7.2	8.2	7.3	6.8	-
Alkalinity (mg/l CaCO ₃)	18.1	14.0	15.0	17.8	18.0	18.5	22.5	17.8	21.0
Turbidity (N.T.U.)	2.0	5.1	2.6	1.3	1.8	7.2	1.0	1.8	4.5
Suspended Solids (mg/l)	0.7	-	-	-	-	-	-	-	-
% S.S. combustible	0	-	-	-	-	-	-	-	-
Total - P (µg/l)	14	20	14	17	34	16	19	42	17
PO ₄ - P (µg/l)	9	8	5	12	14	12	6	6	8
NO ₃ - N (µg/l)	46	26	360	370	110	68	21	68	105
NH ₄ - N (µg/l)	12	20	6	6	33	35	35	44	24
Fe (mg/l)	0.03	0.04	0.04	0.07	0.06	0.01	0.06	0.07	0.09
Si (mg/l)	5.2	8.2	10.4	1.2	10.4	12	14.2	11.4	13.3
Mg (mg/l)	-	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-	-

Date	20/VII/82	18/VIII/82	28/IX/82
Flow (m ³ /s)	0.80	1.29	0.56
Temp. (°C)	22.7	23.3	24.5
O ₂ (dissolved)(mg/l)	8.4	9.4	8.8
Conductivity (µmho/cm)	60	58	59
pH	-	-	-
Alkalinity (mg/l CaCO ₃)	19.0	15.0	18.9
Turbidity (N.T.U.)	2.2	3.2	4.4
Suspended Solids (mg/l)	-	-	-
% S.S. combustible	-	-	-
Total - P (µg/l)	18	13	24
PO ₄ - P (µg/l)	12	13	10
NO ₃ - N (µg/l)	74	121	102
NH ₄ - N (µg/l)	10	5	8
Fe (mg/l)	0.08	0.08	0.12
Si (mg/l)	11.8	12.0	12.1
Mg (mg/l)	-	-	-
Ca (mg/l)	-	-	-
Na (mg/l)	-	-	-
K (mg/l)	-	-	-

Table A2.19

L. Yure, Canal

Date	30/I/80	14/II/80	28/II/80	13/III/80	26/III/80	24/IV/80	15/V/80	5/VI/80
Flow (m ³ /s)	3.35	3.11	3.78	2.04	2.49	4.21	3.11	3.31
Temp. (°C)	25.1	24.2	24.0	26.4	26.9	24.1	28.0	26.4
O ₂ (dissolved)(mg/l)	7.3	7.5	9.8	9.5	9.3	8.9	10.0	9.1
Conductivity (µmho/cm)	49	48	50	50	50	63	47	52
pH	7.45	7.15	6.95	7.75	7.2	7.70	7.25	7.25
Alkalinity (mg/l CaCO ₃)	17.3	16.9	19.0	18.1	18.7	17.8	18.8	17.4
Turbidity (N.T.U.)	4.6	3.0	3.7	4.2	5.0	2.5	3.2	7.4
Suspended Solids (mg/l)	5.4	4.4	5.2	2.2	8.3	2.7	4.9	6.4
% S.S. combustible	85	73	77	73	-	78	60	31
Total - P (µg/l)	10	14	20	20	24	30	14	16
PO ₄ - P (µg/l)	5	8	8	4	4	4	3	4
NO ₃ - N (µg/l)	68	48	<1	28	96	66	19	22
NH ₄ - N (µg/l)	0	1	0	2	4	22	2	2
Fe (mg/l)	.19	.14	.08	.09	.12	.07	.06	.09
Si (mg/l)	12.8	12.9	12.6	13.6	12.6	11.8	11.8	10.3
Mg (mg/l)	0.4	0.4	0.4	0.4	4	0.4	0.4	0.5
Ca (mg/l)	1.5	1.7	1.9	2.0	2.2	2.3	1.6	2.0
Na (mg/l)	3.9	3.8	4.4	4.0	4.2	3.6	4.1	3.8
K (mg/l)	2.4	2.4	2.4	2.4	2.4	2.3	2.4	2.4

Date	26/VI/80	16/VII/80	7/VIII/80	28/VIII/80	18/IX/80	9/X/80	30/X/80	21/XI/80
Flow (m ³ /s)	3.64	2.50	-	-	-	-	-	-
Temp. (°C)	28.7	24.0	22.4	22.9	24.0	21.4	23.6	22.0
O ₂ (dissolved)(mg/l)	7.0	7.8	7.0	8.2	7.4	8.3	9.0	8.8
Conductivity (µmho/cm)	67	70	71	85	-	52	41	46
pH	7.25	8.1	7.65	7.2	7.3	-	7.2	-
Alkalinity (mg/l CaCO ₃)	15.0	18.0	11.8	12.7	12.0	14.0	13.0	14.8
Turbidity (N.T.U.)	9.4	5.6	25	28	22.0	19.5	14.5	15.0
Suspended Solids (mg/l)	6.5	5.6	20.7	27.0	22.5	9.5	11.9	9.0
% S.S. combustible	35	50	13	30	16	5	32	-
Total - P (µg/l)	18	14	16	14	16	14	17	12
PO ₄ - P (µg/l)	10	4	8	10	2	2	4	5
NO ₃ - N (µg/l)	142	47	67	133	-	-	135	134
NH ₄ - N (µg/l)	2	2	15	6	20	12	2	10
Fe (mg/l)	.11	.01	.26	.33	.36	.37	.21	.22
Si (mg/l)	5.0	12.4	5.0	9.1	3.4	8.2	9.6	10.0
Mg (mg/l)	.4	.4	.4	.8	.6	3.0	.6	.5
Ca (mg/l)	1.7	1.6	.9	3.2	2.6	22.9	3.2	3.4
Na (mg/l)	2.7	3.4	3.0	3.4	3.0	7.0	3.2	3.0
K (mg/l)	2.0	2.2	2.2	2.4	2.0	3.3	2.1	2.1

Table A2.19 (cont.)

Date	10/XII/80	8/I/81	22 /I/81	6/II/81	23/II/81	5/III/81	19/III/81	10/IV/81
Flow (m ³ /s)	-	-	2.01	1.72	(8.45)	1.66	1.49	1.10
Temp. (°C)	20.3	20.9	21.1	20.7	21.5	23.5	23.8	24.0
O ₂ (dissolved)(mg/l)	8.8	9.3	10.3	10.1	9.1	8.2	10.4	10.1
Conductivity (µmho/cm)	51	44	43	47	52	52	60	52
pH	-	-	7.2	-	7.2	8.1	8.1	8.3
Alkalinity (mg/l CaCO ₃)	14.0	14.6	14.8	12.0	14.0	11.3	12.7	17.0
Turbidity (N.T.U.)	9.2	2.7	2.7	4.5	4.4	2.7	3.2	3.8
Suspended Solids (mg/l)	5.1	1.7	-	6.0	10.0	10.0	6.3	-
% S.S. combustible	17	100	-	33	40	0	53	-
Total - P (µg/l)	8	19	8	20	8	8	11	22
PO ₄ - P (µg/l)	1	4	7	2	2	1	4	7
NO ₃ - N (µg/l)	150	141	143	45	116	58	<1	16
NH ₄ - N (µg/l)	14	18	28	28	19	18	22	29
Fe (mg/l)	.12	.16	.11	.17	.08	.15	.09	.09
Si (mg/l)	11.2	11.4	11.3	9.6	11.0	8.5	12.2	13.8
Mg (mg/l)	.6	.4	.4	-	.5	-	.4	-
Ca (mg/l)	4.2	3.3	3.0	-	3.5	-	3.4	-
Na (mg/l)	3.6	3.2	3.5	-	3.7	-	3.7	-
K (mg/l)	2.3	2.1	2.0	-	2.4	-	2.5	-

Date	30/IV/81	21/V/81	11/VI/81	25/VI/81	9/VII/81	28/VII/81	13/VIII/81	9/IX/81
Flow (m ³ /s)	1.25	0.69	3.64	(5.29)	(2.70)	(6.48)	(8.89)	(6.62)
Temp. (°C)	27.5	30.0	26.9	24.5	24.0	24.8	21.0	21.8
O ₂ (dissolved)(mg/l)	9.6	9.6	7.8	8.1	8.4	9.0	7.6	8.4
Conductivity (µmho/cm)	47	53	55	45	-	42	45	50
pH	-	8.0	8.4	6.8	7.3	7.0	-	7.3
Alkalinity (mg/l CaCO ₃)	15.0	16.3	13.5	10.0	6.9	12.3	8	9
Turbidity (N.T.U.)	4.1	3.3	13.0	14.0	6.8	19	23	9.4
Suspended Solids (mg/l)	3.4	3.0	12.0	11.8	-	16.3	-	9.3
% S.S. combustible	3 9	83	31	26	-	29	-	32
Total - P (µg/l)	11	43	17	30	56	41	42	12
PO ₄ - P (µg/l)	2	2	2	2	6	7	5	5
NO ₃ - N (µg/l)	10	10	15	77	76	90	89	96
NH ₄ - N (µg/l)	17	17	18	29	8	48	72	21
Fe (mg/l)	.09	.09	.14	.16	.07	.27	.26	.05
Si (mg/l)	9.6	4.3	10.6	8.2	9.0	7.2	7.6	6.5
Mg (mg/l)	.6	.5	.3	.4	.4	.7	.7	-
Ca (mg/l)	3.8	4.2	2.6	3.3	3.2	3.3	3.2	-
Na (mg/l)	4.0	4.3	3.3	3.3	3.5	3.4	3.2	-
K (mg/l)	2.5	2.5	2.5	2.2	2.4	2.6	2.6	-

Table A2.19 (cont.)

Date	29/IX/81	15/X/81	3/XI/81	12/XI/81	4/XII/81	15/XII/81	12/I/82	23/II/82
Flow (m ³ /s)	(5.29)	(7.50)	-	-	(3.02)	(2.30)	1.90	1.88
Temp. (°C)	24.5	20.0	21.6	19.5	21.3	-	-	21.7
O ₂ (dissolved)(mg/l)	9.6	8.4	-	8.6	9.1	-	-	9.4
Conductivity (µmho/cm)	55	47	47	46	49	-	-	102
pH	-	6.4	6.8	6.8	7.2	-	-	-
Alkalinity (mg/l CaCO ₃)	11.9	3.1	16.8	16.5	20.0	15.0	15.8	16.0
Turbidity (N.T.U.)	10.5	17	9.0	7.0	9.3	4.2	2.4	3.2
Suspended Solids (mg/l)	9.6	8.3	6.5	4.0	1.5	6.0	-	-
% S.S. combustible	42	39	38	30	21	33	-	-
Total - P (µg/l)	15	20	16	78	20	6	19	27
PO ₄ - P (µg/l)	4	5	4	627	2	0	6	6
NO ₃ - N (µg/l)	112	108	44	32	16	174	216	40
NH ₄ - N (µg/l)	22	22	19	12	11	16	5	45
Fe (mg/l)	.18	.17	.11	.06	.05	.07	.08	.10
Si (mg/l)	3.3	5.3	7.4	6.2	10.4	7.3	1.0	9.6
Mg (mg/l)	-	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-	-

Date	18/III/82	29/IV/82	27/V/82	22/VI/82	20/VII/82	18/VIII/82	28/IX/82
Flow (m ³ /s)	0.81	1.58	(6.78)	(5.44)	2.06	2.99	3.03
Temp. (°C)	-	30.0	26.0	23.7	24.6	25.0	23.9
O ₂ (dissolved)(mg/l)	-	9.5	10.8	9.5	8.9	8.5	8.9
Conductivity (µmho/cm)	-	52	47	44	46	40	54
pH	-	7.5	-	-	-	-	-
Alkalinity (mg/l CaCO ₃)	15.5	18.0	14.3	13.0	16.0	11.0	14.8
Turbidity (N.T.U.)	2.6	2.0	7.1	13.0	2.5	9.2	6.1
Suspended Solids (mg/l)	-	-	-	-	-	-	-
% S.S. combustible	-	-	-	-	-	-	-
Total - P (µg/l)	27	16	38	18	14	10	16
PO ₄ - P (µg/l)	5	2	4	3	3	6	4
NO ₃ - N (µg/l)	104	21	50	108	136	136	130
NH ₄ - N (µg/l)	36	34	47	20	8	8	4
Fe (mg/l)	.06	.11	.15	.20	.10	.18	.16
Si (mg/l)	11.0	13.8	6.3	12.1	10.8	10.2	10.7
Mg (mg/l)	-	-	-	-	-	-	-
Ca (mg/l)	-	-	-	-	-	-	-
Na (mg/l)	-	-	-	-	-	-	-
K (mg/l)	-	-	-	-	-	-	-

Appendix 3: Zooplankton Community Structure,
L. Yure and L. de Yojoa.

Table A3.1

L. Yure zooplankton community, numbers of individuals
($\times 10^3$) / m² lake surface, 1980-1983.

Date	30-IX-80	9-X-80	30-X-80	20-XI-80	10-XII-80	8-I-81	22-I-81	5-II-81
ROTIFERA								
<i>Filinia longiseta</i>	5.84 (10)	.60 (14)	40.20 (90)	91.36 (20)	192.60 (42)	2.32 (3)	3.31 (12)	35.44 (26)
<i>Hexarthra intermedia</i>	.11 (0)	.07 (21)	-	-	.21 (16)	-	-	.58 (87)
<i>Colurella hindenburghi</i>	.05(141)	.03 (47)	-	-	-	-	-	-
<i>Amuraeopsis navicula</i>	-	-	-	.02 (0)	-	.03(141)	.01(141)	-
<i>Brachionus angularis</i>	67.66 (18)	11.65 (61)	-	.03(135)	-	-	.05(139)	.06(139)
<i>B. patulus</i> var. <i>macranthus</i>	-	-	-	.02(141)	.64 (37)	-	-	-
<i>B. sp. A</i>	.08(140)	-	-	-	.28(141)	-	-	.97(109)
<i>B. sp. B</i>	.11(140)	-	-	-	-	-	-	-
<i>Dipleuchlanis propatula</i>	.02 (0)	-	.13(140)	-	-	-	-	-
<i>Epiphanes macrourus</i>	22.42 (5)	6.82 (35)	18.29 (30)	58.74 (65)	80.11 (11)	1.04 (60)	7.55 (17)	4.55 (4)
<i>E. sp. A</i>	.53 (10)	-	-	-	.30 (76)	-	.13(140)	.11(140)
<i>Keratella cochlearis</i>	3.83 (11)	1.01 (38)	10.32 (11)	5.30(108)	11.43(123)	.46 (7)	7.00 (32)	68.38 (28)
<i>K. americana</i>	-	-	-	-	-	-	-	-
<i>Macrochaetus collinsi</i>	-	.05 (28)	.01(129)	.01(135)	-	.02(138)	-	-
<i>Mytilina trigona</i>	.06(138)	.04 (0)	.01(129)	-	-	-	-	-
<i>Platylas quadricornis</i>	-	-	-	-	-	-	-	-
<i>Brachionus quadridentatus</i>	-	-	-	-	-	-	-	-
<i>Lecane acronycha</i>	.02(141)	-	.01(141)	-	.03(141)	-	.03 (0)	.11 (70)
<i>L. Bulla</i>	.04 (0)	-	.01(129)	-	.41 (94)	-	.13 (28)	-
<i>L. bulla styrae</i>	-	.02(141)	.01(141)	-	-	-	-	-
<i>L. rotundata</i>	.08(141)	.08 (70)	.02 (0)	-	.05(141)	-	.06 (70)	.03(141)
<i>L. pertica</i>	-	-	.01(141)	-	-	-	-	-
<i>L. pyriformis</i>	-	-	.01(141)	-	-	-	-	-
<i>L. sp. A</i>	-	-	.09(141)	.01(141)	-	.06 (94)	-	-
<i>L. sp. B</i>	-	-	-	.01(141)	-	-	-	-
<i>L. sp. C</i>	-	-	-	-	-	-	-	-
<i>L. sp. D</i>	-	-	-	-	-	-	.01(141)	-
<i>L. sp. E</i>	.04 (0)	-	-	-	-	-	-	-
<i>L. sp. F</i>	-	-	-	-	-	-	-	.05 (0)

Date	30-IX-80	9-X-80	30-X-80	20-XI-80	10-XII-80	8-I-81	22-I-81	5-II-81
ROTIFERA (cont.)								
<i>Cephalodella</i> sp. (?)	.02(141)	-	-	-	-	-	-	-
<i>Trichocera ruttneri</i>	.19 (57)	.04 (0)	.01(129)	-	.02(138)	-	.03(136)	.08(140)
<i>T. weberi</i>	-	-	.01(141)	-	-	-	-	-
<i>T. similis grandis</i>	-	-	-	-	.02(138)	-	.26 (28)	.14 (29)
<i>T. sp. A</i>	-	.02(141)	-	-	-	-	-	-
<i>T. sp. B</i>	-	-	-	-	-	-	-	.04(141)
<i>T. sp. C</i>	.02(141)	-	-	-	-	-	-	-
<i>T. sp. D</i>	.02(141)	-	-	-	-	-	-	-
<i>Ascomorpha</i> sp.	-	-	-	-	-	-	-	-
<i>Asplachna</i> sp. A	-	-	-	-	-	-	-	-
<i>A. sp. B</i>	.06(138)	-	-	-	-	-	-	-
<i>Cephalodella</i> sp. B	-	-	-	-	.05(141)	-	.010(141)	.25 (60)
<i>Ploesoma truncatum</i>	.19(113)	-	-	-	.02(138)	-	16.89 (30)	305.71 (30)
<i>Polyarthra vulgaris</i>	1.70 (21)	.76 (33)	3.48 (79)	28.10 (51)	.20(108)	.40(110)	4.71 (4)	47.51 (0)
<i>Synchaeta pectinata</i>	159.36 (7)	35.68 (20)	587.20 (68)	1508.51 (89)	150.08 (17)	380.05 (1)	216.05 (23)	88.86 (42)
<i>S. sp.</i>	-	-	-	-	-	-	-	-
<i>Comochilus dossuarius</i>	-	-	-	-	-	-	-	2.04 (46)
<i>Unknown Rotifer</i> sp. A	-	-	-	-	-	-	-	-
<i>Unknown Rotifer</i> sp. B	-	.01(141)	-	-	-	-	-	-
<i>Unknown Rotifer</i> sp. C	-	.01(141)	-	-	-	-	-	-
<i>Unknown Rotifer</i> sp. D	-	-	-	-	-	-	-	-
<i>Unknown Rotifer</i> sp. E	.04(140)	-	-	-	-	-	-	.11 (0)
<i>Unknown Rotifer</i> sp. F	-	-	-	-	-	-	-	.03(141)
<i>Unknown Rotifer</i> sp. G	.02(138)	-	-	-	.02(138)	-	.29 (13)	1.27 (6)
<i>Unknown Rotifer</i> sp. H	-	-	-	-	-	-	-	-
<i>Unknown Rotifer</i> sp. I	-	-	-	-	-	-	-	.03(141)
<i>Unknown Rotifer</i> sp. J	.02(141)	-	-	-	-	-	-	-

Table A3.1 (cont.)

Date	18-11-81	4-111-81	19-111-81	10-IV-81	30-IV-81	21-V-81	11-VI-81	25-VI-81
ROTIFERA								
<i>Filinia longiseta</i>	132.69 (29)	70.14 (16)	206.40 (8)	8.65 (32)	.23 ?	.02(135)	9.24 ?	53.23 (64)
<i>Hexarthra intermedia</i>	.03(134)	.09(140)	.14(140)	.50 (4)	-	-	.05 ?	2.28 (84)
<i>Colurella hindenburghi</i>	-	-	-	-	-	-	-	-
<i>Amuraeopsis navicula</i>	.05(141)	-	-	-	-	-	-	-
<i>Brachionus angularis</i>	-	-	-	1.61 (31)	89.99 ?	2426.48 (19)	1674.61 ?	916.25 (64)
<i>B. patulus</i> var. <i>macranthus</i>	-	-	-	-	-	-	-	.01(141)
<i>B. sp. A</i>	-	-	-	.04(137)	-	-	-	-
<i>B. sp. B</i>	-	-	-	-	-	-	-	-
<i>Dipleuchlanis propatula</i>	-	-	-	-	-	-	-	-
<i>Epiphanes macrourus</i>	3.55 (28)	27.67 (28)	272.36 (33)	.24 (0)	.07 ?	-	-	.21 (63)
<i>E. sp. A</i>	.89 (58)	-	14.95(141)	-	-	-	-	-
<i>Keratella cochlearis</i>	4.29 (29)	4.22(110)	150.06 (23)	.02(134)	.116 ?	-	.71 ?	21.62 (95)
<i>K. americana</i>	-	-	-	-	-	-	-	-
<i>Macrochaetus collinsi</i>	-	-	-	.05(139)	.03 ?	-	-	.01(136)
<i>Mytilina trigona</i>	-	-	-	-	-	-	-	.08 (20)
<i>Platylas quadricornis</i>	.02(141)	.13 (54)	.02(141)	-	-	-	-	.04(141)
<i>Brachionus quadridentatus</i>	-	-	-	-	-	-	-	.01(141)
<i>Lecane acronycha</i>	.02(141)	-	-	-	-	-	-	-
<i>L. bulla</i>	-	-	.03(137)	-	-	.02(141)	-	.08 (20)
<i>L. bulla styrae</i>	-	.07 (19)	-	-	-	-	-	-
<i>L. rotundata</i>	.11 (89)	.18 (82)	.02(141)	-	-	-	-	-
<i>L. pertica</i>	.07 (58)	.11(141)	-	-	-	-	-	.01(141)
<i>L. pyriformis</i>	.05(141)	-	-	-	-	-	-	-
<i>L. sp. A</i>	-	-	-	-	-	-	-	-
<i>L. sp. B</i>	.02(141)	-	-	-	-	-	-	-
<i>L. sp. C</i>	-	-	-	-	-	-	-	.03 (61)
<i>L. sp. D</i>	.02(141)	-	-	-	-	-	-	-
<i>L. sp. E</i>	.02(141)	-	-	-	-	-	-	-
<i>L. sp. F</i>	.02(141)	-	-	-	-	-	-	-

Date	18-11-81	4-111-81	19-111-81	10-IV-81	30-IV-81	21-V-81	11-VI-81	25-VI-81
ROTIFERA (cont.)								
<i>Cephalodella</i> sp. (?)	-	-	-	-	-	-	-	-
<i>Trichocera ruttneri</i>	.03(134)	-	-	.14 (71)	-	-	-	.02(138)
<i>T. weberi</i>	-	-	-	-	-	-	-	-
<i>T. similis grandis</i>	.14 (28)	.03(137)	-	.84 (47)	.27 ?	-	-	-
<i>T. sp. A</i>	.02(141)	-	-	-	-	-	-	-
<i>T. sp. B</i>	.07 (58)	-	.11(141)	-	-	.01(141)	-	-
<i>T. sp. C</i>	-	-	-	-	-	-	-	-
<i>T. sp. D</i>	.02(141)	-	-	-	-	-	-	-
<i>Ascomorpha</i> sp.	-	-	-	-	-	-	-	-
<i>Asplanchna</i> sp. A	-	29.68 (47)	.90 (84)	-	-	-	-	-
<i>A. sp. B</i>	-	-	-	-	-	-	-	-
<i>Cephalodella</i> sp. B	-	-	-	7.96 ?	-	-	-	-
<i>Ploesoma truncatum</i>	260.82 (1)	40.95(141)	.66(141)	.02(133)	-	-	-	.02 (33)
<i>Polyarthra vulgaris</i>	1.51 (44)	3.24(112)	4.53 (68)	.67 (67)	.03 ?	-	-	.16 (20)
<i>Synchaeta pectinata</i>	36.77 (26)	290.23 (39)	19.32 (2)	9.72 (10)	.15 ?	2.34(141)	14.26 ?	71.41 (63)
<i>S. sp.</i>	-	-	-	-	-	-	-	-
<i>Conochilus dossuarius</i>	54.57 (40)	24.48(141)	14.62(141)	4.70(141)	-	-	-	-
Unknown Rotifer sp. A	-	-	-	-	-	-	-	.01(141)
Unknown Rotifer sp. B	-	-	-	-	-	-	-	-
Unknown Rotifer sp. C	-	-	-	-	-	-	-	-
Unknown Rotifer sp. D	-	-	-	-	-	-	-	-
Unknown Rotifer sp. E	1.02 (36)	60.14 (8)	-	-	.34 ?	-	.09 ?	.01(136)
Unknown Rotifer sp. F	.02(141)	-	.05(141)	-	-	-	-	-
Unknown Rotifer sp. G	1.31 (9)	-	-	.05 (47)	-	-	-	-
Unknown Rotifer sp. H	.02(141)	-	-	-	-	-	-	-
Unknown Rotifer sp. I	.02(141)	-	-	-	-	-	-	-
Unknown Rotifer sp. J	-	-	-	-	-	-	-	-

Table A3.1 (cont.)

Date	15-VII-81	28-VII-81	13-VIII-81	9-IX-81	29-IX-81	15-X-81	10-XI-81	3-XII-81
ROTIFERA								
<i>Filinia longiseta</i>	1.03(135)	81.42 ?	2.65(130)	1.35 (12)	2.28 (46)	12.51(106)	45.36 (21)	672.74 (2)
<i>Hexarthra intermedia</i>	-	.31 (12)	-	2.16 (99)	.06(139)	.48(116)	1.24 (51)	83.65 (7)
<i>Colurella hindenburghi</i>	-	-	-	-	-	-	-	-
<i>Anuraeopsis navicula</i>	-	-	.01(141)	-	-	-	-	-
<i>Brachionus angularis</i>	323.70(141)	519.65 (47)	388.64 (60)	556.46 (8)	2.45 (48)	.13(140)	.22(141)	.01(134)
<i>B. patulus</i> var. <i>macranthus</i>	-	.01(141)	.05(141)	-	-	-	.08(141)	.11 (28)
<i>B. sp. A</i>	-	-	-	-	-	-	-	-
<i>B. sp. B</i>	-	-	.01(141)	-	-	-	-	-
<i>Dipleuchianis propatula</i>	-	-	-	-	-	-	-	-
<i>Epiphanes macrourus</i>	117.36(135)	.11 (16)	.22(141)	.58 (35)	-	-	-	-
<i>E. sp. A</i>	-	3.51(139)	-	.08(140)	-	-	-	-
<i>Keratella cochlearis</i>	1.10(138)	.99 (37)	1.18 (79)	2.99 (67)	4.44(107)	1.45 (31)	13.35 (24)	23.03 (12)
<i>K. americana</i>	-	.01(141)	-	-	-	-	-	-
<i>Macrochaetus collinsi</i>	-	-	.01(132)	-	-	-	-	-
<i>Mytilina trigona</i>	-	.01(131)	-	.03(137)	.01(132)	-	-	.01(134)
<i>Platylas quadricornis</i>	-	.03 (0)	.59 (6)	.09(103)	.02 (47)	-	-	.06 (60)
<i>Brachionus quadridentatus</i>	-	-	-	.02(141)	.20 (42)	-	-	-
<i>Lecane acronycha</i>	-	-	-	-	-	-	-	-
<i>L. Bulla</i>	-	-	-	-	-	-	-	-
<i>L. bulla styrae</i>	-	.01(141)	.01(141)	-	-	-	-	-
<i>L. rotundata</i>	-	.02(141)	-	-	-	-	-	-
<i>L. pertica</i>	-	-	.01(141)	-	-	-	-	-
<i>L. pyriformis</i>	-	-	-	-	-	-	-	-
<i>L. sp. A</i>	-	-	-	-	-	-	-	-
<i>L. sp. B</i>	-	-	-	-	-	-	-	-
<i>L. sp. C</i>	.01(140)	-	-	-	.02(141)	-	-	-
<i>L. sp. D</i>	-	-	-	-	-	-	-	-
<i>L. sp. E</i>	-	-	-	-	-	-	-	-
<i>L. sp. F</i>	-	-	-	-	-	-	-	-

Date	15-VII-81	28-VII-81	13-VIII-81	9-IX-81	29-IX-81	15-X-81	10-XI-81	3-XII-81
ROTIFERA (cont.)								
<i>Cephalodella</i> sp. (?)	-	-	-	-	-	-	-	-
<i>Trichocera ruttneri</i>	-	.01(131)	-	-	-	-	.04(138)	-
<i>T. weberi</i>	-	-	-	-	-	-	-	-
<i>T. similis grandis</i>	.07(140)	.01(131)	-	.11(140)	-	-	.13(140)	4.31(137)
<i>T. sp. A</i>	-	-	-	-	-	-	-	-
<i>T. sp. B</i>	-	-	-	-	-	-	-	-
<i>T. sp. C</i>	-	-	-	-	-	-	-	-
<i>T. sp. D</i>	-	-	-	-	-	-	-	-
<i>Ascomorpha</i> sp.	-	.06(141)	-	-	-	-	-	-
<i>Asplachna</i> sp. A	-	-	-	-	-	-	-	-
<i>A. sp. B</i>	-	-	-	-	-	-	-	-
<i>Cephalodella</i> sp. B	-	-	-	-	-	-	-	-
<i>Ploesoma truncatum</i>	-	-	2.59 (59)	10.26 (10)	452.89 (13)	227.32 (32)	386.21 (32)	98.37 (16)
<i>Polyarthra vulgaris</i>	.01(131)	8.97(120)	-	2.27 (87)	.17 (11)	.30 (31)	245.05 (28)	101.68 (9)
<i>Synchaeta pectinata</i>	-	174.64 (23)	.90(126)	6.99 (36)	4.51 (16)	3.43(118)	24.31 (66)	163.93 (4)
<i>S. sp.</i>	-	-	-	-	-	-	-	-
<i>Conochilus dossuarius</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. A</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. B</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. C</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. D</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. E</i>	12.32(139)	59.99 (3)	1.29 (60)	10.80 (54)	.12(106)	-	1.19 (16)	139.43 (20)
<i>Unknown Rotifer sp. F</i>	-	.11 (20)	48(133)	.04 (48)	-	-	-	-
<i>Unknown Rotifer sp. G</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. H</i>	-	-	.01(141)	-	-	-	-	-
<i>Unknown Rotifer sp. I</i>	-	-	-	-	-	-	-	-
<i>Unknown Rotifer sp. J</i>	-	-	-	-	-	-	-	-

Table A3.1 (cont.)

Date	12-I-82	23-II-82	18-III-82	29-IV-82	27-V-82	4-VII-82	20-VII-82
ROTIFERA							
<i>Filinia longiseta</i>	4.73(133)	47.90 (11)	140.72 (12)	.04 (63)	- -	.13(140)	2.30 ?
<i>Hexarthra intermedia</i>	- -	.18 (67)	3.23 (95)	732.90 (17)	.80 ?	.04(138)	4.25 ?
<i>Colurella hindenburghi</i>	- -	- -	- -	- -	- -	- -	- -
<i>Amuraeopsis navicula</i>	- -	- -	- -	- -	- -	- -	- -
<i>Brachionus angularis</i>	- -	- -	- -	- -	- -	- -	- -
<i>B. patulus</i> var. <i>macranthus</i>	- -	- -	- -	- -	- -	- -	- -
<i>B. sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>B. sp. B</i>	- -	- -	- -	- -	- -	- -	- -
<i>Dipleuchlanis propatula</i>	- -	- -	.04(138)	- -	- -	- -	- -
<i>Epiphanes macrourus</i>	- -	- -	- -	- -	- -	- -	- -
<i>E. sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>Keratella cochlearis</i>	101.68 (35)	85.10 (99)	244.26 (3)	492.57 (25)	1.76 ?	.26(141)	.18 ?
<i>K. americana</i>	- -	- -	- -	- -	- -	- -	- -
<i>Macrochaetus collinsi</i>	.01(134)	- -	- -	.18 (71)	- -	- -	- -
<i>Mytilina trigona</i>	- -	- -	- -	- -	- -	- -	- -
<i>Platylas quadricornis</i>	- -	- -	- -	- -	- -	- -	- -
<i>Brachionus quadridentatus</i>	- -	- -	- -	- -	- -	- -	- -
<i>Lecane acronyche</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. Bulla</i>	.04(138)	- -	- -	- -	- -	- -	- -
<i>L. bulla styran</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. rotundata</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. pertica</i>	- -	- -	.13(141)	- -	- -	- -	- -
<i>L. pyriformis</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. B</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. C</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. D</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. E</i>	- -	- -	- -	- -	- -	- -	- -
<i>L. sp. F</i>	- -	- -	- -	- -	- -	- -	- -

Date	12-I-82	23-II-82	18-III-82	29-IV-82	27-V-82	4-VII-82	20-VII-82
ROTIFERA (cont.)							
<i>Cephalodella sp. (?)</i>	- -	- -	- -	- -	- -	- -	- -
<i>Trichocera ruttneri</i>	- -	- -	- -	- -	- -	- -	- -
<i>T. weberi</i>	- -	- -	- -	- -	- -	- -	- -
<i>T. similis grandis</i>	3.05(117)	.221(141)	.53 (22)	.18(141)	- -	- -	- -
<i>T. sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>T. sp. B</i>	.04(138)	- -	.18(141)	- -	- -	- -	- -
<i>T. sp. C</i>	- -	- -	- -	- -	- -	- -	- -
<i>T. sp. D</i>	- -	- -	- -	- -	- -	- -	- -
<i>Ascomorpha sp.</i>	- -	- -	- -	- -	- -	- -	- -
<i>Asplachna sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>A. sp. B</i>	- -	- -	- -	- -	- -	- -	- -
<i>Cephalodella sp. B</i>	- -	- -	- -	- -	- -	- -	- -
<i>Ploesoma truncatum</i>	68.87 (54)	.93 (46)	7.33 (10)	- -	- -	- -	- -
<i>Polyarthra vulgaris</i>	386.66 (8)	70.60 (39)	170.96 (3)	82.03 (8)	135.57 ?	.71(106)	1.24 ?
<i>Synchaeta pectinata</i>	45.53 (13)	141.07 (20)	49.73 (9)	- -	- -	.35(105)	6.19 ?
<i>S. sp.</i>	- -	- -	- -	- -	- -	- -	- -
<i>Conochilus dossuarius</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. A</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. B</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. C</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. D</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. E</i>	359.20 (56)	59.31 (3)	56.23 (66)	.30(100)	3.00 ?	- -	- -
<i>Unknown Rotifer sp. F</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. G</i>	.01(134)	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. H</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. I</i>	- -	- -	- -	- -	- -	- -	- -
<i>Unknown Rotifer sp. J</i>	- -	- -	- -	- -	- -	- -	- -

Table A3.1 (cont.)

Date	19-VIII-82	4-IX-82	17-IX-82	6-X-82	23-X-82	4-XI-82	18-XI-82	30-XI-82
ROTIFERA								
<i>Filinia longiseta</i>	1.99(141)	-	-	-	-	-	-	-
<i>Hexarthra intermedia</i>	-	-	.62(122)	-	-	-	-	-
<i>Colurella kindenburghi</i>	-	-	-	-	-	-	-	-
<i>Amuraeopsis navicula</i>	-	-	-	-	-	-	-	-
<i>Brachionus angularis</i>	-	-	-	-	-	-	-	-
<i>B. patulus</i> var. <i>macranthus</i>	-	-	-	-	-	-	-	-
<i>B. sp. A</i>	-	-	-	-	-	-	-	-
<i>B. sp. B</i>	-	-	-	-	-	-	-	-
<i>Dipleuchlanis propatula</i>	-	-	-	-	-	-	-	-
<i>Epiphanes macrourus</i>	-	-	-	-	-	-	-	-
<i>E. sp. A</i>	-	-	-	-	-	-	-	-
<i>Keratella cochlearis</i>	6.36 (53)	.04(141)	-	-	3.93 (4)	-	-	.01(141)
<i>K. americana</i>	-	-	-	-	-	-	-	-
<i>Macrochaetus collinsi</i>	-	-	-	-	-	-	-	-
<i>Mytilina trigona</i>	-	-	-	-	-	-	-	-
<i>Platylas quadricornis</i>	-	-	-	-	-	-	-	-
<i>Brachionus quadridentatus</i>	-	-	-	-	-	-	-	-
<i>Lecane acronycha</i>	-	-	-	-	-	-	-	-
<i>L. Bulla</i>	-	-	-	-	-	-	.01(141)	-
<i>L. bulla styrae</i>	-	-	-	-	-	-	-	-
<i>L. rotundata</i>	-	-	-	-	-	-	-	-
<i>L. pertica</i>	-	-	-	-	-	-	-	-
<i>L. pyriformis</i>	-	-	-	-	-	-	-	-
<i>L. sp. A</i>	-	-	-	-	-	-	-	-
<i>L. sp. B</i>	-	-	-	-	-	-	-	-
<i>L. sp. C</i>	-	-	-	-	-	-	-	-
<i>L. sp. D</i>	-	-	-	-	-	-	-	-
<i>L. sp. E</i>	-	-	-	-	-	-	-	-
<i>L. sp. F</i>	-	-	-	-	-	-	-	-

Date	19-VIII-82	4-IX-82	17-IX-82	6-X-82	23-X-82	4-XI-82	18-XI-82	30-XI-82
ROTIFERA (cont.)								
<i>Cephalodella</i> sp. (?)	-	-	-	-	-	-	-	-
<i>Trichocera ruttmerti</i>	-	-	-	-	-	-	-	-
<i>T. weberi</i>	-	-	-	-	-	-	-	-
<i>T. similis grandis</i>	-	-	-	-	-	-	-	.01(141)
<i>T. sp. A</i>	-	-	-	-	-	-	-	-
<i>T. sp. B</i>	-	-	-	-	-	-	-	-
<i>T. sp. C</i>	-	-	-	-	-	-	-	-
<i>T. sp. D</i>	-	-	-	-	-	-	-	-
<i>Ascomorpha</i> sp.	-	-	-	-	.53 (55)	-	.01(141)	.34 (79)
<i>Asplachna</i> sp. A	-	-	-	-	-	-	-	-
<i>A. sp. B</i>	-	-	-	-	-	-	-	-
<i>Cephalodella</i> sp. B	-	-	-	-	-	-	-	-
<i>Ploesoma truncatum</i>	-	-	-	-	-	-	-	-
<i>Polyarthra vulgaris</i>	7.94 (85)	.08 (0)	.13 (47)	-	-	-	-	-
<i>Synchaeta pectinata</i>	75.19 (31)	.88 (0)	.92 (47)	.81 (59)	-	-	.01(141)	9.28(133)
<i>S. sp.</i>	-	-	-	-	-	-	-	-
<i>Conochilus dossuarius</i>	-	-	-	-	-	-	-	-
Unknown Rotifer sp. A	-	-	-	-	-	-	-	-
Unknown Rotifer sp. B	-	-	-	-	-	-	-	-
Unknown Rotifer sp. C	-	-	-	-	-	-	-	-
Unknown Rotifer sp. D	-	-	-	-	-	-	-	-
Unknown Rotifer sp. E	25.06 (38)	.61 (20)	.08(141)	-	-	-	-	-
Unknown Rotifer sp. F	-	-	-	-	-	-	-	-
Unknown Rotifer sp. G	-	-	-	-	-	-	.01(141)	-
Unknown Rotifer sp. H	-	-	-	-	-	-	-	-
Unknown Rotifer sp. I	-	-	-	-	-	-	-	-
Unknown Rotifer sp. J	-	-	-	-	-	-	-	-

Table A3.1 (cont.)

Date	9-11-82	4-1-83	19-1-83	31-1-83	15-11-83	25-11-83	2-11-83
ROTIFERA							
<i>Filinia longiseta</i>	-	-	-	.74 (58)	3.37 (85)	5.35 (1)	2.21(141)
<i>Hexarthra intermedia</i>	-	4.56 (59)	2.61 (31)	1.72 (26)	6.18 (60)	5.61 (28)	2.96(121)
<i>Colurella Hindenburghi</i>	-	-	-	-	-	-	-
<i>Amuraeopsis navicula</i>	-	-	-	-	-	-	-
<i>Brachionus angularis</i>	-	-	-	-	-	-	-
<i>B. patulus</i> var. <i>macranthus</i>	-	-	-	-	-	-	-
<i>B. sp. A</i>	-	-	-	-	-	-	-
<i>B. sp. B</i>	-	-	-	-	-	-	-
<i>Dipleuchlanis propatula</i>	-	-	.04(138)	-	-	-	-
<i>Epiphanes macrourus</i>	-	-	-	-	-	-	-
<i>E. sp. A</i>	-	.13(140)	-	-	-	-	-
<i>Keratella cochlearis</i>	.01(141)	3.66 (46)	.41 (51)	.04(138)	1.32 (23)	2.52 (82)	.66(141)
<i>K. americana</i>	-	-	-	-	-	-	-
<i>Macrochaetus collinsi</i>	-	-	-	-	-	-	-
<i>Mytilina trigona</i>	.01(141)	.09(140)	-	-	-	-	-
<i>Platylas quadricornis</i>	-	-	-	-	-	-	-
<i>Brachionus quadridentatus</i>	-	-	-	-	-	-	-
<i>Lecane acronycha</i>	-	-	-	-	-	-	-
<i>L. Bulla</i>	-	-	-	.04(138)	-	-	-
<i>L. bulla styax</i>	-	-	-	-	-	-	-
<i>L. rotundata</i>	-	-	-	-	-	-	-
<i>L. pertica</i>	-	-	.04(138)	-	-	-	-
<i>L. pyriformis</i>	-	-	-	-	-	-	-
<i>L. sp. A</i>	-	-	-	-	-	-	-
<i>L. sp. B</i>	-	-	-	-	-	-	-
<i>L. sp. C</i>	-	-	-	-	-	-	-
<i>L. sp. D</i>	-	-	-	-	-	-	-
<i>L. sp. E</i>	-	-	-	-	-	-	-
<i>L. sp. F</i>	-	-	-	-	-	-	-

Date	9-11-82	4-1-83	19-1-83	31-1-83	15-11-83	25-11-83	2-11-83
ROTIFERA (cont.)							
<i>Cephalodella sp. (?)</i>	-	-	-	-	-	-	-
<i>Trichocera rutleri</i>	-	-	-	-	-	-	-
<i>T. weberi</i>	-	-	-	-	-	-	-
<i>T. similis grandis</i>	-	.08(140)	.31 (21)	.96 (52)	2.51 (67)	1.59 (31)	.36(104)
<i>T. sp. A</i>	-	-	-	-	-	-	-
<i>T. sp. B</i>	-	-	-	-	-	-	-
<i>T. sp. C</i>	-	-	-	-	-	-	-
<i>T. sp. D</i>	-	-	-	-	-	-	-
<i>Ascomorpha sp.</i>	-	46.59 (1)	8.14 (34)	22.50 (14)	7.56 (9)	2.17 (37)	1.54 (4)
<i>Asplanchna sp. A</i>	-	-	-	-	-	-	-
<i>A. sp. B</i>	-	-	-	-	-	-	-
<i>Cephalodella sp. B</i>	-	-	-	-	-	-	-
<i>Ploesoma truncatum</i>	-	-	-	-	-	-	-
<i>Polyarthra vulgaris</i>	-	4.77 (10)	3.86 (3)	1.85 (27)	3.45 (80)	2.38 (63)	.08(140)
<i>Synchaeta pectinata</i>	.13 (48)	39.30 (10)	73.92 (10)	37.57(113)	35.23 (10)	17.60 (11)	15.21 (3)
<i>S. sp.</i>	-	-	-	-	-	-	-
<i>Conochilus dossuarius</i>	-	-	-	-	-	-	-
Unknown Rotifer sp. A	-	-	-	-	-	-	-
Unknown Rotifer sp. B	-	-	-	-	-	-	-
Unknown Rotifer sp. C	-	-	-	-	-	-	-
Unknown Rotifer sp. D	-	-	-	-	-	-	-
Unknown Rotifer sp. E	-	-	.18(141)	.30(102)	.31(141)	-	-
Unknown Rotifer sp. F	-	-	-	-	-	-	-
Unknown Rotifer sp. G	-	-	-	-	-	-	-
Unknown Rotifer sp. H	-	-	-	-	-	-	-
Unknown Rotifer sp. I	-	-	-	-	-	-	-
Unknown Rotifer sp. J	-	-	-	-	-	-	-

Table A3.1 (cont.)

	29-11-81	16-1-81	10-11-81	3-111-81	12-1-82	23-11-82	18-111-82	29-11-82	27-V-82	4-V11-82
CLADOCERA										
<i>Moina micrura</i>	11.46 (17)	110.53 (60)	3.73 (19)	21.92 (8)	37.71 (6)	14.14 (36)	31.34 (27)	.18 (71)	.35 7	.83 (38)
<i>Ceriodaphnia rigaudi</i>	4.02 (31)	1.02 (32)	.53 (22)	6.51 (6)	3.98 (28)	.05(138)	.13(140)	.09(138)	-	-
<i>Simoccephalus serrulatus</i>	.25 (88)	.04(138)	-	.13 (47)	-	.05(138)	-	-	.08 7	-
<i>Daphnia pulex</i>	-	-	-	-	-	-	-	-	.44 7	331.19 (43)
<i>Hydrophilus spinifer</i>	.01(132)	.04(140)	-	-	-	.05(138)	.09 (6)	.05(138)	.08 7	-
<i>Macrothrix laticornis</i>	-	.03(137)	-	.03 (61)	.02(134)	.05(138)	-	-	-	.09 (8)
<i>Isidya macrops</i>	-	-	-	-	-	.05(138)	-	-	-	-
<i>Oypurella tenuicaudis</i>	-	-	-	-	-	-	-	-	-	-
<i>Alona</i> sp.	.11 (20)	.04(138)	.09 (2)	.08 (79)	.05(138)	.05(138)	.05(138)	-	-	-
<i>Chydorus sphaericus</i>	.09 (48)	-	.04(138)	.03 (8)	.08 (79)	.09(140)	-	-	-	-
Copepoda										
<i>Tropocyclops prasinus</i>	90.52 (0)	54.17 (35)	13.08 (54)	457.38 (14)	145.33 (3)	420.00 (20)	1142.93 (10)	1107.45 (15)	200.05 7	163.94 (2)
<i>nauplii</i>	122.86 (35)	90.92 (77)	19.45 (22)	273.34 (8)	68.29 (3)	205.21 (18)	527.16 (15)	135.56 (10)	52.66 7	197.09 (40)
<i>nauplii</i>	-	-	-	-	-	-	-	-	-	-
<i>nauplii</i>	1.81 (19)	91 (39)	-	9.23 (29)	25.64 (80)	5.35 (34)	1.10(141)	1.06 (20)	.79 7	-
<i>nauplii</i>	-	-	-	-	-	-	-	-	-	-
<i>Chydorus</i> sp	3.60 (52)	2.35 (27)	04(140)	08 (16)	.09 (8)	.36 (67)	.56 (11)	4.51 (4)	2.73 7	.48 (10)
CLADOCERA										
<i>Moina micrura</i>	-	-	5.95 (28)	.44 (28)	.21 (35)	.01(141)	1.01 (61)	.01(141)	-	-
<i>Ceriodaphnia rigaudi</i>	-	-	-	-	-	.01(141)	-	-	-	.07 (26)
<i>Simoccephalus serrulatus</i>	-	-	-	-	-	-	-	-	-	-
<i>Daphnia pulex</i>	12.38 7	-	127.71 (12)	23.81 (4)	40.35 (14)	12.50 (27)	18.35 (25)	13.24 (6)	26.42 (5)	40.64 (39)
<i>Hydrophilus spinifer</i>	-	-	39(141)	-	-	-	-	-	-	-
<i>Macrothrix laticornis</i>	-	-	-	.08 (8)	-	-	-	-	-	-
<i>Isidya macrops</i>	-	-	-	-	-	-	-	-	-	-
<i>Oypurella tenuicaudis</i>	-	-	-	-	-	-	-	-	-	-
<i>Alona</i> sp.	-	-	-	-	-	.01(141)	-	-	.01(141)	-
<i>Chydorus sphaericus</i>	-	-	.79 (8)	.04(141)	-	-	.04(141)	.01(141)	-	.03(141)
Copepoda										
<i>Tropocyclops prasinus</i>	75.06 7	-	74.84 (3)	2.87 (6)	4.72 (43)	1.39 (46)	55.47 (27)	4.81 (17)	5.52 (5)	2.28 (92)
<i>nauplii</i>	38.28 7	-	64.46 (15)	2.42 (10)	10.38 (39)	3.80 (30)	79.65 (5)	20.70 (15)	6.35 (9)	8.14 (19)
<i>nauplii</i>	-	-	-	-	-	-	-	-	-	-
<i>nauplii</i>	.27 7	-	-	-	.22(141)	.03 (45)	4.13(141)	.53 (7)	-	.08(141)
<i>nauplii</i>	-	-	-	-	.66 (46)	.08(141)	8.00 (52)	.60 (3)	.07 (83)	.19(141)
<i>Chydorus</i> sp	.97 7	-	1.14 (15)	-	-	-	-	.11(141)	-	.06 (68)

Tabl'e A3.1 (cont.)

	9-11-82	4-1-83	19-1-83	31-1-83	15-11-83	25-11-83	2-111-83
<u>CI ADDEERA</u>							
<i>Polina micrura</i>	.01(141)	-	.22(141)	.04(138)	.13(140)	.09(140)	-
<i>Ceriodaphnia rigaudi</i>	.01(141)	.13 (40)	.30 (62)	.08 (0)	.13(140)	.13 (54)	-
<i>Simcephalus serrulatus</i>	-	-	-	-	-	-	-
<i>Daphnia pulex</i>	6.34 (6)	26.35 (27)	16.53 (0)	11.88 (4)	11.45 (7)	9.10 (8)	9.62 (51)
<i>Hyocryptus spinifer</i>	-	-	-	-	-	-	-
<i>Macrothrix laticornis</i>	-	-	-	-	.04(138)	-	-
<i>Daphnia macrops</i>	-	-	-	-	-	-	-
<i>Oxyurella tenuicaudis</i>	-	-	-	-	-	-	-
<i>Alona</i> sp.	.01(141)	.04(138)	-	-	-	-	-
<i>Chydorus sphaericus</i>	-	.04(138)	-	.04(138)	-	.09(140)	-
<u>COPEPODA</u>							
<i>Temnocyclus prasinus</i>							
<i>nauplii</i>	1.25 (15)	56.06 (6)	57.74 (1)	77.80 (0)	56.05 (22)	62.34 (73)	62.95 (27)
<i>Copepodites + adults</i>	3.20 (12)	20.90 (8)	25.65 (14)	51.28 (11)	31.47 (14)	32.32 (5)	31.96 (16)
<i>Mesocyclops leuckartii</i>							
<i>nauplii</i>	.01(141)	-	-	-	-	-	-
<i>Copepodites + adults</i>	.31 (20)	1.80 (24)	.61(141)	1.54(141)	.23 (28)	.18(141)	.70 (54)
<u>DIPTERA</u>							
<i>Chaburus</i> sp.	.01(141)	17 (70)	.05(138)	.08(140)	.05(138)	.08(140)	.36(104)

Table A3 2

Individual dry weights of the major zooplankton species
in L. Yure.

Species	Dry Weight (μ g)	Species	Dry Weight (μ g)
COPEPODA		ROTIFERA	
<u>Tropocyclops prasinus</u>		<u>B. sp. 1</u>	.1063
<u>mexicanus</u>		<u>B. sp. 2</u>	.0405
nauplii	.1667	<u>Dipleuchlanis propatula</u>	.0494
copepodites	1.445	<u>Epiphanes macrourus</u>	.1044
adult female	1.85	<u>E. sp.</u>	.12
adult male	1.35	<u>Keratella cochlearis</u>	.00387
<u>Mesocyclops leukarti</u>		<u>K. americana</u>	
copp + adult ♀	3.3	<u>Macrochaetus collinsi</u>	.0308
CLADOCERA		<u>Mytilina trigona</u>	.0184
<u>Moina micrura</u>	6.18	<u>Platytias quadricornis</u>	.67
<u>Ceriodaphnia rigaudi</u>	1.6	<u>Brachionus quadridentatus</u>	.2729
<u>Simocephalus vetulus</u>	1.25	<u>Lecane acronynca</u>	.0176
<u>Daphnia pulex</u>		<u>L. bulla</u>	.0043
size class A	3.01	<u>L. bulla styrae</u>	.0178
size class B	10.04	<u>L. rotundata</u>	.006
size class C	21.	<u>L. pyriiformis</u>	.0038
DIPTERA		<u>L. sp. 1</u>	
<u>Chaoborus sp.</u>		<u>L. sp. 2</u>	.0107
stage I	15.5	<u>L. pertica</u>	.0035
stage II	32.0	<u>L. sp. 3</u>	.0697
stage III	72.5	<u>L. sp. 4</u>	.037
stage IV	99.6	<u>L. sp. 5</u>	.0406
ROTIFERA		<u>L. sp. 6</u>	.0126
<u>Filinia longiseta</u>	.048	<u>Cephalodella sp. 1</u>	.0231
<u>Hexarthra intermedia</u>	.01034	<u>Trichocerca ruttnerii</u>	.0474
<u>Colulella hindenburghi</u>	.00881	<u>T. weberi</u>	.0191
<u>Anuraeopsis navicula</u>	.113	<u>T. similis grandis</u>	.0132
<u>Brachionus angularis</u>	.0454	<u>T. sp. 1</u>	.0136
<u>B. patulus</u> var. <u>macranthus</u>	.109		

Table A3.2 (continued).

Species	Dry Weight (μ g)
ROTIFERA	
<u>Trichocerca</u> sp. 2	.0242
<u>T.</u> sp. 3	.0435
<u>T.</u> sp. 4	.1602
<u>Ascomorpha</u> sp.	.03284
<u>Asplanchna</u> sp. 1	1.19
<u>Asplanchna</u> sp. 2	.601
<u>Cephalodella</u> sp. 2	.05023
<u>Ploesoma truncatum</u>	.0439
<u>Polyarthra vulgaris</u>	.0486
<u>Synchaeta pectinata</u>	.0795
<u>S.</u> sp.	
<u>Conochilus dossuarius</u>	.0032
Unknown Rotifer 1	
2	.0477
3	.0013
4	.037
5	.0122
6	.0049
7	.0266
8	.0396
9	.1246
10	.0188

Table A3.3

Zooplankton synoptic, L. Yure, 31/VII/80,
(numbers of individuals[$\times 10^3$] / m^2)

Genus	Station:		Index		1		2		3		4		5		6		7	
	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)
Filinia	9.88	(4.85)	13.44	(3.80)	2.58	(3.65)	24.10	(12.80)	16.34	(3.34)	15.50	(1.19)	8.62	(5.59)	5.82	(.63)	.88	(1.17)
Brachionus	1022.00	(134.61)	1083.99	(113.02)	695.03	(110.72)	1320.52	(610.76)	813.34	(247.16)	653.68	(68.07)	655.23	(67.24)	119.81	(25.34)	318.09	(42.81)
Epiphanes	135.34	(1.70)	130.78	(46.93)	56.92	(.21)	36.83	(26.61)	113.97	(21.29)	177.31	(25.71)	117.27	(38.14)	157.21	(.58)	232.00	(6.43)
Keratella	9.04	(6.99)	6.38	(2.68)	2.13	(1.85)	21.77	(4.18)	17.74	(5.32)	29.23	(29.17)	18.96	(5.12)	6.72	(.63)	4.71	(.88)
Synchaeta	0		0		3.44	(4.87)	1.61	(2.28)	1.00	(.10)	2.82	(1.85)	1.29	(.84)	4.03	(1.90)	7.61	(1.40)
Moina	13.44	(11.40)	8.44	(5.60)	5.05	(1.05)	10.48	(4.18)	7.36	(2.81)	8.04	(4.45)	8.73	(8.35)	4.48	(1.27)	0	
Tropocyclops																		
--copepodites + adults	35.46	(12.13)	42.46	(4.29)	18.59	(2.90)	27.96	(1.52)	37.44	(31.67)	42.46	(1.99)	34.43	(38.04)	33.15	(13.94)	0.83	(1.17)
--nauplii	72.22	(39.79)	46.01	(.44)	20.10	(10.18)	19.81	(3.93)	19.87	(12.89)	44.53	(33.78)	6.18	(7.23)	19.26	(6.97)	1.24	(1.75)
Chaoborus	0.37	(.12)	0.36	(.05)	.18	(.11)	.24	(.06)	0.19	(.02)	0.35	(.25)	0.39	(.21)	0.09	(.05)	0	

Table A3.4

Zooplankton synoptic, L. Yure, 30/IX/80

(numbers of individuals $\times 10^3$ / m^2)

Station:	Index		1		2		4		5		6		7		8	
Species	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)
ROTIFERA																
<i>Filinia longiseta</i>	7.78	(.20)	27.97	(9.99)	19.69	(.20)	43.15	(51.05)	8.87		19.77	(1.64)	68.54	(4.45)	64.51	(18.85)
<i>Hexarthra intermedia</i>	.15	(.01)	.11	(.03)	.16	(.07)	.01	(.02)	.13		.11	(.04)	.24	(.09)	.48	(.59)
<i>Brachionus angularis</i>	91.09	(22.78)	117.31	(29.05)	32.45	(6.73)	14.44	(.30)	140.67		37.97	(30.01)	50.71	(7.72)	65.49	(15.09)
<i>Epiphanes macrourus</i>	29.91	(.70)	55.97	(17.06)	49.34	(11.44)	7.32	(1.96)	21.26	(No replicate sample taken)	63.14	(19.88)	243.30	(37.64)	331.03	(14.75)
<i>Epiphanes sp.</i>	.72	(.13)	.71	(.52)	.69	(.06)	.03	(.05)	.23		4.54	(2.94)	23.73	(12.48)	19.91	(11.92)
<i>Keratella cochlearis</i>	5.15	(.93)	5.90	(.53)	3.59	(3.01)	2.44	(2.31)	4.57		1.84	(1.52)	17.78	(4.43)	49.06	(10.38)
<i>Macrochaetus collinsi</i>	0		.03	(.05)	0		.01	(.02)	0		.01	(.01)	0		0	
<i>Mytilina trigona</i>	.08	(.11)	.03	(.05)	.01	(.01)	0		0		0		.01	(.01)	0	
<i>Platyas quadridentatus</i>	0		.02	(.02)	.04	(.02)	0		0		0		0		.01	(.01)
<i>Lecane sp. 1</i>	.02	(.03)	.16	(.02)	.01	(.01)	0		0		0		.01	(.01)	.01	(.01)
<i>Lecane spp.</i>	.04	(0)	.01	(.01)	.10	(.02)	.01	(.02)	0	.04	(.01)	0		.01	(.01)	
<i>Trichocerca spp.</i>	.25	(.13)	.24	(.03)	.20	(.13)	.05	(.01)	.08	.16	(.06)	.18	(.01)	.72	(.56)	
<i>Polyarthra vulgaris</i>	2.25	(.30)	3.06	(3.49)	2.90	(3.66)	2.26	(2.32)	4.13	.20	(.01)	1.12	(1.10)	6.19	(1.94)	
<i>Synchaeta pectinata</i>	212.53	(1.27)	51.93	(25.61)	29.44	(7.65)	460.20	(124.15)	497.19	30.18	(22.77)	45.68	(4.66)	19.43	(3.40)	
(unknown genus)	0		.02	(.01)	.06	(.02)				.08	(0)	.09	(.13)	.04	(.06)	

(No replicate sample taken)

Table A3.4 (cont.)

Station:	Index		1		2		4		5		6		7		8	
Species	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)	$\bar{x}$	(s.d.)
CLADOCERA																
Moina micrura	20.30	(.76)	13.50	(3.67)	11.01	(2.74)	8.88	(5.00)	9.22		10.60	(3.54)	7.04	(.60)	2.84	(.09)
Ceriodaphnia spp.	.02	(.03)	.04	(.03)	.09	(.05)	0		.02		.01	(.01)	.03	(.01)	.04	(.04)
Macrothrix sp.	.02	(.03)	.02	(.02)	.49	(.22)	.04	(.02)	0		.01	(.01)	.02	(.00)	.02	(.00)
Ilyocriptus spinifer (?)	0		0		.06	(.00)	.06	(.08)	0		.02	(.01)	.05	(.01)	.01	(.01)
Simocephalus exspinosus (?)	.04	(0)	.05	(.02)	.10	(.11)	.09	(.08)	.10		.01	(.02)	.05	(.04)	0	
Alona sp.	.08	(.11)	.08	(.02)	.12	(.06)	0		0		0		.03	(.02)	.01	(.01)
Chydorus sp.	0		0		.01	(.01)	0		0		0		0		0	
COPEPODA																
Mesocyclops leuckarti																
-- copepodites + adults	.08	(.04)	.74	(.81)	.08	(.11)	.09	(.08)	1.01		.03	(.04)	.07	(.08)	0	
-- nauplii	0		.08	(.12)	.17	(.24)	.05	(.01)	.06	(No replicate sample taken)	0		.05	(.05)	.03	(.05)
Tropocyclops prasinus																
-- copepodites + adult	23.08	(.11)	95.49	(19.54)	4.86	(.89)	12.98	(8.13)	50.51		46.98	(13.02)	69.83	(30.28)	.53	(.01)
-- adult	0		16.98	(4.92)	.55	(.72)	1.40	(.57)	3.16		6.77	(3.12)	15.19	(3.44)	.06	(.08)
-- nauplii	25.52	(4.30)	100.99	(28.67)	5.73	(2.38)	12.63	(3.77)	36.81		39.85	(16.43)	57.17	(27.49)	.78	(.18)
DIPTERA																
Chaoborus sp.	1.45	(.48)	1.42	(.16)	.53	(.28)	.70	(.42)	1.01		.98	(.16)	.86	(.01)	.07	(.05)

(No replicate sample taken)

Table A3.5

L. de Yojoa zooplankton community structure, 1980-1982, (#indiv.[x10³]/m²).

Species	24/VII/80 #/m ² (C.V.)	14/VIII/80 #/m ² (C.V.)	25/IX/80 #/m ² (C.V.)	29/X/80 #/m ² (C.V.)	27/XI/80 #/m ² (C.V.)	18/XII/80 #/m ² (C.V.)	9/I/81 #/m ² (C.V.)	29/I/81 #/m ² (C.V.)
CLADOCERA								
<u>Daphnia pulex</u>	40.88 (30)	50.25 (14)	2.58 (68)	82.55 (25)	5.79 (25)	1.41 (24)	12.90 (5)	36.86 (8)
# eggs / ♀ <u>Daphnia</u>	.13	.08	.48	.05	.35	.11	.15	.09
<u>Ceriodaphnia rigaudi</u>	-	-	-	-	-	-	-	.33(141)
<u>C. sphaericus</u>	21.52 (24)	161.45 (11)	100.49 (5)	77.17 (10)	19.72 (12)	23.53 (14)	29.37 (15)	17.59 (26)
# eggs / ♀ <u>Ceriodaphnia</u>	.21	.08	.36	.04	.52	.07	.09	.10
<u>Diaphanosoma leuchtenbergianum</u>	2.14 (4)	24.77 (13)	21.04 (12)	75.74 (3)	11.79	36.11 (13)	39.49 (6)	16.59 (4)
# eggs / ♀ <u>Diaphanosoma</u>	.06	.06	.07	.05	.35	.10	.11	.05
<u>Chydorus</u> sp.	-	-	-	-	-	-	-	-
COPEPODA								
<u>Diaptomus colombiensis</u> :								
- copepodites + adults	13.98 (6)	120.97 (1)	146.17 (39)	110.87 (4)	133.62 (13)	136.60 (3)	231.69 (23)	154.36 (4)
- ♀♀ with eggs	.33 (27)	2.15 (12)	3.25 (34)	3.82 (0)	2.74 (12)	10.17 (28)	5.70 (25)	3.67 (39)
<u>Mesocyclops inversus</u> :								
- copepodites + adults	139.44 (18)	269.39 (10)	113.36 (41)	194.37 (4)	34.47 (1)	55.04 (39)	41.57 (33)	38.95 (9)
- ♀♀ with eggs	-	.06(141)	-	.25 (0)	.06(141)	.16(141)	-	-
Nauplii (<u>Diaptomus</u> + <u>Mesocyclops</u>)	38.80 (33)	391.29 (19)	408.55 (30)	329.60 (2)	37.99 (28)	119.84 (10)	134.80 (41)	105.74 (4)
Large Cyclopoid:								
- copepodites + adults	.06(141)	.12(141)	.12(141)	-	3.35 (76)	2.75 (22)	.57 (34)	1.75(141)
- ♀♀ with eggs	-	-	-	-	.06(141)	.08(141)	.07(141)	-
- nauplii	.06(141)	-	-	-	-	.50(141)	-	-
ROTIFERA								
<u>Keratella americana</u>	158.67 (23)	161.92 (2)	28.65 (15)	71.56 (13)	27.96 (80)	21.35 (34)	131.67 (14)	35.11 (11)
<u>K. cochlearis</u>	-	-	-	-	-	-	-	-
<u>Filinia longiseta</u>	-	-	-	1.80 (66)	.77 (54)	94.33 (21)	30.15 (41)	3.42 (73)
<u>Brachionus patulus patulus</u>	.27 (0)	-	.12(141)	-	-	-	-	-
<u>B. patulus macranthus</u>	-	-	-	-	-	-	-	-
<u>Lecane bulla</u>	-	-	.12(141)	-	.06(141)	-	-	-
<u>Platyas</u> sp.	-	-	-	1.08(109)	-	-	-	-
<u>Hexarthra</u> sp.	-	-	-	-	-	-	-	-
<u>Polyarthra</u> sp.	-	-	-	-	-	-	-	-
DIPTERA								
<u>Chaoborus</u> sp.	3.26 (51)	2.10 (31)	5.03 (16)	24.26 (29)	12.01 (25)	16.84 (24)	7.55 (0)	8.99 (55)
ZOOFLAGELLATE								
	-	4.79 (4)	-	-	-	-	-	-
OSTRACODA								
	-	.34 (95)	.45(141)	-	.66 (14)	3.59 (16)	1.93 (16)	6.00 (47)

Table A3.5 (cont.)

Species	26/II/81 #/m ² (C.V.)	26/III/81 #/m ² (C.V.)	23/IV/81 #/m ² (C.V.)	29/V/81 #/m ² (C.V.)	1/VII/81 #/m ² (C.V.)	3/VIII/81 #/m ² (C.V.)	26/VIII/81 #/m ² (C.V.)	2/X/81 #/m ² (C.V.)
CLADOCERA								
<u>Daphnia pulex</u>	47.20 (1)	22.26 (1)	17.67 (16)	8.42 (10)	27.32 (1)	81.80 (16)	189.64 (15)	224.16 (21)
# eggs / ♀ <u>Daphnia</u>	.21	.20	.12	.09	.13	.07	.15	.08
<u>Ceriodaphnia rigaudi</u>	.57(102)	1.92 (6)	.91 (13)	-	-	-	.35(141)	.42 (0)
<u>C. sphaericus</u>	9.25 (4)	.51 (0)	-	.07(141)	.12(141)	-	-	-
# eggs / ♀ <u>Ceriodaphnia</u>	.07	.03	-	-	-	-	-	-
<u>Diaphanosoma leuchtenbergianum</u>	15.00 (6)	15.34 (0)	14.81 (1)	.53(102)	-	-	1.76 (57)	.83 (70)
# eggs / ♀ <u>Diaphanosoma</u>	.04	.01	.02	-	-	-	-	-
<u>Chydorus</u> sp.	-	-	-	-	-	-	5.45 (23)	3.93 (97)
COPEPODA								
<u>Diaptomus colombiensis:</u>								
- copepodites + adults	86.72 (5)	46.78 (10)	28.02 (34)	28.09 (35)	11.72 (6)	12.66 (31)	47.50 (28)	74.44 (13)
- ♀♀ with eggs	.41 (32)	1.59 (37)	.83 (27)	-	.47 (69)	.16(141)	1.22 (61)	1.04 (84)
<u>Mesocyclops inversus:</u>								
- copepodites + adults	32.52 (14)	29.69 (2)	48.45 (15)	51.05 (8)	16.65 (1)	28.60 (2)	55.42 (31)	102.77 (24)
- ♀♀ with eggs	.57 (62)	.48 (47)	.16(141)	-	-	-	-	-
<u>Nauplii (Diaptomus + Mesocyclops)</u>	78.90 (8)	94.90 (6)	52.45 (5)	130.65 (11)	31.93 (6)	35.67 (24)	245.41 (45)	254.35 (28)
<u>Large Cyclopoid:</u>								
- copepodites + adults	-	.08(141)	-	-	-	.32 (0)	-	.37(141)
- ♀♀ with eggs	-	-	-	-	-	-	-	-
- nauplii	-	-	-	-	-	.08(141)	-	-
ROTIFERA								
<u>Keratella americana</u>	94.15 (30)	68.39 (10)	33.52 (9)	6.13 (25)	1.96 (9)	1.88 (59)	.18(141)	-
<u>K. cochlearis</u>	-	-	-	-	-	-	-	-
<u>Filinia longiseta</u>	-	22.26 (34)	.65 (72)	-	-	-	.18(141)	-
<u>Brachionus patulus patulus</u>	-	-	-	-	.12(141)	.71 (47)	-	-
<u>B. patulus macranthus</u>	-	-	-	-	-	.16(141)	-	-
<u>Lecane bulla</u>	-	-	-	-	-	-	-	-
<u>Platyas</u> sp.	-	-	-	-	-	-	-	-
<u>Hexarthra</u> sp.	-	-	-	-	-	-	-	-
<u>Polyarthra</u> sp.	-	-	-	-	-	-	-	-
DIPTERA								
<u>Chaoborus</u> sp.	2.08 (5)	2.50 (28)	1.83 (38)	2.38 (68)	1.04 (46)	.71 (47)	.71 (70)	7.44 (0)
ZOOFLAGELLATE								
	-	15.17 (20)	104.91 (1)	1592.15 (3)	199.54 (13)	2.83 (31)	-	-
OSTRACODA								
	.32(141)	.91 (13)	13.25 (67)	.16(141)	3.90 (42)	4.39 (61)	12.41 (6)	15.10 (25)

Table A3.5 (cont.)

Species	24/XI/81 #/m ² (C.V.)	19/I/82 #/m ² (C.V.)	2/II/82 #/m ² (C.V.)	22/II/82 #/m ² (C.V.)	9/III/82 #/m ² (C.V.)	23/III/82 #/m ² (C.V.)	13/IV/82 #/m ² (C.V.)
CLADOCERA							
<u>Daphnia pulex</u>	156.29 (1)	51.44 (11)	48.67 (26)	39.82 (26)	33.54 (5)	23.96 (2)	67.19 (23)
# eggs / ♀ <u>Daphnia</u>	.53	.12	.09	.05	.01	-	.01
<u>Ceriodaphnia rigaudi</u>	- -	.29(141)	- -	- -	- -	- -	- -
<u>C. sphaericus</u>	- -	- -	- -	- -	- -	- -	- -
# eggs / ♀ <u>Ceriodaphnia</u>	- -	- -	- -	- -	- -	- -	- -
<u>Diaphanosoma leuchtenbergianum</u>	7.26 (73)	.55(141)	1.10(141)	2.24 (46)	6.26 (41)	4.05 (13)	6.35 (18)
# eggs / ♀ <u>Diaphanosoma</u>	- -	- -	- -	- -	- -	- -	- -
<u>Chydorus</u> sp.	- -	8.05 (5)	2.88(141)	1.86 (30)	- -	.73(141)	- -
COPEPODA							
<u>Diaptomus colomblensis</u> :							
- copepodites + adults	139.32 (11)	136.62 (6)	77.51 (5)	63.05 (34)	81.13 (6)	46.08 (8)	167.30 (20)
- ♀♀ with eggs	.54(141)	1.13 (69)	1.82 (27)	1.48(141)	1.11 (45)	4.05 (90)	6.90 (51)
<u>Mesocyclops inversus</u> :							
- copepodites + adults	219.77 (11)	111.20 (15)	82.20 (5)	63.78 (29)	69.32 (8)	128.70 (5)	80.75 (7)
- ♀♀ with eggs	.18(141)	.29(141)	- -	1.10(141)	2.59 (21)	2.94 (71)	2.50 (79)
Nauplii (<u>Diaptomus</u> + <u>Mesocyclops</u>)	275.81 (4)	273.23 (2)	311.14 (2)	412.26 (4)	513.65 (3)	274.71 (1)	390.20 (38)
Large Cyclopoid:							
- copepodites + adults	- -	13.01 (3)	.37(141)	.73(141)	- -	1.36 (70)	- -
- ♀♀ with eggs	- -	.29(141)	- -	.37(141)	- -	- -	- -
- nauplii	- -	.55(141)	1.47 (0)	- -	- -	- -	- -
ROTIFERA							
<u>Keratella americana</u>	- -	.58 (0)	- -	1.10 (45)	9.60 (65)	7.37 (28)	66.37 (19)
<u>K. cochlearis</u>	- -	- -	- -	- -	- -	- -	- -
<u>Filinia longiseta</u>	- -	- -	- -	- -	.37(141)	1.48 (70)	.29(141)
<u>Brachionus patulus patulus</u>	- -	1.95 (19)	.37(141)	- -	- -	- -	- -
<u>B. patulus macranthus</u>	- -	- -	- -	- -	- -	- -	- -
<u>Lecane bulla</u>	1.41(141)	1.10(141)	- -	- -	.37(141)	- -	- -
<u>Platys</u> sp.	- -	1.66 (47)	.74 (0)	- -	- -	- -	- -
<u>Hexarthra</u> sp.	- -	- -	- -	- -	- -	- -	- -
<u>Polyarthra</u> sp.	- -	.29(141)	- -	- -	- -	- -	- -
DIPTERA							
<u>Chaoborus</u> sp.	3.00 (8)	8.03 (25)	5.47 (49)	5.60 (49)	4.07 (38)	2.21 (93)	4.16 (9)
ZOOFLAGELLATE							
	- -	- -	.37(141)	2.21(141)	25.80 (12)	25.44 (27)	999.45 (9)
OSTRACODA							
	.35(141)	9.95 (47)	- -	- -	- -	6.99 (22)	2.76 (1)

Table A3.5 (cont.)

Species	27/IV/82 #/m ² (C.V.)	20/V/82 #/m ² (C.V.)	10/VI/82 #/m ² (C.V.)	28/VI/82 #/m ² (C.V.)	8/VII/82 #/m ² (C.V.)	19/VII/82 #/m ² (C.V.)	6/VIII/82 #/m ² (C.V.)	24/VIII/82 #/m ² (C.V.)
CLADOCERA								
<u>Daphnia pulex</u>	55.00 (29)	39.11 (3)	83.85 (15)	38.14 (14)	21.72 (30)	11.35 (24)	45.36 (29)	14.96 (5)
# eggs / ♀ <u>Daphnia</u>	.02	.05	.06	.01	.04	.05	.03	.48
<u>Ceriodaphnia rigaudi</u>	-	-	-	-	-	-	-	-
<u>C. sphaericus</u>	-	-	-	-	-	-	.26(141)	.27(141)
# eggs / ♀ <u>Ceriodaphnia</u>	-	-	-	-	-	-	-	-
<u>Diaphanosoma leuchtenbergianum</u>	3.58 (10)	-	.84(141)	-	-	-	-	-
# eggs / ♀ <u>Diaphanosoma</u>	-	-	-	-	-	-	-	-
<u>Chydorus</u> sp.	-	-	-	-	-	-	-	-
COPEPODA								
<u>Diaptomus colombiensis</u> :								
- copepodites + adults	49.20 (6)	17.99 (50)	23.76 (7)	10.80 (61)	14.65 (40)	4.98 (40)	16.59 (47)	27.92 (10)
- ♀♀ with eggs	.55(141)	-	.84(141)	-	.13(141)	.97(141)	.26(141)	.53 (0)
<u>Mesocyclops inversus</u> :								
- copepodites + adults	79.91 (1)	96.79 (15)	137.17 (1)	156.51 (3)	197.74(105)	65.40 (2)	194.69 (12)	114.47 (18)
- ♀♀ with eggs	1.37(141)	1.24 (15)	.27(141)	4.47(105)	4.84 (60)	.84 (2)	4.43 (54)	3.32 (47)
Nauplii (<u>Diaptomus</u> + <u>Mesocyclops</u>)	206.04 (14)	135.64 (9)	104.78 (6)	362.03 (4)	386.33 (15)	298.56 (13)	585.49 (17)	271.02 (26)
Large Cyclopoid:								
- copepodites + adults	-	-	-	-	-	-	-	-
- ♀♀ with eggs	-	-	-	-	-	-	-	-
- nauplii	-	-	-	-	-	-	-	-
ROTIFERA								
<u>Keratella americana</u>	269.36 (1)	2057.52 (1)	42.83 (1)	13.81 (0)	17.17 (9)	25.04 (12)	60.89 (10)	13.66 (13)
<u>K. cochlearis</u>	1.66(141)	-	-	.27(141)	-	-	-	.84 (9)
<u>Filinia longiseta</u>	.29(141)	-	-	-	-	-	-	-
<u>Brachionus patulus patulus</u>	-	-	-	-	-	-	-	-
<u>B. patulus macranthus</u>	-	-	-	-	-	-	-	-
<u>Lecane bulla</u>	-	-	-	-	-	-	-	-
<u>Platys</u> sp.	-	-	-	-	-	-	-	-
<u>Hexarthra</u> sp.	-	-	-	-	-	-	-	-
<u>Polyarthra</u> sp.	-	-	-	-	-	-	-	-
DIPTERA								
<u>Chaoborus</u> sp.	6.64 (47)	3.74 (78)	.27(141)	.27(141)	-	.13(141)	1.42 (27)	1.11 (74)
ZOOFLAGELLATE								
	229.54 (4)	62.79 (96)	7.48 (6)	1.50 (67)	-	.69(141)	1.37 (87)	-
OSTRACODA								
	1.66(141)	1.79 (33)	.53 (0)	-	-	.13(141)	.57(141)	-

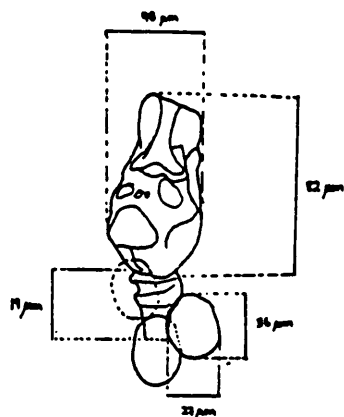
Table A3.5 (cont.)

Species	2/IX/82 #/m ² (C.V.)	5/X/82 #/m ² (C.V.)	21/X/82 #/m ² (C.V.)	9/XI/82 #/m ² (C.V.)	25/XI/82 #/m ² (C.V.)	21/XII/82 #/m ² (C.V.)
CLADOCERA						
<u>Daphnia pulex</u>	48.81 (21)	73.54 (9)	8.14 (23)	17.48 (3)	29.11 (5)	9.07 (29)
# eggs / ♀ <u>Daphnia</u>	.07	.01	.18	.01	.03	.04
<u>Ceriodaphnia rigaudi</u>	-	-	-	-	-	-
<u>C. sphaericus</u>	-	-	-	.06 (47)	.22(141)	.18 (0)
# eggs / ♀ <u>Ceriodaphnia</u>	-	-	-	-	-	-
<u>Diaphanosoma leuchtenbergianum</u>	-	-	-	.26 (0)	1.37 (23)	4.96 (9)
# eggs / ♀ <u>Diaphanosoma</u>	-	-	-	-	-	-
<u>Chydorus</u> sp.	-	-	-	-	-	-
COPEPODA						
<u>Diaptomus colombiensis</u> :						
- copepodites + adults	23.23 (47)	33.72(137)	35.80 (13)	22.68 (6)	58.85 (11)	50.51 (13)
- ♀♀ with eggs	-	1.59(141)	.18 (0)	.62 (30)	2.26 (42)	.69(123)
<u>Mesocyclops inversus</u> :						
- copepodites + adults	185.44 (4)	171.42 (4)	86.90 (13)	95.49 (2)	67.65 (27)	37.52 (1)
- ♀♀ with eggs	5.40 (16)	1.19 (37)	.49 (13)	.71 (9)	.49(116)	.66 (9)
Nauplii (<u>Diaptomus</u> + <u>Mesocyclops</u>)	229.73 (8)	226.41 (15)	195.31 (18)	89.82 (2)	105.84 (0)	60.02 (25)
Large Cyclopoid:						
- copepodites + adults	-	-	-	-	-	-
- ♀♀ with eggs	-	-	-	-	-	-
- nauplii	-	-	-	-	-	-
ROTIFERA						
<u>Keratella americana</u>	49.38 (13)	126.11 (23)	171.55 (4)	170.04 (8)	300.71 (25)	270.47 (17)
<u>K. cochlearis</u>	1.50 (33)	5.18 (11)	1.68 (0)	.18 (35)	-	-
<u>Filinia longiseta</u>	-	-	-	-	-	-
<u>Brachionus patulus patulus</u>	-	-	-	-	-	-
<u>B. patulus macranthus</u>	-	-	-	-	-	-
<u>Lecane bulla</u>	-	-	-	-	-	-
<u>Platyas</u> sp.	-	-	-	.55 (74)	-	-
<u>Hexarthra</u> sp.	-	-	-	-	-	.07 (47)
<u>Polyarthra</u> sp.	-	-	-	-	-	-
DIPTERA						
<u>Chaoborus</u> sp.	.18(141)	4.69 (13)	1.33 (19)	2.48 (8)	1.95 (0)	1.11 (0)
ZOOFLAGELLATE						
	-	73.01 (16)	86.90 (27)	.02(141)	-	1.57(141)
OSTRACODA						
	.35(141)	.79 (0)	.22 (28)	.44 (57)	.13 (48)	.40(141)

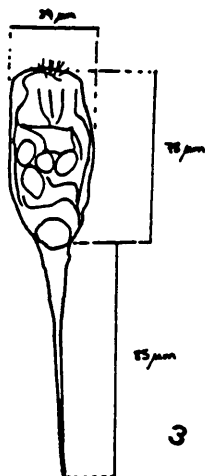
Figure A3.1

Illustrations of unidentified species and genera of rotifers, L. Yure.

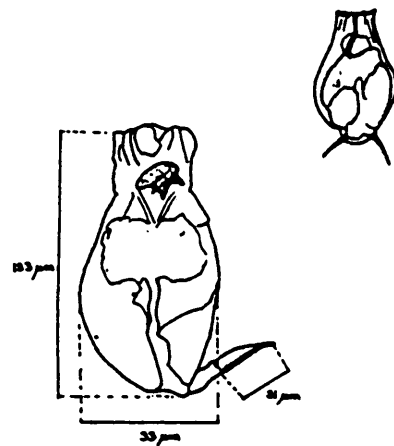
UNKNOWN ROTIFER



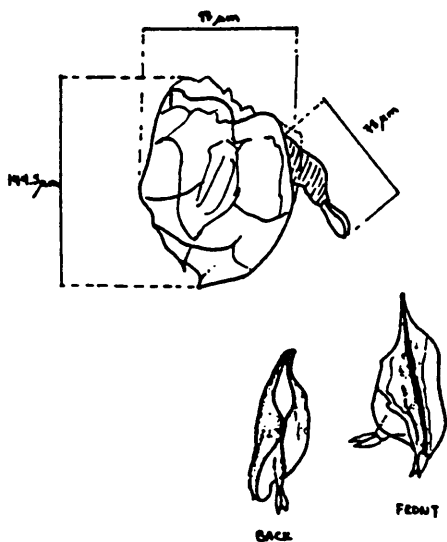
Sp 5



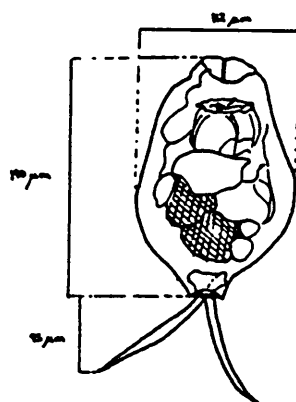
Sp 6



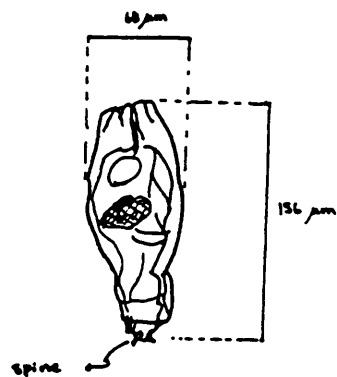
Sp 7



Sp 8



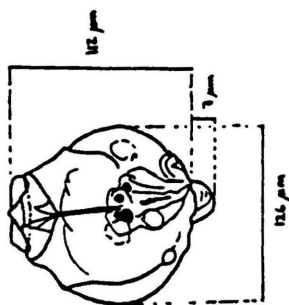
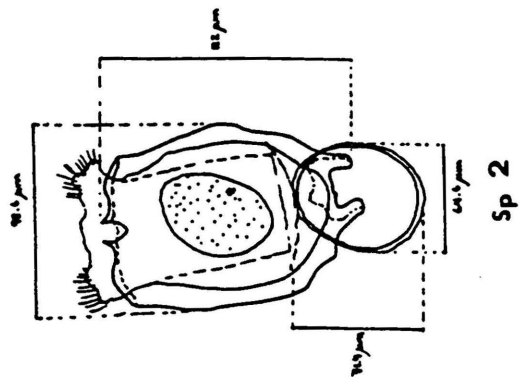
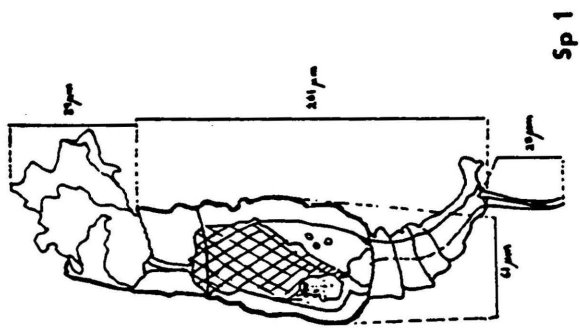
Sp 9



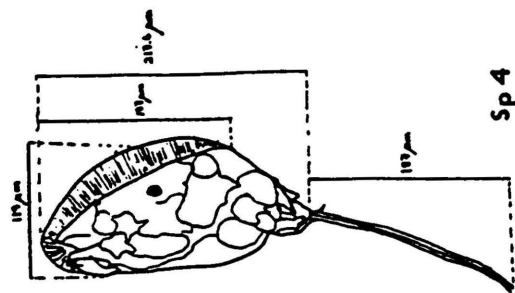
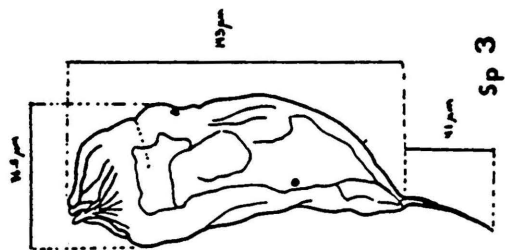
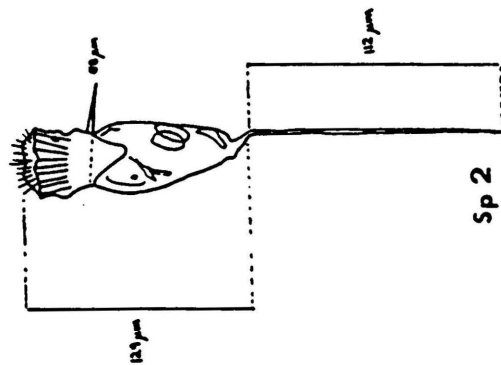
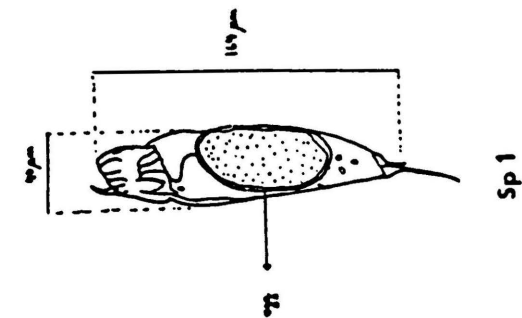
Sp 10

Figure A3.1 (cont.)

CEPHALODELLA

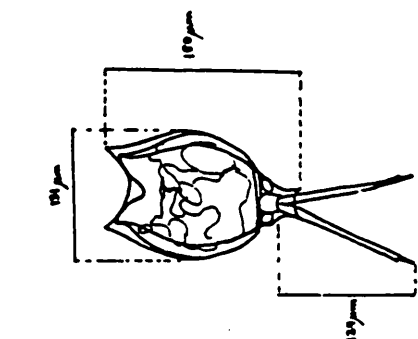


TRICHOCECA

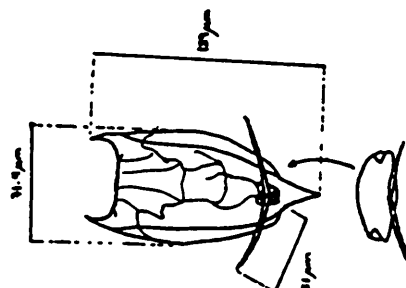


LECANE

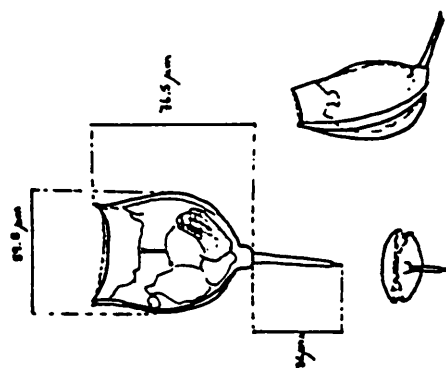
Figure A3.1 (cont.)



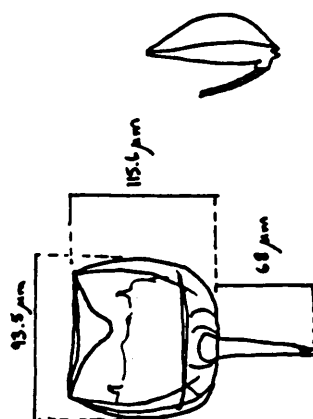
Sp 3



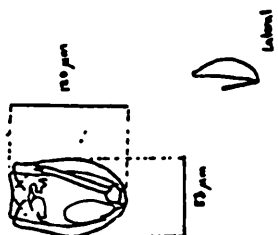
Sp 6



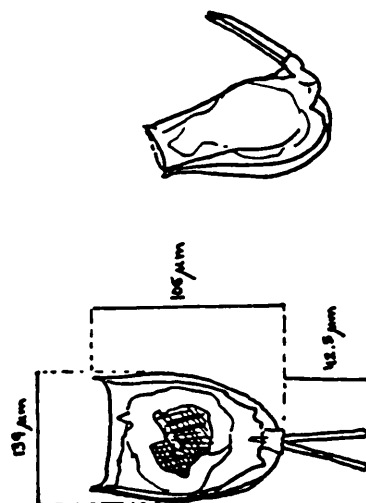
Sp 2



Sp 5

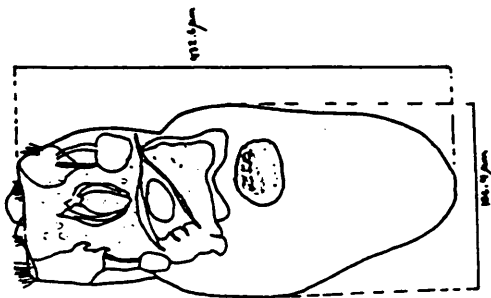


Sp 1

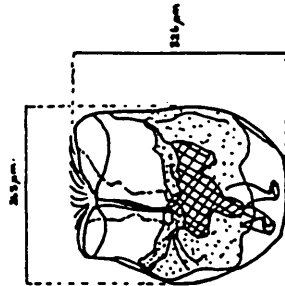


Sp 4

ASPLANCHNA

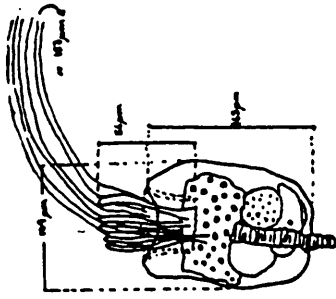


Sp 1

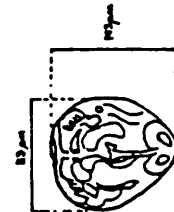


Sp 2

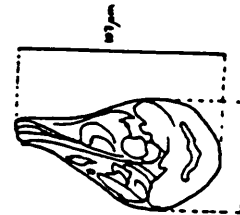
COLLOTHECA



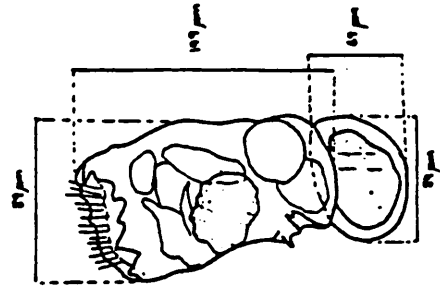
UNKNOWN ROTIFERS



Sp 2



Sp 3



Sp 4

Appendix 4:

L. Yure and L. de Yojoa Phytoplankton Counts.

(Data represent number of cells / ml. Where replicate counts were made, means and standard deviations are recorded).

L. Yure Phytoplankton

Station:	Index		
Depth:	0-5 m		
Date:	14-II-80	25-III-80	17-IV-80
Desmid (uniden.)	5300	4905	1706
Staurostrum <u>c.f.</u> laeve	21	74	25
S. sp. A	62	2	--
Pediastrum duplex <u>var.</u> gracillimum	2	--	--
P. <u>c.f.</u>	--	5	12
Scenedesmus denticulatus <u>var.</u> linearis	19	21	25
S. dimorphus	12	5	25
Tetraedron <u>c.f.</u> trilobulation	7	145	896
I. minimum	2	--	--
Ankistrodesmus falcatus <u>var.</u> mirabilis	--	5	25
A. convolutus	160	1617	12
Kirchneriella lunaris (?)	2	--	--
Crucigenia tetrapedia	5	--	--
Sphaerocystis schroeteri	--	19	--
Lobomonas (?) sp.	--	2	--
Chlamydomonas <u>c.f.</u> praecox	2	--	--
C. sp. A	--	52	--
C. sp. B	7	--	--
C. sp. C	--	24	--
C. sp. D	--	--	12
Dinobryon sertularia	50	7	12
Mallomonas <u>c.f.</u> acaroides	--	--	37
M. <u>c.f.</u> bernardinensis	--	19	25
Asterionella formosa	--	7	--
Cocconeis placentula <u>var.</u> euglypta	--	2 (empty)	--
Synedra radians	7	14	12
S. ulna	2	7	--
Navicula <u>c.f.</u> falaisiensis	2	--	--
N. hassiaca	19	7	--
N. sp.	--	2	--
Peridinium <u>c.f.</u> africanum tab.	7	--	--
conjunctum <u>var.</u> javanicum	--	--	--
P. <u>c.f.</u> cunningtonii tab.	2	2	12
contractum	--	--	--
P. <u>c.f.</u> inconspicuum	10	19	12
Merismopedia sp.	--	38	--
Oscillatoria angusta (?)	98	171	--
Cryptomonas ovata	295	45	98
Chroomonas minuta	2	--	--
Cryptomonad (small)	--	2	--
Flagellate sp. A	--	140	--
Flagellate sp. B	--	--	61
Flagellate sp. C	--	--	98
Flagellate sp. D	--	--	--
Flagellate sp. E	--	--	37
<u>c.f.</u> Carteria	--	--	12
UNKNOWN:			
<u>c.f.</u> Mallomonas	--	--	12
"naviculoid"	271	379	982
"spicule"	17	--	--
"sphere"	110	164	344
<u>c.f.</u> "Mallomonas ciliate"	2	2	--
<u>c.f.</u> Euglena	17	--	--
<u>c.f.</u> Eremosphaera	--	79	37
"small sphere"	136	10	233

L. Yure Phytoplankton

20-XI-80

Station:	QSN	QdC	QT
Depth (m):	0-3	0-3	0-3
Carteria klebsii	0	66(8)	92(17)
Chlamydomonas epiphytica	513(7)	553(17)	596(23)
C. polypyrenoideum	51(2)	97(6)	30(4)
C. sphagnicola	178(2)	149(13)	227(19)
Polytoma granuliferum	34(1)	0	31(4)
Asterococcus linneticus	73(10)	53(8)	113(12)
Oocystis sp.	0	0	8(4)
Golenkinia sp.	19(4)	14(3)	81(13)
Cosmarium <u>c.f.</u> connatum	308(20)	386(4)	248(13)
C. sp. 2	0	32(2)	0
Peridinium africanum	282(13)	92(1)	249(8)
P. inconspicuum	141(13)	176(6)	267(8)
P. willei	200(13)	110(1)	265(21)
Peridinium sp.	68(4)	124(19)	159(16)
Chroomonas nordstedtii	0	360(14)	355(7)
Cryptomonas sp.	26(5)	0	13(2)
Merotrichia sp.	19(4)	20(3)	0
Rhizochrysis scherefelii	0	112(11)	0
Dinobryon sertularia	21(1)	25(4)	0
D. vanhoeffmii	44(1)	190(2)	206(6)
Mallomonas acaroides	66(8)	47(4)	74(4)
M. ciliata	38(8)	0	0
Synedra fasciculata	0	0	15(1)
Achnanthes exigua	0	39(8)	0
Navicula hassiaca	29(13)	3(4)	15(5)
N. rhyncephala	0	0	22(6)
Stichosiphon regularis	0	26(5)	0

L. Yure Phytoplankton

8-I-81

Station:	Index
Depth (m):	0-6
Carteria klebsii	131(8)
Chlamydomonas sp.	419(1)
Closteriopsis sp.	210(20)
Oocystis sp.	13(4)
Cosmarium sp.	112(12)
Staurastrum sp.	8(3)
Peridinium sp.	39(9)
Chroomonas nordstedtii	40(2)
Cryptomonas sp.	41(11)
Dinobryon sertularia	173(33)
Mallomonas acaroides	49(7)
M. ciliata	24(4)
M. ovata	38(7)
Melosira granulata	11(1)
Navicula hassiaca	17(4)
N. latelongitudinalis	21(1)

L. Yure Phytoplankton

6-II-81

Station:	Index
Depth: (m)	0 2 6
Carteria klebsii	169 240 656
Chlamydomonas epiphytica	235 87 863
C. polypsenoides	87 0 33
C. praecox	60 25
C. sphagnicola	333 290 432
Sphaerellopsis fluvialilis	688 290 355
Gonium sp.	191
Gloeocystis major	16 38 0
Tetradron regulare	38 11 11
T. trilobulatum	0 11 0
Closteriopsis sp.	22 16 7
Oocystis sp.	16 0 82
Golenkinia sp.	11 22 126
Scenedesmus dimorphus	16 0 11
Cosmarium sp.	678 425 22
C. (c.f.) connatum	3688 2012 1213
Staurastrum rotula	0 11 0
Euglenomorpha hegneri	16 11 16
Trachelomonas (c.f.) ampulla	180 87 0
Gymnodinium sp.	116 0 0
Chroomonas nordstedtii	126 164 269
Cryptomonas erosa	0 164 0
Rhizochrysis limnetica	71 44 60
Mallomonas acaroides	16 16 44
M. ciliata	0 0 11
Achnanthes sp.	5 0 0
Navicula hassiaca	11 109 0
Pinnularia braunii	33 11 0

L. Yure Phytoplankton

23-II-81

Station:	Index
Depth(m):	0 2 4 6
Carteria klebsii	689 191 738 388
Chlamydomonas epiphytica	1301 404 847 344
C. polypirenoideum	306 1033 36 191
C. sphagnicola	388 153 142 104
Chloromonas sp.	404 459 224 295
Polytoma granuliferum	38 5 11 0
Gonium sociale	175 60 22 0
Uva gracilis	0 0 11 0
Tetradron regulare	5 0 0 0
T. trilobulatum	16 0 31 60
Ankistrodesmus faleatus	43 180 66 11
Nephrocystium sp.	109 0 0 0
Oocystis major	164 16 49 33
Golenkinia sp.	16 448 0 22
Scenedesmus sp.	11 38 0 0
Actinotægenium sp.	22 22 22 0
Cosmarium sp.	180 38 8 16
C. (c.f.) connatum	842 16 301 126
Staurastrum sp.	208 5 0 0
Gymnodinium (c.f.) palustre	27 71 16 0
Peridinium africanum	5 0 16 0
Chroomonas nordstedtii	66 27 16 0
Cryptomonas erosa	27 16 44 11
Mallomonas acaroides	32 0 33 0
M. ciliata	11 0 0 0
M. ovata	42 66 60 60
Synedra fasciculata	11 0 0 0
Navicula hassiaca	44 27 38 0
Surirella sp.	11 0 0 0

L. Yure Phytoplankton		19-III-81	20-III-81	21-III-81
Station:	Index	QdC	Qt	
Depth(m):	0-6	0-6	0-6	
<i>Carteria klebsii</i>	546	727	590	
<i>Chlamydomonas epiphytica</i>	738	842	1044	
<i>C. sphagnicola</i>	33	0	0	
<i>Chlorogonium sp.</i>	246	0	5	
<i>Sphaerellopsis fluviatilis</i>	0	0	224	
<i>Gonium sociale</i>	131	0	0	
<i>Tetraedron sp.</i>	382	0	0	
<i>Ankistrodesmus sp.</i>	93	5	0	
<i>Oocystis sp.</i>	158	0	0	
<i>Golenkinia sp.</i>	11	71	16	
<i>Scenedesmus sp.</i>	22	0	0	
<i>Chlorosarcinopsis sp.</i>	0	60	0	
<i>Apatococcus sp.</i>	0	33	0	
<i>Actinotaenium sp.</i>	0	0	11	
<i>Cosmarium sp.</i>	37	98	55	
<i>C. (c.f.) connatum</i>	1377	2232	1082	
<i>Microsterias sp.</i>	0	16	0	
<i>Staurastrum sp.</i>	22	0	5	
<i>Euglena polymorpha</i>	0	4	0	
<i>E. proscina</i>	77	0	0	
<i>Euglenomorpha hegneri</i>	44	0	0	
<i>Gymnodinium sp.</i>	0	213	0	
<i>Peridinium africanum</i>	0	5	0	
<i>P. inconspicuum</i>	5	22	0	
<i>Chroomonas nordstedtii</i>	142	38	153	
<i>Mallomonas acaroides</i>	11	0	17	
<i>M. ovata</i>	126	142	169	
<i>Synedra sp.</i>	11	0	0	
<i>S. fasciculata</i>	5	5	0	
<i>Navicula hassiaca</i>	71	0	0	
<i>Surirella sp.</i>	0	0	5	

L. Yure Phytoplankton		21-V-81	25-VI-81			
Station:	Index		Index			
Depth (m):	0	2	0	2	4	
<i>Carteria klebsii</i>	76(6)	170(16)	369	210	80	
<i>Chlamydomonas epiphytica</i>	31(20)	11(16)	0	0	0	
<i>C. polypyrrenoideum</i>	69(4)	94(6)	644	346	109	
<i>C. sphagnicola</i>	167(12)	66(16)	90	0	0	
<i>Chloromonas sp.</i>	81(1)	137(61)	0	11	0	
<i>Gonium sociale</i>	47(4)	0	0	0	0	
<i>Tetraedron regulare</i>	0	2(1)	0	0	0	
<i>T. trilobulatum</i>	0	11(8)	0	0	0	
<i>Eremosphaera sp.</i>	0	596(31)	709	812	125	
<i>Ankistrodesmus sp.</i>	70(1)	160(13)	0	12(1)	4(2)	
<i>Kirchneriella sp.</i>	0	0	0	3	0	
<i>Oocystis sp.</i>	63(12)	90(9)	0	0	0	
<i>O. major</i>	0	0	8	0	0	
<i>Golenkinia sp.</i>	0	0	0	0	11	
<i>Cosmarium (c.f.) connatum</i>	1297(11)	4296(1227)	436	292	25	
<i>C. sp. 2</i>	32(9)	96(35)	0	0	0	
<i>Microsterias sp.</i>	0	0	0	2	0	
<i>Staurastrum laevi</i>	11(8)	0	0	0	0	
<i>S. sebaldi</i>	39(14)	28(33)	0	0	0	
<i>Gymnodinium sp.</i>	0	0	16	22	2	
<i>Peridinium sp.</i>	0	60(0)	4	0	0	
<i>P. inconspicuum</i>	0	87(16)	0	0	0	
<i>P. willei</i>	0	0	36	54	15	
<i>Chroomonas nordstedtii</i>	0	0	179	191	33	
<i>Cryptomonas sp.</i>	16(1)	0	0	0	0	
<i>Dinobryon sertularia</i>	0	0	0	11	0	
<i>Mallomonas acaroides</i>	85(11)	36(12)	32	36	8	
<i>M. ciliata</i>	0	52(11)	0	0	0	
<i>M. ovata</i>	0	47(19)	25	48	6	
<i>Synedra fasciculata</i>	0	11(8)	0	0	0	
<i>Achnanthes exigua</i>	0	0	8	0	0	
<i>Cocconeis sp.</i>	0	14(4)	0	0	0	
<i>Navicula hassiaca</i>	3(4)	19(4)	14	0	0	
<i>Cymbella sp.</i>	3(4)	0	0	0	0	
<i>Surirella sp.</i>	0	0	0	0	6	
<i>Chroococcus sp.</i>	0	0	77	70	12	
<i>C. limneticus</i>	0	0	16	44	0	

L. Yure Phytoplankton

9-VII-81

13-VIII-81

Station:	Index	Index			
Depth (m):	0-4	0	2	4	6
<i>Carteria klebsii</i>	290(25)	1672	109	93	45
<i>Chlamydomonas epiphytica</i>	349(52)	0	0	0	0
<i>C. polyipirenoideum</i>	464(46)	191	71	27	22
<i>C. sphagnicola</i>	81(25)	44	120	60	58
<i>Chloromonas</i> sp.	14(2)	0	0	0	0
<i>Polytoma granuliferum</i>	0	5	0	0	0
<i>Chlorococcum</i> sp.	0	104	27	0	0
<i>Tetradron regulare</i>	0	33	60	5	0
<i>Eremosphaera</i> sp.	1340(61)	628	798	169	119
<i>Ankistrodesmus</i> sp.	4 (2)	5	0	5	0
<i>Oocystis</i> sp.	0	11	0	5	0
<i>O. major</i>	17(10)	0	0	0	0
<i>Golenkinia</i> sp.	5(6)	0	0	0	0
<i>Scenedesmus</i> sp.	4(0)	0	0	0	0
<i>Elakatothrix</i> sp.	2(1)	5	0	0	0
<i>Apatococcus</i> sp.	0	44	0	0	0
<i>Closterium parvulum</i>	0	0	0	5	0
<i>Cosmarium</i> (c.f.) <i>connatum</i>	540(71)	593	256	191	108
<i>C. sp. 2</i>	0	0	0	5	0
<i>Staurastrum laevis</i>	0	5	5	0	0
<i>S. rotula</i>	0	0	87	33	11
<i>Euglena polymorpha</i>	3(1)	0	0	0	0
<i>Gymnodinium</i> sp.	18(8)	11	0	0	0
<i>Peridinium africanum</i>	9(6)	11	0	0	11
<i>P. inconspicuum</i>	0	22	645	5	0
<i>P. willei</i>	76(18)	44	137	0	0
<i>Chroomonas nordstedtii</i>	175(16)	290	16	16	11
<i>Dinobryon sertularia</i>	27(9)	0	0	0	0
<i>Mallomonas acaroides</i>	53(8)	11	22	0	0
<i>M. ciliata</i>	29(11)	0	0	0	0
<i>M. ovata</i>	35(7)	33	16	27	0
<i>Navicula bicephala</i>	2(1)	0	0	0	0
<i>N. hassiaca</i>	4(0)	11	0	5	5
<i>Surirella</i> sp.	2(1)	0	0	0	0
<i>Chroococcus</i> sp.	0	120	22	22	0
<i>C. limneticus</i>	40(9)	0	0	0	0
<i>Marsoniella</i> sp.	0	5	0	0	0
<i>Synechococcus</i> sp.	0	16	0	0	0

L. Yure Phytoplankton

9-IX-81

Station:	Index	Index			
Depth (m):	0	2	4	6	
<i>Carteria klebsii</i>	97(27)	279(23)	19(11)	66(23)	
<i>Chlamydomonas epiphytica</i>	25(4)	0	0	0	
<i>C. polyipirenoideum</i>	25(12)	112(20)	36(12)	22(23)	
<i>C. sphagnicola</i>	0	47(12)	0	0	
<i>Chloromonas</i> sp.	118(26)	22(6)	0	0	
<i>Polytoma</i> sp.	50(8)	0	0	3(4)	
<i>Eudorina</i> sp.	6(8)	0	0	0	
<i>Gonium sociale</i>	19(27)	0	0	0	
<i>Tetradron regulare</i>	17(8)	27(15)	0	0	
<i>Ankistrodesmus</i> sp.	36(4)	8(4)	0	0	
<i>Eremosphaera</i>	1093(193)	2175(15)	229(30)	30(11)	
<i>Oocystis major</i>	19(11)	8(4)	3(4)	0	
<i>Golenkinia</i>	3(4)	0	0	0	
<i>Cosmaeum</i> (c.f. <i>connatum</i>)	388(54)	112(20)	30(12)	19(11)	
<i>Staurastrum</i> sp.	6(7)	3(4)	0	0	
<i>S. sebaldi</i>	53(10)	44(0)	8(4)	0	
<i>Peridinium</i> sp.	6(8)	0	0	0	
<i>P. inconspicuum</i>	3(4)	3(4)	0	0	
<i>P. willei</i>	14(19)	269(22)	3(4)	11(8)	
<i>Chroomonas nordstedtii</i>	210(35)	19(11)	0	0	
<i>Mallomonas acaroides</i>	11(0)	0	0	11(8)	
<i>M. ciliata</i>	0	55(16)	0	36(12)	
<i>M. ovata</i>	14(4)	3(4)			

L. Yure Phytoplankton

3-X-81

12-XI-81

	Station: Index				Index			
	Depth (m):	0	2	4	0	2	4	6
<i>Carteria klebsii</i>	32(4)	138(2)	63(11)	625(35)	420	79(18)	0	
<i>Chlamydomonas epiphytica</i>	61(1)	318(16)	33(4)	0	0	0	0	
<i>C. polypirenoideum</i>	40(3)	325(23)	21(6)	212(89)	128	35(7)	13(4)	
<i>C. sphagnicola</i>	22(0)	0	0	66(6)	70	75(8)	21(4)	
<i>Chloromonas</i> sp.	47(5)	36(5)	0	0	0	0	0	
<i>Polytoma</i> sp.	0	0	0	0	8	0	0	
<i>Gloeocystis</i> sp.	18(1)	0	0	0	0	0	0	
<i>G. mayor</i>	22(0)	0	0	0	0	0	0	
<i>Sphaerello cystis</i>	4(1)	0	0	0	0	0	0	
<i>Chlorococcum</i> sp.	0	0	0	69(27)	32	0	0	
<i>Tetraedron regulare</i>	11(3)	32(16)	0	0	0	0	0	
<i>Ankistrodesmus</i> sp.	0	16(4)	8(4)	0	0	0	0	
<i>Eremosphaera</i> sp.	0	2517(198)	0	325(106)	118(81)	109(58)	25(7)	
<i>Oocystis major</i>	0	8(4)	0	22(3)	8(4)	0	0	
<i>Golenkinia</i> sp.	11(2)	3(1)	0	0	0	0	0	
<i>Pediastrum simplex</i>	8(0)	8(0)	0	0	0	0	0	
<i>Cosmarium</i> (c.f.) <i>connatum</i>	0	109(12)	28(6)	840(198)	673	209(43)	26(13)	
<i>Staurastrum sebaldi</i>	0	53(3)	0	0	0	0	0	
<i>Gymnodinium</i> sp.	0	0	0	8(1)	8(1)	0	2(3)	
<i>Peridinium inconspicuum</i>	0	3(4)	0	33(6)	181	211(25)	0	
<i>P. willei</i>	0	68(2)	0	0	0	0	0	
<i>Chroomonas nordstedtii</i>	114(4)	11(3)	0	341(41)	61	28(3)	0	
<i>Mallomonas ciliata</i>	0	76(12)	0	0	0	0	0	
<i>M. ovata</i>	0	44(2)	0	25(16)	11(3)	0	0	
<i>Achnanthes exigua</i>	208(19)	180(31)	44(10)	0	0	0	0	
<i>Navicula bicephala</i>	25(2)	0	0	0	0	0	0	
<i>N. hassiaca</i>	36(2)	0	0	0	0	0	0	
<i>Surirella</i> sp.	11(1)	0	0	0	0	0	0	
<i>Chroococcus limneticus</i>	73(8)	0	0	0	0	0	0	

L. Yure Phytoplankton

12-I-82

	Station:	Index			
	Depth (m):	0	2	4	6
Carteria klebsii	492	82	344	230	
Chlamydomonas epiphytica	175	98	66	97	
C. polypyrenoideum	0	0	0	0	
C. sphagnicola	11	0	0	27	
Chloromonas sp.	530	541	738	148	
Polytoma granuliferum	38	44	16	11	
Gloeocystis sp.	0	0	0	0	
Merostigma viridis	0	0	0	0	
Tetraedron regulare	16	11	16	0	
T. trilobulatum	0	0	0	0	
Echinosphaerella sp.	0	0	0	0	
Eremosphaera sp.	191	257	33	0	
Kirchneriella sp.	0	0	0	0	
Oocystis sp.	0	0	5	0	
Golenkinia sp.	5	0	38	11	
Scenedesmus sp.	55	0	22	0	
Actinotaenium sp.	22	0	0	0	
Cosmarium sp.	612	377	235	87	
Staurastrum sp.	22	16	11	5	
S. sebaldi	0	0	0	0	
Trachelomonas lacustris	38	503	158	0	
T. volvocina	38	0	0	0	
Gymnodinium sp.	0	0	0	0	
Peridinium africanum	33	27	0	5	
P. inconspicuum	33	5	0	5	
P. willei	0	0	0	0	
Chroomonas nordstedtii	49	66	82	33	
Cryptomonas sp.	5	0	16	16	
Dinobryon sp.	0	0	0	0	
D. sertularia	0	0	22	11	
Mallomonas acaroides	0	11	0	0	
M. ovata	38	49	120	115	
Synedra sp.	0	0	0	0	
S. fasciculata	27	44	27	16	
Navicula hassiaca	0	16	11	0	
Cymbella sp.	5	0	0	0	
Surirella sp.	0	0	0	0	

L. Yure Phytoplankton

18-III-82

Station:	Index				
Depth (m):	0	2	4	6	
Carteria klebsii	87	22	0	115	
Chlamydomonas polypirenoideum	175	153	98	38	
C. sphagnicola	84	66	16	16	
Chloromonas sp.	0	5	322	109	
Gloeocystis sp.	153	33	5	0	
Mesostigma viridis	5	16	0	0	
Tetradon regulare	8	22	0	0	
T. trilobulatum	0	0	38	0	
Ankistrodesmus sp.	295	115	169	65	
Eremosphaera sp.	186	180	180	22	
Kirchneriella sp.	0	5	0	0	
Oocystis major	11	0	0	0	
Golenkia sp.	16	0	0	0	
Scenedesmus sp.	11	11	0	5	
Cosmarium (c.f.) connatum	464	175	339	71	
Staurostrum sp.	44	0	0	0	
S. sebaldi	0	11	44	0	
Gymnodinium sp.	33	169	218	27	
Peridinium willeyi	87	486	344	0	
Chroomonas nordstedtii	27	33	49	16	
Dinobryon sp.	33	76	66	0	
Mallomonas acaroides	5	5	0	0	
M. ovata	11	5	11	82	
Synedra delicatissima	6	5	5	0	
Nairoidia hassiaca	21	22	3	0	
Surirella sp.	0	5	0	0	

L. Yure Phytoplankton

29-IV-82

Station:						
Depth (m):	0	1	2	3	4	5
Aphanothece nidulans	306	273	360	358	60	239
Asterococcus limneticus	349	224	218	269	119	-
Carteria klebsii	180	164	207	-	-	328
Chlamydomonas polypirenoideum	437	316	382	328	179	119
C. sphaegnica	-	27	22	30	-	179
Chloromonas sp.	65	54	54	60	30	30
Chroomonas nordstedtii	-	-	295	119	-	30
Cosmarium c.f. connatum	486	426	437	1134	209	1045
Gyrosigma sp.	-	27	27	30	-	-
Kirchneriella sp.	-	-	-	60	-	30
Mallomonas acaroides	-	-	-	-	30	30
M. ovata	27	66	254	926	448	836
Microcystis sp.	-	-	-	-	-	60
Ankistrodesmus convolutus	-	55	65	90	60	60
Oocystis major	-	153	245	299	179	149
Polytoma granuliferum	-	-	137	119	-	149
Scenedesmus sp.	-	-	-	-	-	119
Staurostrum sebaldi	-	55	62	119	-	179
S. sp.	-	55	-	119	90	179

L. Yure Phytoplankton

27-V-82

22-VI-82

Station:	Index								
Depth (m):	0	2	4	6	0	2	4	6	
Carteria klebsii	495	836	82	5	0	82	0	11	
Chlamydomonas polypirenoideum	769	514	5	0	71	66	22	0	
C. epiphytica	0	0	0	64	0	0	0	0	
C. sphagnicola	126	120	22	49	11	60	0	5	
Chloromonas sp.	219	279	0	16	721	5	5	5	
Polytoma sp.	0	11	0	0	16	0	0	0	
P. granuliferum	27	0	0	0	0	0	0	0	
Gloeocystis sp.	590	557	98	0	55	60	55	27	
Asterococcus limneticus	0	0	0	5	0	0	0	0	
Mesostigma sp.	0	0	0	0	11	5	0	0	
Tetradon regulare	27	5	0	0	0	5	0	0	
T. trilobulatum	0	0	0	0	5	0	0	0	
Ankistrodesmus sp.	220	245	27	93	546	5	11	0	
Eremosphaera sp.	328	426	186	33	33	22	27	33	
Kirchneriella sp.	11	0	0	0	16	0	0	0	
Oocystis sp.	0	0	0	22	0	5	22	0	
Scenedesmus sp.	87	64	0	0	5	0	0	0	
Pediastrum sp.	0	0	93	0	0	0	0	0	
P. boryanum	0	87	0	0	0	0	0	0	
P. tetras	0	0	437	0	0	0	0	0	
Cosmarium sp.	1791	1885	442	87	229	11	5	0	
Microsterias sp.	5	0	0	0	0	0	0	0	
Staurostrum sp.	82	109	27	22	5	0	0	0	
S. sebaldi	0	109	11	5	27	0	0	0	
Gymnodinium sp.	16	27	60	0	55	11	11	0	
Peridinium africanum	0	0	0	0	0	27	5	5	
P. willeyi	142	328	60	11	16	38	5	5	
Chroomonas nordstedtii	71	180	38	16	87	16	82	235	
Cryptomonas sp.	164	44	0	0	19	284	1098	169	
Dinobryon sp.	0	0	0	0	0	11	0	0	
Mallomonas acaroides	0	5	0	5	0	22	22	5	
M. ciliata	16	16	0	5	0	5	0	0	
M. ovata	71	109	109	33	366	16	44	27	
Synedra delicatissima	0	0	16	0	11	0	0	0	
Nairoidia hassiaca	0	11	0	0	0	0	0	0	
Surirella sp.	0	0	0	0	11	5	0	5	

L. de Yojoa Phytoplankton

Date:	29/1/81	26/III/81
Depth (m):	0-13	0-12
Achnanthes exigua		34(11)
Aphanocapsa endophytica	206(80)	
Aphanocapsa grevillei	38(5)	63(10)
Aphanothece nidulans	208(56)	384(11)
Asterococcus limneticus	182(13)	77(49)
Carteria klebsii		7(10)
Centritractus belanophorus	4(5)	
Chroococcus limneticus	296(5)	
Chrocomonas nordstedtii		14(20)
Cocconeis sp.	6(2)	
Cosmarium cf. connatum		21(30)
Cosmarium sp.	13(3)	
Cymbella sp.	8(5)	21(30)
Cryptomonas sp.		364(97)
Gloeocapsa sp.	41(16)	369(286)
Gonium sp.	53(11)	
Mallomonas acaroides		21(10)
Mallomonas ovata		63(88)
Melosina granulata		56(40)
Melosira sp.	227(71)	
Microcystis sp.	49(11)	55(11)
Navicula bicephala	8(5)	
Navicula hassiaca	6(8)	14(0)
Oocystis major	38(11)	7(10)
Oscillatoria sp.		711(78)
Pediastrum simplex		7(10)
Peridinium williei	21(30)	
Scenedesmus sp.		28(40)
Surirella sp.	4(5)	28(0)
Synedra delicatissima	2(3)	35(49)
Synedra fasciculata	6(8)	91(49)
Tetraedron regular		7(10)

L. de Yojoa Phytoplankton

Date:	23/IV/81	1/VII/81
Depth (m)	0-13	0-12
Achnanthes exigua	3(5)	
Ankistrodesmus sp.		21(29)
Aphanocapsa elachista	47(3)	
Aphanocapsa endophytica	34(5)	826(103)
Aphanocapsa grevillei	51(8)	8(11)
Aphanothece nidulans	120(16)	111(120)
Asterococcus limneticus	171(19)	154(21)
Carteria klebsii		174(109)
Centritractus belanophorus	15(6)	34(11)
Chlamydomonas epiphytica		196(98)
Chlamydomonas polypirenoideum		28(40)
Chroococcus limneticus		240(175)
Chrocomonas nordstedtii		427(11)
Cocconeis sp.	17(8)	
Cymbella sp.	4(5)	
Elakatothrix		34(11)
Eremosphaena sp.		13(18)
Gloeocapsa sp.		112(158)
Gloeocystis sp.	69(18)	
Gonium sp.		13(18)
Gymnodinium sp.	24(3)	
Kirchneriella sp.		30(16)
Mallomonas acaroides		34(11)
Mallomonas ciliata		190(29)
Mallomonas ovata		34(11)
Melosira sp.	69(3)	
Navicula bicephala		8(11)
Navicula hassiaca	28(8)	10(8)
Nodularia sp.	120(16)	
Ochoomonas minuta		41(21)
Oochromonas verilucosa		56(79)
Oocystis lacustris		13(18)
Oocystis major	45(11)	39(18)
Oscillatoria sp.	71(6)	
Pediastrum simplex	2(3)	
Scenedesmus sp.	38(8)	
Staurastrum sebaldi		21(8)
Synechococcus sp.		41(16)
Synedra delicatissima	13(11)	21(8)

L. de Yojoa Phytoplankton

Date: 3/VIII/81

Depth (m)	0	3	6	9	12
Ankistrodesmus sp.	5(1)			6(3)	6(8)
Aphanocapsa endophytica	52(12)	42(5)	10(2)	108(56)	71(86)
Aphanothece nidulans	5(1)	2(3)	106(25)		
Asterococcus sp.	229(115)	202(8)	157(114)	214(52)	68(63)
Carteria klebsii				12(1)	5(1)
Centritractus sp.	7(2)	4(0)			3(1)
Chlamydomonas epyphytica				58(2)	
Chlamydomonas polypirendideum	2(3)			11(4)	17(2)
Chlamydomonas sphagnicola	10(3)	8(5)	3(1)		8(4)
Chlamydomonas nordstedtii	24(6)	21(3)	14(15)	45(63)	
Cryptomonas sp.	12(1)	12(5)	14(15)	40(3)	22(10)
Cocconeis sp.				3(1)	
Dinobryon sp.				3(1)	
Eremosphaera sp.	4(0)	2(3)			
Gloeocapsa sp.	40(1)	44(2)	9(1)	5(1)	63(4)
Gonatozigon sp.				14(4)	
Gonium sp.	7(1)	8(5)	10(13)	3(1)	
Gymnodinium sp.	4(0)		12(1)	7(1)	3(1)
Mallomonas acaroides	2(3)	8(0)	13(3)	17(4)	7(1)
Mallomonas ciliata			5(1)	5(2)	7(1)
Mallomonas ovata				7(1)	7(1)
Melosira sp.	4(0)	2(3)			
Merismopedtia			3(1)		
Mesostigma	5(1)			14(2)	
Navicula bicephala	25(19)	29(8)	17(12)	20(23)	7(2)
Navicula hassiaca	2(3)		5(1)		
Navicula sp.	2(3)				
Oocystis sp.	57(17)	70(3)	14(15)	39(9)	22(13)
Oscillatoria sp.	6(3)	4(6)	13(3)	7(1)	3(1)
Peridinium willei	11(4)	10(2)			
Staurostrum sp.	2(3)				

L. de Yojoa Phytoplankton

Date: 2/X/81

Species	Depth (m)	0	3	6	12	15
Aphanocapsa elachista				34(5)	6(8)	28(7)
Aphanocapsa grevillei		19(11)		38(11)	19(6)	10(2)
Aphanocapsa cf. microspora		32(8)				
Aphanothece nidulans	113(6)	235(22)	141(25)	214(18)		53(1)
Asterococcus limneticus	90(6)					
Carteria klebsii	14(8)	5(2)		26(6)		12(5)
Cerasterias sp.				8(5)		
Chlamydomonas epyphytica	29(13)	8(6)		2(3)		
Chlamydomonas polypirenoideum	12(5)	13(3)				17(3)
Chlamydomonas sphagnicola	2(3)	61(13)	15(11)	19(5)		2(3)
Chroococcus sp.			6(7)			
Chroococcus sp.	136(6)		38(1)			
Chroomonas nordstedtii		24(3)	17(8)	71(16)		28(13)
Cryptomonas sp.		-6(0)		8(5)		
Cocconeis sp.		2(3)				
Gloeocapsa sp.	17(8)					2(3)
Gloeotheca linearis		21(4)				
Gymnodinium sp.	19(0)			8(5)		
Mallomonas acaroides		9(2)		8(5)		6(3)
Mallomonas ciliata	8(5)			15(6)		10(8)
Mallomonas ovata	14(8)	13(3)	25(8)	25(8)		10(2)
Mesostigma viridis	120(5)	8(1)				
Monoraphidium contortum		2(3)				
Mycrocystis sp.		2(3)	2(3)			
Navicula bicephala	13(3)	13(3)	9(3)	36(8)		17(3)
Navicula sp.	15(6)	6(3)	8(5)			
Nodularia sp.		2(3)	2(3)			
Oocystis major	23(11)	7(2)	13(13)	8(5)		6(2)
Rhizochrysis sp.		2(3)				
Tetradron regulare		4(6)				
Trachelomonas sp.	130(3)	9(2)				

L. de Yojoa Phytoplankton

Date: 13/XI/81

Species	Depth(m)	0	3	6	9	12	15
Ankistrodesmus sp.		4(5)	3(4)		6(8)	11(0)	
Aphanocapsa sp.		43(60)	69(13)	8(11)	147(68)	131(10)	137(67)
Aphanothece nidularis		4(5)		88(123)			
Asterococcus limneticus		310(148)	158(14)	237(76)	178(251)	112(23)	66(33)
Carteria klebsii					12(11)	4(5)	
Centrictactus sp.		8(5)	5(1)			2(3)	
Chlamydomonas ephphitica					59(56)		
Chlamydomonas polypirenoideum		4(0)			14(8)	18(15)	22(4)
Chlamydomonas sphaenicola		8(11)	13(3)	2(3)		11(5)	
Chroomonas nordstedtii		20(28)	87(83)	24(3)	89(0)		6(2)
Chryptomonas sp.		12(11)	9(3)	23(3)	39(42)	29(15)	4(5)
Cocconeis sp.					2(3)		
Dinobryon sp.					2(3)		
Eremosphaera sp.		2(3)	1(2)				
Eudorina sp.							8(5)
Gloeocapsa sp.		39(40)	20(28)	10(8)	4(6)	60(65)	
Gonatozigon sp.					11(16)		
Gonium sp.		6(8)	10(2)	19(0)	2(3)		
Gymnodinium sp.		2(3)	2(3)	12(11)	6(8)	2(3)	2(3)
Mallomonas acarooides		4(0)	6(8)	15(11)	14(20)	6(8)	6(2)
Mallomonas ciliata				4(5)	6(3)	6(8)	2(3)
Mallomonas ovata					6(8)	6(8)	9(7)
Melosira sp.		2(3)	1(2)				
Merismopedta sp.				2(3)			
Mesostigma sp.		4(5)	3(4)		12(5)		
Navicula bicephala		38(11)	34(32)	25(8)	36(4)	8(5)	
Navicula hassiaca		2(3)	1(2)	4(5)			
Navicula sp.		2(3)	1(2)				
Oocystis sp.		69(45)	174(182)	24(3)	32(45)	31(12)	13(18)
Oscillatoria sp.		2(3)	1(2)	11(15)	6(8)	2(3)	
Peridinium wittei			6(3)				
Pleodorina sp.					4(6)	57(80)	
Polytoma sp.							
Staurastrum sp.			1(2)				
Surirella sp.					2(3)		
Synedra sp.					9(13)	6(2)	

Appendix 5: Invertebrate Community of Q. El Cajon, 1979-1980.
(Data represent mean number [standard deviation]
of animals per 5 minute sample)

Table A5.1

Date N (= number of 5 min. samples)	9/XI/79 12	30/XI/79 7	14/XII/79 7	27/XII/79 7	10/I/81 7	24/I/80 8	22/II/80 8	21/III/80 9	10/IV/80 6
<u>DIPTERA</u>									
SIMULIIDAE: Simulium	.4(1.4)	.1 (.4)	.3 (.5)	-	-	.1 (.4)	-	-	-
CHIRONOMIDAE: Pentaneura	.3 (.5)	.3 (.8)	1.0(1.2)	.4(1.1)	.9(2.3)	1.3(2.1)	.3 (.5)	-	2.2(4.0)
PSYCHODIDAE: Maruina	.3 (.6)	.7(1.9)	-	.1 (.4)	-	1.8(3.2)	-	-	-
DIXIDAE:	-	-	-	-	-	.1 (.4)	-	-	-
STRATIOMYIDAE: Euparyphus	-	-	-	-	-	-	.1 (.4)	-	-
EMPIDIDAE:	-	-	.1 (.4)	-	-	-	-	-	-
?	.3 (.9)	-	-	.1 (.4)	-	.8 (.9)	-	-	-
<u>MEGALOPTERA</u>									
CORYDALIDAE: Corydalis	.1 (.3)	.3 (.5)	.3 (.5)	-	-	.4 (.7)	-	.1 (.3)	-
<u>TRICHOPTERA</u>									
HYDROPSYCHIDAE: Leptonema	-	.4 (.8)	-	-	.3 (.8)	.1 (.4)	.1 (.4)	-	.2 (.4)
Smicridea	.4 (.9)	.9(1.2)	-	-	.1 (.4)	.5(1.4)	.6(1.8)	.2 (.4)	-
HYDROPTILIDAE: Leucotrichia	1.3(3.3)	.1 (.4)	1.9(4.5)	-	2.1(4.5)	.4(1.1)	.6(1.8)	-	-
Hydroptila	.5(1.2)	.1 (.4)	-	.1 (.4)	.1 (.4)	.3 (.5)	1.6(1.4)	1.8(3.0)	.2 (.4)
Oxythira	1.1(2.9)	-	-	-	.7(1.0)	.1 (.4)	.3 (.7)	2.0(4.4)	-
Neotrichia (?)	-	-	-	-	-	-	-	.1 (.3)	-
Ochrotrichia	.9(2.3)	.1 (.4)	-	-	-	.1 (.4)	-	-	-
LEPTOCERIDAE:	-	-	-	.1 (.4)	-	.1 (.4)	-	.1 (.3)	-
HELICOPSYCHIDAE: Helicopsyche	.1 (.3)	.1 (.4)	-	.1 (.4)	.1 (.4)	.6(1.4)	.1(1.4)	.4 (.7)	-
GLOSSOSOMATIDAE:	-	-	.1 (.4)	-	-	.4(1.1)	-	-	-
PSYCHOMYIDAE:	-	-	-	-	-	.1 (.4)	-	-	-
POLYCENTROPIDAE:	-	-	.1 (.4)	-	-	-	.1 (.4)	-	-
CALAMOCERATIDAE: Anisocentropus	-	-	-	-	-	-	.1 (.4)	-	-
PHILOPOTAMIDAE: Chimarra	-	-	-	-	-	-	-	-	-
Dolophillodes	-	-	-	-	-	-	-	-	.2 (.4)
?	.3 (.5)	.3 (.8)	.1 (.4)	.7 (.8)	-	.9(2.1)	1.3(1.8)	.1 (.3)	-

Table A5.1 (cont.)

Date N (= number of 5 min. samples)	9/XI/79 12	30/XI/79 7	14/XII/79 7	27/XII/79 7	10/I/80 7	24/I/80 8	22/II/80 8	21/III/80 9	10/IV/80 6
EPHEMEROPTERA									
BAETIDAE: Baetis	1.0(2.3)	2.0(2.2)	.7(1.1)	1.9(2.2)	-	.6(1.1)	.4 (.5)	-	-
Dactylobaetis	1.6(2.6)	3.0(2.7)	1.6(2.9)	6.0(4.1)	2.0(4.1)	2.9(5.5)	-	1.3 (.3)	-
Baetodes	1.2(2.7)	.7(1.5)	2.1(2.7)	.6 (.8)	2.3(4.5)	.4 (.7)	-	-	-
LEPTOPHLEBIDAE: Paraleptophlebia	-	-	1.4(1.9)	-	-	-	-	-	-
Traverella	.3 (.7)	.4 (.8)	1.0(1.7)	1.4(2.5)	.3 (.8)	-	.1 (.4)	.4(1.3)	.3 (.8)
TRICORYTHIDAE: Leptohyphes	1.4(2.9)	.7(1.0)	1.3(1.4)	2.3(1.7)	.6(1.5)	2.0(1.9)	.8(1.2)	.4 (.5)	1.3(1.2)
Tricorythodes	.1 (.3)	-	-	-	.4(1.1)	.5(1.1)	.5(1.1)	-	.3 (.8)
EPHEMERIDAE: Thraulodes	.4 (.9)	3.6(2.2)	.4(1.1)	3.0(2.8)	.3 (.5)	2.0(2.2)	1.0(1.3)	1.4(1.5)	.2 (.4)
CAENIDAE: Caenis	.1 (.3)	-	-	-	-	-	.1 (.4)	-	1.2(2.9)
?	-	-	.9(2.3)	-	-	.1 (.4)	-	-	-
COLEOPTERA									
PSEPHENIDAE: Psephenus	.3 (.5)	.7(1.5)	.7(1.5)	-	-	1.4(1.3)	.9 (.8)	.9(1.4)	1.3(2.2)
ELMIDAE: Limnius	.5(1.7)	-	1.9(2.9)	.9(1.2)	.3 (.5)	-	.6(1.8)	.2 (.4)	-
Elsianus	-	-	-	-	-	-	.5(1.1)	-	-
Lara	-	-	-	-	-	-	.6 (.7)	-	-
Heterelmis	-	-	-	-	-	-	.3 (.5)	.1 (.3)	-
Stenelmis	-	-	-	-	-	-	-	.1 (.3)	-
Neelmis	-	-	-	-	-	-	-	.1 (.3)	-
Neocyllloepus	-	-	-	-	-	-	-	-	-
STAPHYLINIDAE: Phenocerus	.1 (.3)	-	-	.1 (.4)	-	-	-	-	-
? (Larvae)	-	-	-	-	-	.1 (.3)	-	.1 (.3)	-
? (Adults)	-	.4 (.8)	-	-	-	.8(1.1)	.1 (.4)	.3 (.7)	-
HEMIPTERA									
VELIIDAE: Rhagovelia	.7(1.6)	-	.1 (.4)	1.7(3.7)	.3 (.5)	-	1.1(1.0)	.2 (.4)	1.7(2.3)
Microvelia	-	-	-	-	-	-	-	.2 (.7)	.3 (.8)
NAUCORIDAE: Ambrysus	.1 (.3)	-	-	-	-	-	-	-	-
Potemocoris	-	-	-	-	-	.1 (.4)	-	-	-
BELOSTOMATIDAE: Belostoma	.1 (.3)	-	-	-	-	-	-	-	-
HYDROMETRIDAE: Hydrometra	-	-	-	-	-	-	-	.2 (.7)	-

Table A5.1 (cont.)

Date N (= number of 5 min. samples)	9/XI/79 12	30/XI/79 7	14/XII/79 7	27/XII/79 7	10/I/80 7	24/I/80 8	22/II/80 8	21/III/80 9	10/IV/80 6
<u>ODONATA</u>									
COENAGRIIDAE: Ischnura	.1 (.3)	.1 (.4)	.1 (.4)	.1 (.4)	.3 (.5)	-	-	-	-
Argia	-	-	.1 (.4)	.3 (.5)	-	.4(1.1)	.1 (.4)	.7(1.0)	.2 (.4)
AGRIIDAE: Hetaerina	-	-	-	-	-	-	.1 (.4)	-	-
LIBELLULIDAE: Tetragoneuria	-	-	-	-	-	.1 (.4)	-	-	-
Macrothelmis	-	-	-	-	-	-	-	.3 (.7)	-
Leucorrhinia	.2 (.4)	-	-	-	-	-	.3 (.7)	-	-
Tauriphila	-	-	-	-	-	-	.1 (.4)	-	-
CORDULIIDAE: Somatochlora	-	.1 (.4)	-	.1 (.4)	-	-	-	-	-
GOMPHIDAE: Ophiogomphus	-	-	-	-	-	-	-	.1 (.3)	-
?	-	.1 (.4)	-	-	.4 (.5)	-	-	-	-
<u>PLECOPTERA</u>									
PERLIDAE: Atoperla	.2 (.6)	-	-	-	-	-	-	-	-
Acroneura	-	.4 (.5)	-	.1 (.4)	-	-	.5 (.8)	-	.2 (.4)
Anacroneuria	.1 (.3)	-	-	-	-	-	-	-	-
?	-	-	-	-	-	.6(1.2)	-	-	-
<u>LEPIDOPTERA</u>									
PYRALIDAE: Paragyraetis	.2 (.4)	.1 (.4)	.1 (.4)	.1 (.4)	-	.3 (.7)	.9(1.5)	.1 (.3)	.3 (.8)
Paraponyx	.2 (.4)	-	-	-	-	-	-	-	-
?	-	-	.4 (.5)	-	-	.1 (.4)	-	.1 (.3)	-
<u>GASTROPODA</u>									
ANCYLIDAE:	.1 (.3)	-	-	-	-	-	-	-	-
<u>NEMATODA</u>									
	-	-	-	-	-	-	.1 (.4)	-	-

Table A5.1 (cont.)

Date N (= number of 5 min. samples)	22/V/80 8	6/VI/80 7	20/VI/80 6	18/VII/80 5	14/VIII/80 6	27/VIII/80 8	25/IX/80 7	29/X/80 7
<u>DIPTERA</u>								
SIMULIIDAE: Simulium	-	-	.6(1.2)	.6(1.3)	-	-	.1 (.4)	.1 (.4)
CHIRONOMIDAE: Pentaneura	-	-	.2 (.4)	-	-	-	.1 (.4)	.1 (.4)
PSYCHODIDAE: Maruina	-	-	-	-	.2 (.4)	-	-	.1 (.4)
DIXIDAE:	-	-	-	-	-	-	-	-
STRATIOMYIDAE: Euparyphus	-	-	-	-	-	-	-	-
EMPIDIDAE:	-	-	-	-	-	-	-	-
?	-	-	-	-	-	.1 (.4)	-	-
<u>MEGALOPTERA</u>								
CORYDALIDAE: Corydalis	.1 (.4)	-	-	-	-	.1 (.4)	.1 (.4)	.3 (.5)
<u>TRICHOPTERA</u>								
HYDROPSYCHIDAE: Leptonema	-	-	-	-	-	-	.1 (.4)	-
Smicridea	.1 (.4)	-	.2 (.4)	1.0(2.4)	.1 (.4)	.3 (.5)	1.0(1.5)	-
HYDROPTILIDAE: Leucotrichia	-	-	-	.3 (.5)	-	.1 (.4)	1.6(2.3)	-
Hydroptila	.1 (.4)	-	-	-	-	-	-	-
Oxythira	-	-	-	-	-	-	-	-
Ochrotrichia	-	-	-	-	-	-	-	-
Neotrichia (?)	-	-	-	-	-	-	-	-
<u>LEPTOCERIDAE:</u>								
HELICOPSYCHIDAE: Helicopsyche	.1 (.4)	.3 (.5)	-	-	-	-	-	-
GLOSSOSOMATIDAE:	-	-	-	-	-	-	-	-
PSYCHOMYIDAE:	-	-	-	-	-	-	-	-
POLYCENTROPIDAE:	.1 (.4)	-	-	-	-	-	-	-
CALAMOCERATIDAE: Anisocentropus	-	-	-	-	-	-	-	-
PHILOPOTAMIDAE: Chimarra	.4 (.5)	-	-	-	-	-	-	-
Dolophilodes	-	-	-	-	-	-	-	-
?	.1 (.4)	.3 (.8)	-	-	.7(1.2)	-	-	-

Table A5.1 (cont.)

Date N (= number of 5 min. samples)	22/V/80 8	6/VI/80 7	20/VI/80 6	18/VII/80 5	14/VIII/80 6	27/VIII/80 8	25/IX/80 7	29/X/80 7
<u>EPHEMEROPTERA</u>								
BAETIDAE: Baetis	-	-	.2 (.4)	7.0(15.1)	.3 (.5)	.1 (.4)	2.0(1.9)	1.6(1.7)
Dactylobaetis	-	-	-	15.2(21.0)	9.7(11.4)	1.4(1.8)	2.6(3.0)	2.0(2.5)
Baetodes	-	-	-	6.2(13.3)	7.7 (9.1)	1.5(2.8)	3.7(5.1)	5.7(8.7)
LEPTOPHLEBIDAE: Paraleptophlebia	-	-	-	-	-	-	-	-
Traverella	.1 (.4)	-	-	-	.5 (1.2)	.1 (.4)	.7(1.1)	.6 (.8)
TRICORYTHIDAE: Leptohyphes	1.3(1.2)	-	.3 (.8)	.4 (.5)	.5 (.8)	.4 (.7)	.4 (.8)	2.1(1.3)
Tricorythodes	-	-	-	-	.3 (.8)	-	-	-
EPHEMERIDAE: Thraulodes	.9(1.6)	-	-	.2 (.4)	.8 (.8)	2.0(2.1)	1.9(1.6)	3.1(2.7)
CAENIDAE: Caenis	.3 (.5)	.4(1.1)	-	-	-	-	-	-
?	-	-	-	.2 (.4)	.2 (.4)	-	-	-
<u>COLEOPTERA</u>								
PSEPHENIDAE: Psephenus	2.8(4.0)	2.9(2.2)	.2 (.4)	-	1.3 (2.2)	.9(1.0)	.3 (.8)	.6 (.8)
ELMIDAE: Limnius	.6(1.1)	-	-	.4 (.5)	.2 (.4)	.3 (.7)	-	.7(1.1)
Elsianus	-	-	-	-	-	-	-	-
Lara	-	-	-	-	-	-	-	.1 (.4)
Heterelmis	-	-	-	-	-	-	-	.1 (.4)
Stenelmis	-	-	-	-	-	-	-	-
Neoeelmis	.4 (.7)	-	-	-	-	-	-	-
Neocylloepus	1.3(1.4)	.1 (.4)	-	-	-	-	-	-
STAPHYLINIDAE: Phanocerus	-	-	-	-	-	-	-	.3 (.5)
? (Larvae)	.1 (.4)	.1 (.4)	.7 (.8)	-	-	-	-	.3 (.8)
<u>HEMIPTERA</u>								
VELIIDAE: Rhagovelia	.1 (.4)	-	-	.2 (.4)	.8 (2.0)	-	-	-
Microvelia	-	-	-	-	-	.1 (.4)	-	-
NAUCORIDAE: Ambrysus	.1 (.4)	-	.2 (.4)	-	-	.1 (.4)	-	-
Potemocoris	-	-	-	-	-	-	-	-
BELOSTOMATIDAE: Belostoma	-	-	-	-	-	-	-	-
HYDROMETRIDAE: Hydrometra	-	-	-	-	-	-	-	-

Table A5.1 (cont.)

Date N (= number of 5 min. samples)	22/V/80 8	6/VI/80 7	20/VI/80 6	18/VII/80 5	14/VIII/80 6	27/VIII/80 8	25/IX/80 7	29/X/80 7
<u>ODONATA</u>								
COENAGRIIDAE: Ischnura Argia	.6(1.1)	.6 (.8)	.2 (.4)	.6 (.5)	.2 (.4)	1.1 (.6)	.6 (.8)	.1 (.4)
ARGRIIDAE: Hetaerina	-	-	-	-	-	.1 (.1)	-	-
LIBELLULIDAE: Tetragoneuria	-	-	-	-	-	-	-	-
Macrothelms	-	-	-	-	-	-	-	-
Leucorrhinia	-	-	-	-	-	-	-	-
Tauriphila	-	-	-	-	-	-	-	-
CORDULIIDAE: Somatochlora	-	-	-	-	-	-	-	-
GOMPHIDAE: Ophiogamphus	-	-	-	-	-	-	-	-
?	.3 (.5)	.4(1.1)	-	-	-	-	-	-
<u>PLECOPTERA</u>								
PERLIDAE: Atoperla	-	-	-	-	-	-	-	-
Acroneura	.1 (.4)	-	-	-	-	.1 (.4)	-	-
Anacroneuria	-	-	-	-	-	-	-	-
?	-	-	-	-	-	-	-	-
<u>LEPIDOPTERA</u>								
PYRALIDAE: Paragyraetis	-	-	-	-	-	-	-	-
Paraponyx	-	-	-	-	-	-	-	-
?	-	.4(1.1)	-	-	-	-	-	-
<u>GASTROPODA</u>								
ANACYLIDAE:	-	-	-	-	-	-	-	-
NEMATODA:	-	-	-	-	-	-	-	-

Appendix 6: The Rio Tamalito Diversion Project
 --- environmental impact study.

Introduction

In October 1981, the Limnology Laboratory agreed to undertake for ENEE an environmental impact study of the Tamalito diversion project. The project was designed to divert water from the Tamalito watershed into Lago de Yojoa in order to increase the power generation capacity of the Canaveral/Rio Lindo hydroelectric complex.

The environmental impact study that was proposed to ENEE included an intensive monitoring of river water quality over a period of one month in both wet and dry seasons. A survey of the vegetation in the area to be flooded and of the fish in the Tamalito and Jaitique rivers were additional components of the study.

The river water quality monitoring program began in December 1981 and the dry season phase was completed in January 1982. In March, however, ENEE decided that it was not going to proceed with the diversion project at that time and so the environmental study could not be completed as originally planned. However, in order to obtain complementary wet season water quality data, monitoring of the R. Tamalito was resumed for a period of 9 days in July 1982.

This appendix presents the major part of the water quality data collected during the study , since it may serve as a base for future work in this area. The R. Tamalito was sampled just upstream from the main crossing of the north-south road. Data from this station appear in Table A6.1. Since the R. Varsovia at times flows into the R. Tamalito, it was included in the sampling program. Data from two stations sampling water from this river are included in Tables A6.2 and A6.3.

Table A6.1: R. Tamalito water quality.

Date Time	5/XII/81 11:55	18:10	6/XII/81 9:30	17:20	7/XII/81 12:00	15:30
O ₂ (mg/l)	9.3	9.0	9.5	-	-	-
pH	8.0	8.2	8.3	-	8.4	8.0
Temp. (°C)	18.1	17.0	16	-	18	19.0
Cond. (µmho/cm)	328	480	429	-	400	311
Flow (m ³ /sec)	0.98	-	0.84	-	0.79	-
Susp. Sol. (mg/l)	12.7	22.8	17.2	34.2	-	20.4
Alkal. (mg/l CaCO ₃)	144.7	150.6	149.9	148.6	144.8	138.8
Turb. (NTU)	2.5	4	6.4	6.0	7.2	2.5
Total-P (µg/l)	12	10	19	12	12	8
PO ₄ -P (µg/l)	9	9	11	10	11	11
NO ₃ -N (µg/l)	62	50	47	35	57	38
NH ₄ -N (µg/l)	35	11	19	36	32	26
Si (total) (mg/l)	10	9	12	12	12	12
Fe (total) (mg/l)	.04	.06	.07	.09	.09	.04

Date Time	8/XII/81 7:40	14:40	9/XII/81 7:25	16:10	10/XII/81 8:00	15:30
O ₂ (mg/l)	8.2	-	-	9.0	9.6	9.2
pH	8.0	8.1	8.1	8.2	8.0	8.1
Temp. (°C)	23	17	16	17	16	15.5
Cond. (µmho/cm)	315	420	441	374	331	375
Flow (m ³ /sec)	0.8	0.8	0.9	0.7	1.06	1.53
Susp. Sol. (mg/l)	18.05	32.2	28.6	42.4	15.5	14.2
Alkal. (mg/l CaCO ₃)	144.8	146	146.0	136.2	139.2	119.7
Turb. (NTU)	3	2.7	3.3	4.5	5.7	34.5
Total-P (µg/l)	9	21	15	16	12	12
PO ₄ -P (µg/l)	10	12	7	10	12	6
NO ₃ -N (µg/l)	60	89	77	92	80	31
NH ₄ -N (µg/l)	20	28	16	30	27	20
Si (total) (mg/l)	11	8	6	8	5	10
Fe (total) (mg/l)	.05	.02	.03	.06	.07	.24

Table A6.1 (cont.)

Date Time	11/XII/81 7:30	15:30	12/XII/81 7:30	14:50	29/XII/81 12:02	9/I/82 10:20
O ₂ (mg/l)	9.2	9.2	8.8	8.2	9.6	11.0
pH	8.0	8.2	8.1	8.1	8.2	8.1
Temp. (°C)	14	17.5	15	19	21	18
Cond. (umho/cm)	446	344	438	403	286	376
Flow (m ³ /sec)	1.36	1.23	0.83	0.89	0.56	0.65
Susp. Sol. (mg/l)	19.7	23.7	18.7	-	-	-
Alkal. (mg/l CaCO ₃)	122.8	-	130.3	132.6	117.6	130.8
Turb. (NTU)	24	-	12	8.3	2.8	2.4
Total-P (ug/l)	23	14	10	15	15	12
PO ₄ -P (ug/l)	18	13	13	9	10	10
NO ₃ -N (ug/l)	93	78	95	54	57	58
NH ₄ -N (ug/l)	24	14	33	27	21	28
Si (total) (mg/l)	11	11	11	10	11.7	11.9
Fe (total) (mg/l)	.16	.14	.12	.05	.07	.05

Date Time	9/I/82 14:05	14/I/82 11:00	14:25	21/I/82 12:30	13 :30	18/I/82 10:35
O ₂ (mg/l)	11.0	8.2	8.2	6.6	6.6	9.3
pH	8.0	8.1	8.1	8.1	8.1	-
Temp. (°C)	18	19.0	19.0	20	20	22
Cond. (umho/cm)	370	311	305	315	315	301
Flow (m ³ /sec)	0.61	0.52	0.57	0.3	0.29	-
Susp. Sol. (mg/l)	-	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	130.0	129.0	130.8	125.0	125.0	-
Turb. (NTU)	2.3	2.3	2.5	2.2	2.4	-
Total-P (ug/l)	15	23	15	15	-	23
PO ₄ -P (ug/l)	15	5	4	12	-	16
NO ₃ -N (ug/l)	62	58	62	51	-	93
NH ₄ -N (ug/l)	6,18	12	11	7	-	31
Si (total) (mg/l)	11.9	11.4	11.6	11.9	-	15.3
Fe (total) (mg/l)	.05	.07	.06	-	-	.06

Table A6.1 (cont.)

Date Time	18/II/82 16:10	22/III/82 13:30	21/VII/82 12:20	17:55	22/VII/82 6:15	12:00
O ₂ (mg/l)	9.0	10.8	5.4	5.45	5.4	6.3
pH	-	-	8.3	8.3	8.0	8.1
Temp. (°C)	22.5	18.8	24	24	20.7	22.4
Cond. (μmho/cm)	308	310	271	275	179	212
Flow (m ³ /sec)	0.31	.38	-	-	-	-
Susp. Sol. (mg/l)	-	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	-	-	127.8	127.8	85	97
Turb. (NTU)	-	-	53	25	328	141
Total-P (μg/l)	34	-	44	23	138	95
PO ₄ -P (μg/l)	13	-	8	7	10	10
NO ₃ -N (μg/l)	96	-	25	26	30	33
NH ₄ -N (μg/l)	14	-	32	23	30	24
Si (total) (mg/l)	15.3	-	11.0	10.3	8.4	8.9
Fe (total) (mg/l)	.05	-	.77	.31	4.60	2.77

Date Time	22/VII/82 17:55	23/VII/82 6:00	12:00	18:00	24/VII/82 6:00	12:00
O ₂ (mg/l)	5.7	7.1	5.6	6.6	5.21	6.35
pH	8.2	8.15	8.31	8.3	8.2	8.31
Temp. (°C)	23.8	20.9	22.0	22.8	19.5	22.2
Cond. (μmho/cm)	224	212	255	255	237	238
Flow (m ³ /sec)	-	-	-	-	-	-
Susp. Sol. (mg/l)	-	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	106.5	100.0	122.0	123.2	111.0	117.1
Turb. (NTU)	91	180	66	43	189	99.0
Total-P (μg/l)	46	74	39	28	70	54
PO ₄ -P (μg/l)	8	8	8	6	8	7
NO ₃ -N (μg/l)	53	42	47	47	48	58
NH ₄ -N (μg/l)	29	26	22	22	23	17
Si (total) (mg/l)	9.7	9.6	9.4	10.2	9.5	9.4
Fe (total) (mg/l)	1.70	2.34	1.28	.60	2.01	1.45

Table A6.1 (cont.)

Date Time	24/VII/82 18:00	25/VII/82 6:07	11:50	18:00	26/VII/82 6:15	12:00
O ₂ (mg/l)	5.45	7.43	7.51	6.00	6.1	6.85
pH	8.3	-	-	-	-	8.4
Temp. (°C)	17.8	18.5	21.9	22.2	16.8	23.5
Cond. (µmho/cm)	268	291	219	230	283	252
Flow (m ³ /sec)	-	-	-	-	-	-
Susp. Sol. (mg/l)	-	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	116.0	96.5	100.5	115.6	117.3	116.8
Turb. (NTU)	71.0	108	80	62	33	32
Total-P (µg/l)	45	66	57	45	29	26
PO ₄ -P (µg/l)	8	11	10	9	10	6
NO ₃ -N (µg/l)	80	61	70	58	87	70
NH ₄ -N (µg/l)	18	21	23	13	13	13
Si (total) (mg/l)	6.6	6.7	4.5	6.4	7.4	9.0
Fe (total) (mg/l)	.96	1.51	1.19	.90	.50	.38

Date Time	26/VII/82 17:40	27/VII/82 6:00	12:00	17:40	28/VII/82 6:30	12:20
O ₂ (mg/l)	5.82	5.85	6.6	6.25	8.2	8.28
pH	8.3	8.2	8.3	8.3	8.2	8.4
Temp. (°C)	23.1	21.0	24.1	23.6	21.4	23.3
Cond. (µmho/cm)	249	273	261	258	283.4	331.5
Flow (m ³ /sec)	-	-	-	-	-	-
Susp. Sol. (mg/l)	-	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	116.8	132.0	131.5	124.0	137.3	128.2
Turb. (NTU)	20	22.0	17	12	14.3	12.0
Total-P (µg/l)	23	22	21	24	16	17
PO ₄ -P (µg/l)	6	8	7	6	6	6
NO ₃ -N (µg/l)	63	80	61	49	68	54
NH ₄ -N (µg/l)	10	10	13	9	10	8
Si (total) (mg/l)	9.4	7.6	9.5	9.6	9.9	6.3
Fe (total) (mg/l)	.34	.27	.21	.20	.18	.11

Table A6.1 (cont.)

Date Time	28/VII/82 17:43	29/VII/82 6:15	11:50	17:40	30/VII/82 6:08
O ₂ (mg/l)	8.63	8.3	8.54	7.87	8.4
pH	8.3	8.4	8.4	8.31	8.3
Temp. (°C)	23.3	21.3	23.8	24.0	21.4
Cond. (µmho/cm)	279.4	284	287.8	261.4	204.5
Flow (m ³ /sec)	-	-	-	-	-
Susp. Sol. (mg/l)	-	-	-	-	-
Alkal. (mg/l CaCO ₃)	132.5	137.7	130.1	125.5	136.5
Turb. (NTU)	12.3	8.45	13.0	8.0	8.7
Total-P (µg/l)	15	14	16	15	18
PO ₄ -P (µg/l)	6	6	5	5	5
NO ₃ -N (µg/l)	39	53	29	25	39
NH ₄ -N (µg/l)	11	10	17	10	25
Si (total) (mg/l)	5.7	9.3	10.2	9.9	5.4
Fe (total) (mg/l)	.12	.12	.14	.10	.13

Table A6.2:

R. Varsovia water quality (Yojoa canal at Los Remos)

Date Time	7/XII/81 a.m.	p.m.	8/XII/81 a.m.	p.m.	9/XII/81 a.m.	p.m.	10/XII/81 a.m.
O ₂ (mg/l)	-	-	-	-	-	7.6	7.0
pH	7.8	7.6	7.0	7.6	7.6	6.9	6.9
Temp. (°C)	18.5	15	21	15	16	15	14
Cond. (µmho/cm)	163	175	57	63	76	213	191
Susp. Solids (mg/l)	-	33.5	29.2	38.4	53.6	46.3	22.8
Turb. (NTU)	1.6	5.0	16	3.6	16	14	6.3
Alkal. (mg/l CaCO ₃)	23.0	23.1	24.4	3.6	25.0	19.1	22.7
Total-P (µg/l)	5	7	11	7	14	56	7
PO ₄ -P (µg/l)	4	9	9	16	8	11	12
NO ₃ -N (µg/l)	155	59	77	48	170	158	176
NH ₄ -N (µg/l)	56	22	20	22	28	28	28
Si (total)(mg/l)	5	7	9	7	8	6	6
Fe (total)(mg/l)	.12	.15	.10	.13	.18	.12	.06

Date Time	10/XII/81 p.m.	11/XII/81 a.m.	p.m.	12/XII/81 a.m.	p.m.	29/XII/81 a.m.	9/I/82 a.m.
O ₂ (mg/l)	7.2	10.0	9.0	9.2	6.0	8.0	7.0
pH	7.0	7.0	7.8	7.7	7.0	7.8	7.8
Temp. (°C)	14	13	14	14.5	15	19	17
Cond. (µmho/cm)	230	117	77	76	108	81	72
Susp. Solids (mg/l)	20.0	7.7,-	12.9	58.0	-	-	-
Turb. (NTU)	3.2	12	-	4.3	4.2	2.1	26.0
Alkal. (mg/l CaCO ₃)	24.8	24.6	-	25.8	24.8	31.8	23.8
Total-P (µg/l)	8	10	6	10	11	12	20
PO ₄ -P (µg/l)	11	9	11	9	9	7	30
NO ₃ -N (µg/l)	102	149	129	140	140	90	56
NH ₄ -N (µg/l)	45	23	28	24	13	31	12
Si (total)(mg/l)	5	10	4	10	4	12.5	10.2
Fe (total)(mg/l)	.07	.11	.08	.06	.08	.09	.35

Table A6.2 (cont.)

Date Time	9/1/82 p.m.	14/1/82 a.m.	p.m.	21/1/82 a.m.	p.m.	18/11/82 a.m.	p.m.
O ₂ (mg/l)	7.5	8.8	8.9	8.6	8.6	5.5	5.6
pH	7.8	7.6	7.6	7.6	7.6	-	-
Temp. (°C)	17	15	15	16	16	18.0	18.0
Cond. (µmho/cm)	72	88	88	86	87	94	92
Susp. Solids (mg/l)	-	-	-	-	-	-	-
Turb. (NTU)	25.0	2.6	2.6	2.1	2.0	-	-
Alkal. (mg/l CaCO ₃)	24.3	24.3	28.0	29.0	29.3	-	-
Total-P (µg/l)	25	17	14	28	-	48	47
PO ₄ -P (µg/l)	28	8	8	11	-	10	12
NO ₃ -N (µg/l)	48	68	55	89	-	62	67
NH ₄ -N (µg/l)	12	12	14	12	-	16	9
Si (total)(mg/l)	8.9	12.5	12.6	11.5	-	13.3	13.3
Fe (total)(mg/l)	.31	.09	.03	.08	-	.08	.10

Table A6.3: R. Varsovia water quality (Yojoa canal at La Pita)

Date Time	5/XII/81 a.m.	p.m.	6/XII/81 a.m.	p.m.	7/XII/81 a.m.	p.m.
O ₂ (mg/l)	9.1	9.4	9.0	-	-	-
pH	7.1	8.0	7.9	-	7.6	6.9
Temp. (°C)	16.0	16.0	16	-	19	19.5
Cond. (µmho/cm)	96	74	123	-	127	57
Susp. Solids (mg/l)	21.7	16.8	16.0	25.4	-	36.2
Turb. (NTU)	12	6	20	21	13	7
Alkal. (mg/l CaCO ₃)	22.5	22.3	24.8	24.6	22.6	23.3
Total-P (µg/l)	16	39	15	15	14	12
PO ₄ -P (µg/l)	10	13	10	12	9	11
NO ₃ -N (µg/l)	44	16	44	59	8	8
NH ₄ -N (µg/l)	30	32	29	27	23	39
Si (total)(mg/l)	7	8	9	10	11	11
Fe (total)(mg/l)	.29	.91	.36	.27	.16	.16

Date Time	8/XII/81 a.m.	p.m.	9/XII/81 a.m.	p.m.	10/XII/81 a.m.	p.m.
O ₂ (mg/l)	-	-	-	10.0	9.3	9.2
pH	6.9	7.6	7.6	7.0	7.1	7.1
Temp. (°C)	20	15	15	15	15	14
Cond. (µmho/cm)	101	75	125	150	199	128
Susp. Solids (mg/l)	33.9	35.8	54.2	35.8	28.9	14.1
Turb. (NTU)	5	4	25	14	7	1
Alkal. (mg/l CaCO ₃)	23.5	26.6	17.3	19.1	21.5	23
Total-P (µg/l)	7	150	30	15	9	15
PO ₄ -P (µg/l)	16	15	14	12	12	8
NO ₃ -N (µg/l)	48	216	174	136	168	118
NH ₄ -N (µg/l)	22	14	15	12	12	14
Si (total)(mg/l)	7	10	8	5	7	16.6
Fe (total)(mg/l)	.13	.05	.32	.12	.10	-

Table A6.3 (cont.)

Date Time	11/XII/81 a.m.	p.m.	12/XII/81 a.m.	p.m.	29/XII/81 13:00	9/I/82 a.m.	p.m.
O ₂ (mg/l)	9.4	8.8	10.0	8.8	8.1	8.5	8.5
pH	6.9	7.1	7.0	7.1	7.8	7.7	7.7
Temp. (°C)	13	16.5	14	16.5	19	16	16
Cond. (µmho/cm)	234	85	179	73	81	61	61
Susp. Solids (mg/l)	10.3	31.0	27.0	-	-	-	-
Turb. (NTU)	14	-	4	7	2	21	20
Alkal. (mg/l CaCO ₃)	20.8	-	25.8	24.0	31.0	21.0	23.3
Total-P (µg/l)	15	15	8	9	17	39	25
PO ₄ -P (µg/l)	16	10	10	10	9	9	8,14
NO ₃ -N (µg/l)	131	227	152	200	87	127	120
NH ₄ -N (µg/l)	16	22	24	8	10	16	8
Si (total)(mg/l)	14	15	12	9	12.5	10.0	10.6
Fe (total)(mg/l)	.17	.08	.08	.05	.08	.34	-

Date Time	14/I/82 a.m.	p.m.	21/I/82 a.m.	p.m.	18/II/82 a.m.	p.m.
O ₂ (mg/l)	9.0	8.9	8.8	8.7	9.4	9.2
pH	7.6	7.6	7.6	7.5	-	-
Temp. (°C)	15	15	17	17	19.2	20.0
Cond. (µmho/cm)	100	100	84	86	86	90
Susp. Solids (mg/l)	-	-	-	-	-	-
Turb. (NTU)	3	3	3	2	-	-
Alkal. (mg/l CaCO ₃)	26.0	26.3	30.0	30.0	-	-
Total-P (µg/l)	15	29	24	-	48	47
PO ₄ -P (µg/l)	7	9	14,8	-	10	12
NO ₃ -N (µg/l)	66	61	84	-	62	67
NH ₄ -N (µg/l)	14	13	12	-	16	9
Si (total)(mg/l)	13.7		12.0	-	13.3	13.3
Fe (total)(mg/l)	.06	.08	.10	-	.08	.10

Appendix 7.

Reservoir System Management for Water Quality

by R.G. Willey, M. ASCE, D.J. Smith, A.M. ASCE
and J.H. Duke, M. ASCE

RESERVOIR SYSTEM MANAGEMENT FOR WATER QUALITY

by

R. G. Willey¹, M. ASCE, D. J. Smith², A.M. ASCE
and J. H. Duke³, M. ASCE

ABSTRACT

A reservoir system analysis computer model has been recently developed with the capability to simulate up to 10 reservoirs, 30 control points and 8 water quality parameters. With this model the user can evaluate a "best" system operation analysis for multipurpose reservoir regulation to obtain target water quality conditions at user specified control points.

The model uses a linear programming algorithm to evaluate the "best" system operation among all the reservoirs and a nonlinear routine for operation of multilevel intakes at any one reservoir in the system. The user may select to operate the system for a balanced reservoir pool operation and its associated water quality or to allow for a modified flow distribution between reservoirs to improve the water quality operation.

The water quality routines are capable of analyzing water temperature and up to three conservative and three nonconservative constituents. If at least one of the nonconservative constituents is an oxygen demanding parameter, dissolved oxygen can also be analyzed. A special option has been added to analyze phytoplankton and associated nutrients.

INTRODUCTION

The U.S. Army Corps of Engineers is responsible for the operation of hundreds of multiple purpose reservoirs in addition to maintenance of hundreds of miles of non-reservoir projects (e.g., levees and navigation channels). Management of each reservoir project can be analyzed for its best operation by any one of numerous reservoir computer programs (4, 5, 7, 8, 10). With river analysis programs (5), the impact of specified reservoir releases can be evaluated at downstream points of interest.

The problem with using single project models is the difficulty of coordinating releases among projects that impact on a single location. This is shown in Figure 1 where the operation of both reservoirs A and B impact on the amount and quality of water at City A (i.e., control point 3). As the system is expanded further downstream, the computations necessary to provide a best operation of reservoirs A through D for control point 7 obviously require a comprehensive system approach.

¹Hydraulic Engineer, U.S. Army Corps of Engineers, Hydrologic Engineering Center, 609 Second Street, Davis, CA

²Resource Management Associates, Lafayette, CA

³Consulting Water Engineer, Austin, TX

The "HEC-5Q, Simulation of Flood Control and Conservation Systems (Including Water Quality Analysis)" computer model (6) has been developed specifically for evaluating the type of problem shown in Figure 1. The model is capable of evaluating a reservoir system of up to ten reservoirs and up to thirty control points. The model will analyze a best system operation for water quantity and quality by evaluating operational concerns like flood control, hydropower, water supply, and irrigation diversions. Changing needs and natural inputs can also be accommodated.

MATHEMATICAL MODEL

Flow Simulation Module

The flow simulation module was developed to assist in planning studies for evaluating proposed reservoirs in a system and to assist in sizing the flood control and conservation storage requirements for each project recommended for the system. The program can be used in studies made immediately after the occurrence of a flood to show the effects of existing and/or proposed reservoirs on flows and damages in the system. The program should also be useful when selecting the proper reservoir releases during flood emergencies in order to minimize flooding and yet empty the system quickly while maintaining a balance of flood control storage ("balanced pool") among the reservoirs.

Water Quality Simulation Module

The water quality simulation module was developed to simulate temperature, three user-selected conservative and three user-selected non-conservative constituents. The model also allows dissolved oxygen to be simulated if the user selects either carbonaceous or nitrogenous oxygen demanding constituents. An option for phytoplankton evaluation is also available.

The water quality simulation module accepts system flows generated by the flow simulation module and computes the distribution of all the water quality constituents in up to ten reservoirs and their associated downstream reaches. The ten reservoirs may be in any arbitrary parallel and/or tandem configuration.

The water quality simulation module also selects the gate openings for reservoir withdrawal structures to meet user-specified water quality objectives at downstream control points. If the objectives cannot be satisfied with the previously computed "balanced pool" flows, the model will compute a modified flow distribution necessary to better satisfy all downstream objectives. With these capabilities, the planner may

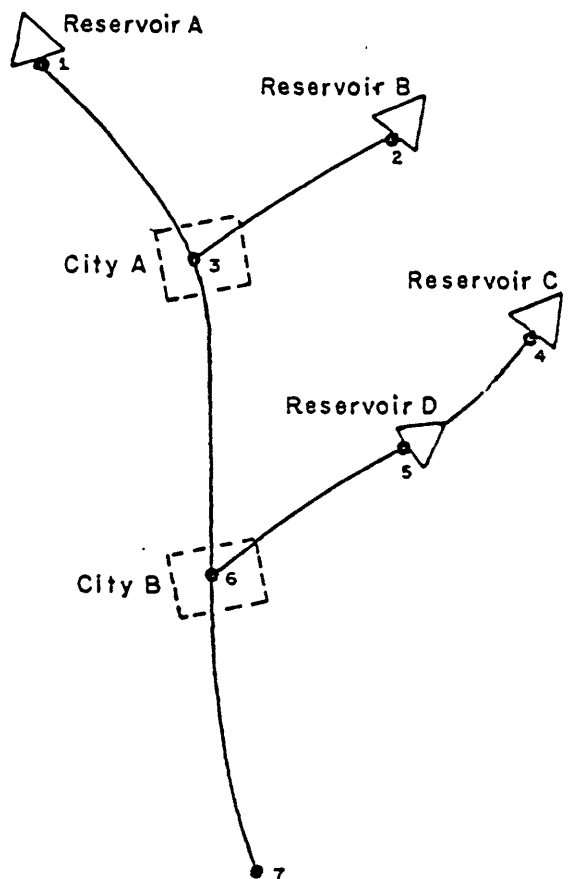


Figure 1

TYPICAL RESERVOIR
SYSTEM SCHEMATIC

evaluate the effects on water quality of proposed reservoir-stream system modifications and determine how a reservoir intake structure should be operated to achieve desired water quality objectives within the system.

Each reservoir is assumed to be a control point, in keeping with the concepts used in the development of the flow simulation module. The water quality module will allow for up to thirty control points, including the reservoir control points. The additional control points may be placed in the stream system below the reservoirs at stream confluences and any other desirable locations.

The reservoirs are represented conceptually by one dimensional horizontal elements. Each horizontal element is characterized by an area, thickness and volume. In the aggregate, the assemblage of layered volume elements is a geometric representation of the prototype reservoir. This one dimensional representation has been shown to adequately represent water quality conditions in many deep, well stratified reservoirs by Eiker (8), Baca (1) and Water Resources Engineers (9, 10, 11).

AUTHORS: Webb typed text, tables, and

Each horizontal layer is assumed to be completely mixed with all isopleths parallel to the water surface both laterally and longitudinally. External inflows and withdrawals occur as sources or sinks within each layer and are instantaneously dispersed and homogeneously mixed throughout each element from the headwaters of the impoundment to the dam. It is not possible, therefore, to look at longitudinal variations in water quality constituents. Simulation results are most representative of conditions in the main reservoir body.

Vertical advection is governed by the location of inflow to, and outflow from, the reservoir. Thus the computation of the zones of distribution and withdrawal for inflows and outflows are of considerable significance in operation of the model. The WES withdrawal method (2) is used for determining the allocation of outflow. The Debler inflow allocation method (3) is used for the placement of inflows.

Vertical advection is the net interelement flow and is one of two transport mechanisms used in the module to transport water quality constituents between elements. Effective diffusion is the other transport mechanism. The effective diffusion is composed of molecular and turbulent diffusion and convective mixing.

The stream system is represented conceptually as a linear network of segments or volume elements. Each element is characterized by length, width, cross sectional area, hydraulic radius, Manning's n and a flow and depth relationship. Flow rates at stream control points are calculated within the flow simulation module using any one of the several programmed hydrologic routing methods. Within the flow simulation module, incremental local flows (i.e., inflow between adjacent control points) are assumed to be located at the nearest control point.

Within the water quality simulation module, the incremental local flow may be divided into components and placed at different locations within the stream reach (i.e., that portion of the stream bounded by the two control points). A flow balance is used to determine the flow rate at element boundaries. Any flow imbalance (i.e., the difference in the flow at the upstream control point plus all tributary inflows and the flow at the downstream control point) is distributed uniformly to the flows at each element boundary. Once interelement flows are established, the depth, surface width, and cross sectional area are computed at each element boundary assuming normal flow.

Once the desired reservoir release and the target water quality to meet downstream needs have been computed, the gate selection algorithm determines which ports should be open and what flow rate should pass through each open port in order to maximize a function of the downstream water quality concentrations. Solution of this problem is accomplished by using mathematical optimization techniques. The objective function is related to meeting downstream target qualities subject to various hydraulic constraints on the individual ports.

The algorithm considers a sequence of problems, each representing a different combination of open ports. For each combination the optimal allocation of total flow to ports is first determined and then a water quality index is determined for the optimal allocation of flows. The combination of open ports with the highest water quality index and its associated allocation of flows define the optimal operation strategy for the time period under consideration.

Flow Alterations

AUTHORS: HEC-5 word text, table, and
illustrations. Martin J. DeBordain, Willey,
1976. 100 pages. 100% of typed text.

The flow alteration routine is designed to change the reservoir releases, computed by the flow simulation module, to better satisfy the stream control point water quality objectives. The routine is designed about a mass balance for all reservoir releases and all control points affected by those releases. Tributary inflows and other flow changes are included. Second order effects, such as reaeration and external heating due to increased or decreased stream surface area, are not included.

Thus the flow augmentation requirement can be computed for each control point and for each constituent. The various computed flow rates are then combined by using the coefficients of the linear programming objective function and the deviation of the respective constituent concentrations from the target concentrations at each respective control point.

Once the flow augmentation requirement is determined, the flow simulation module is recalled and the daily computations for flow and water quality are solved again for the final results.

SUMMARY

The HEC-5Q model is capable of simulating the effects of the operation of as many as ten reservoirs and the stream network of the basin. Each reservoir may be operated to satisfy a number of objectives, including flood control, low flow, hydropower production, water supply and water quality control. The water quality portion of the model will simulate temperature and eight water quality constituents including dissolved oxygen and phytoplankton. The model will internally determine the water quality needed from all reservoir releases to meet specified downstream water quality objectives and will determine the gate openings in each reservoir that will yield the appropriate reservoir release water quality. Should it be necessary, flows will be altered to ensure that downstream water quality objectives are met. The model selects the best solution for system-wide reservoir operation on a daily basis.

1. Baca, R.G., A.F. Gasperino, A. Branstetter and M.S. Annette, 1977, "Water Quality Models for Municipal Water Supply Reservoirs," a report prepared for the Engineering and Water Supply Department, Adelaide, South Australia.
2. Bohan, J.P. and J.L. Grace, Jr., 1973, "Selective Withdrawal from Man-made Lakes; Hydraulic Laboratory Investigation," Technical Report H-73-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
3. Debler, W.R., 1959, "Stratified Flow into a Line Sink," ASCE Journal of Engineering Mechanics Division, Vol. 85, EM3.
4. Hydrologic Engineering Center, 1972, "Reservoir Temperature Stratification", Computer Program Description, Davis, CA.
5. Hydrologic Engineering Center, 1978, "Water Quality for River-Reservoir Systems," Draft Computer Program Description, Davis, CA.
6. Hydrologic Engineering Center, 1982, "HEC-5Q, Simulation of Flood Control and Conservation Systems (Including Water Quality Analysis)," Draft Computer Program Users Manual, (Errata published October 1983), Davis, CA.
7. Loftis, B., 1980, "WESTEX - A Reservoir Heat Budget Model," Draft Computer Program Description, U.S. Waterways Experiment Station, Vicksburg, MS.
8. U.S. Army Corps of Engineers, Baltimore District, 1977, "Thermal Simulation of Lakes," Computer Program Description, Baltimore, MD.
9. Water Resources Engineers, 1968, "Prediction of Thermal Energy Distribution in Streams and Reservoirs," Report to Department of Fish and Game, State of California, Walnut Creek, CA.
10. Water Resources Engineers, 1969a, "Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments," report to the Environmental Protection Agency, Walnut Creek.
11. Water Resources Engineers, 1969b "The Thermal Simulation of Applegate Reservoir to Evaluate the Effect of Outlet Placement and Discharge on Downstream Temperature," Report to U.S. Army Corps of Engineers, Portland District, Walnut Creek, CA.

ELECTRONIC COMPUTER PROGRAM ABSTRACT

TITLE OF PROGRAM HEC-5Q Simulation of Flood Control and Conservation Systems (Including Water Quality Analysis)		PROGRAM NO.
PREPARING AGENCY U.S. Army Corps of Engineers, The Hydrologic Engineering Center, 609 Second Street, Davis, California 95616		
AUTHOR(S) Bill Eichert, HEC (water quantity portion). Don Smith and Jim Duke (water quality portion) Consulting Engr.	DATE PROGRAM COMPLETED	STATUS OF PROGRAM
	December 1983	PHASE FINAL

A. PURPOSE OF PROGRAM

This program simulates the sequential operation of a ten reservoir system for flood control and conservation purposes including water quality. The flows to be released are determined by the program to meet at site and downstream control point requirements for quantity and quality.

B. PROGRAM SPECIFICATIONS

The program is written in FORTRAN IV. Ten reservoirs, 30 control points and any length of study period can be evaluated on a daily or monthly interval. This is a one-dimensional model; it calculates vertical stratification in the reservoir and longitudinal variations along the stream channel. The reservoir is dimensioned for 50 isoquality horizontal layers and the stream for 300 isoquality computational elements.

C. METHODS (See HEC-5 abstract for water quantity portion of model.)

Reservoir inflow rate and quality is routed through each reservoir and the minimum allowable discharge for all downstream needs is computed. The discharge and all intervening local inflow are routed to all control points downstream of the reservoirs. The thermal simulation of the reservoirs and river system uses the equilibrium temperature approach. Violations of control point water quality requirements are minimized by mixing reservoir discharges from the different vertical levels allowed at the intake structure.

D. EQUIPMENT DETAILS

The program was developed on a Harris 500 with virtual memory. Computers without virtual memory will probably require modifications.

E. INPUT - OUTPUT

Card input and printer output are used. Scratch units are used to transfer the discharge flow rates to the water quality subroutines.

F. ADDITIONAL REMARKS This program is a direct expansion, in subroutine form, of the HEC-5A computer program. The model can calculate up to 9 water quality parameters, one of which must be water temperature. Other parameters include 3 conservatives, 3 non-conservatives, dissolved oxygen and a phytoplankton option. An option exists to provide a flow alteration (different than the HEC-5 distribution) to better meet water quality at all control points. Both linear and non-linear programming routines are used.

A7-472

Appendix 8

METHODS FOR PHYTOPLANKTON
IDENTIFICATION AND
ENUMERATION
EL CAJON PROJECT

Prepared by Patricia A. Arneson
January 1981

Ecological Research Associates
2094 Alta Loma
Davis, California 95616

FOREWORD

The following discussion of phytoplankton identification and enumeration methods is arranged in a logical progression beginning with collection of the phytoplankton sample and ending with the final calculation of number of cells per unit volume for any particular species. The basic procedure I have described is only one of many possible variations. There are almost always some improvements and alterations to be made before finding the method best suited to the lake being studied.

Section I. Collection of Phytoplankton Samples

Amount of Water Needed

It is difficult at first to determine how much water to collect until a representative sample has been settled and viewed under a microscope. It may be necessary to collect only 10 ml from a very productive lake while an oligotrophic lake may contain so few algal cells that 100 or more milliliters are needed.

For a moderately to very productive lake, start by collecting at least 100 ml of lake water in 100-125 ml glass screw cap jars. Since 50 or fewer milliliters will be needed for the actual settling and counting, the remaining water is always available in case a settling chamber leaks. Plastic bottles or vials may also be used but they have a greater tendency to leak and they become stained by the iodine mixture (Lugol's solution) used to preserve the algae. The stained plastic makes it difficult to see 1) how much water is in the container, 2) whether there has been any leakage, and 3) whether the Lugol's has faded over time. It is also not known how much Lugol's is lost from the water sample during the staining of the plastic container.

Labelling and Preservation of Samples

To avoid mixups, labels (written in permanent ink) should be placed on the glass jars rather than on the caps. The samples should be preserved as soon after collection as possible. Lugol's solution (100 gm potassium iodide + 50 gm iodine (resublimed) per liter of distilled water) is probably the most commonly used preservative. Acidic Lugol's solution (100 gm KI + 50 gm I₂ + 100 ml glacial acetic acid per liter distilled water) is also frequently used. However, calcareous flagellates may be

destroyed. Buffered formalin or gluteraldehyde solutions can be used as preservatives. However, they do not stain the cells which makes identification of many species difficult. In addition, formaldehyde may damage naked flagellates.

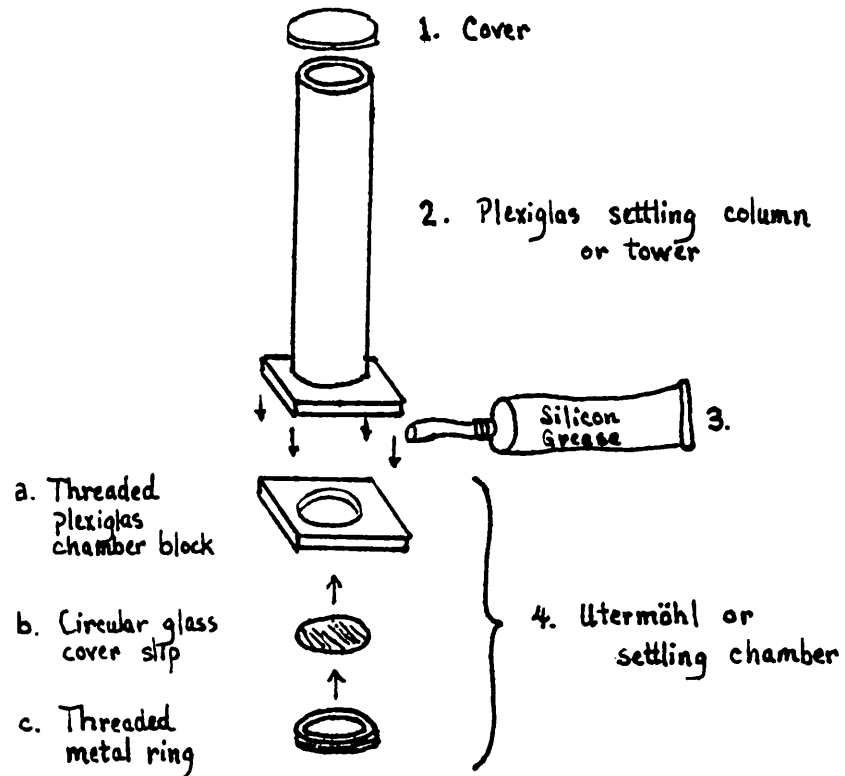
Approximately 2 ml Lugol's solution should be added for every 100 ml of lake water collected. The color should resemble that of dark tea. Variable amounts of Lugols will introduce an error into your final calculations of cell concentrations. Therefore, it is important to be consistent in the amount of Lugols added to each sample, particularly if only a small volume of water (e.g., 10-30 mls) is to be settled. Similarly, it is advisable to collect the same amount of lake water in each jar.

Storage of Samples

The best place to store jars of preserved phytoplankton is in a dark refrigerator kept at approximately 5°C. Once the jars have been cooled in the refrigerator, check each jar to make sure the caps are still screwed on tightly. When a jar is cooled, contraction of the glass tends to loosen the cap making evaporation of the sample possible. Always store the jars upright. If a refrigerator is not available, keep the jars in a cool dark place (preferably upright in cardboard boxes). In hot and/or dry environments a pan of water placed with the samples will increase the humidity and may help slow the rate of sample evaporation.

Section II. Preparation of Settling Apparatus

The settling or "sedimentation" apparatus consists of the following parts:



1. The cover is simply a glass or plastic disc that is set on top of the settling column to 1) keep out dust particles, 2) slow the rate of evaporation, and 3) hopefully create a vacuum or suction seal that helps prevent leakage through the silicon grease seal between column and chamber.
2. The settling column or tower is a plexiglas tube open at both ends. The water sample is poured into this tube after it is affixed to the Utermöhl or settling chamber w/silicon grease.
3. Silicon (stopcock) grease is a viscous lubricant used to affix the settling column to the settling chamber. It should be applied to the bottom surface of the column and to the top surface of the chamber.

Problems associated with too little silicon grease:

- a. If too little grease is applied, it will usually be apparent to the observer. The thin layer of grease will look patchy and uneven usually resulting in one or more leaks. Solution: carefully slide or pry the column off of the chamber and apply more grease.

Problems associated with too much silicon grease:

- a. Air bubbles trapped in a thick layer of grease may be forced outward by the hydrostatic pressure of the water column. The moving bubbles form small channels allowing leakage of the water sample.
- b. In hot environments, a thick layer of grease becomes more fluid. If the base of the column is completely level the column will begin to slide off the chamber on the softened layer of grease.

Solution for a. and b.: If necessary, first reposition the column atop the chamber. Then, keeping the chamber stationary, rotate the column 90° to 360° using a slight downward pressure to force some of the excess grease outward where it may be wiped off and discarded. This rotation also aids in respreading the grease and resealing any channels formed by bubble movement.

NOTE: If too much grease is applied, the excess will also ooze inward obscuring a portion of the algal cells which settled near the perimeter of the chamber.

4. The Utermöhl or settling chamber is assembled by placing the circular glass cover-slip (b) into the threaded metal ring (c) and carefully

screwing the ring into the threads of the plexiglas chamber block (a).

NOTE: A leak may sometimes occur between the glass coverslip and metal ring. There are several reasons for such a leak:

- the coverslips are very fragile and an edge may crack while the metal ring is being screwed into the chamber block. It may also crack if the entire chamber is accidentally dropped. If any cracking occurs the glass coverslip must be replaced. Remember, the metal ring must be screwed in snugly but if screwed in too tightly it may fracture the glass coverslip.
- because of slight unevenness in the glass or plexiglas or corrosion of the metal ring, there may be an inadequate seal between glass coverslip and chamber block (the seal may be improved by applying a thin layer of silicon grease between the chamber block and the outer edge of the glass coverslip; it's a good idea to do this routinely even if there are no leakage problems) or between glass coverslip and metal ring (apply a thin layer of clear nail polish where the leak appears).

Testing for Leaks

After assembling the settling apparatus described above, test for leakage by filling the column with distilled water. NOTE: Leaks do not always occur immediately (see Problems associated with too much silicon grease). It is usually best to test the apparatus for several hours or overnight before emptying and refilling it with an actual sample.

Remember to cover the column during this test period.

Settling a Phytoplakton Sample

If the phytoplankton sample was stored in a refrigerator or in an

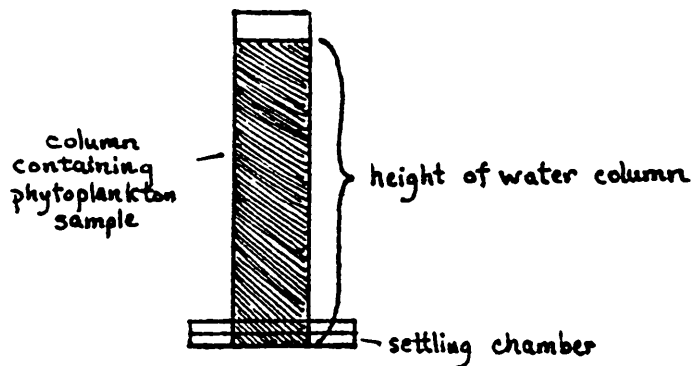
unusually cool place, first allow it to equilibrate to room temperature. Otherwise, thermal convection currents may occur within the column of water causing cells to settle in a non-random manner.

Place the assembled columns and chambers (now emptied of distilled H₂O) on a level surface preferably in a dark cupboard free of vibration, air currents or large temperature fluctuations. Next, gently shake the sample by rocking the jar back and forth for 15 seconds to make sure it is completely homogenous. Pour the desired volume in to a graduated cylinder and dispense this water into the settling column.

NOTE: The act of dispensing the sample into the column may in itself set up undesirable currents. Although temporary, these currents may result in non-random settling of the larger ("quickest to settle") algal cells. There is an apparatus available (a tube with several dispensing holes at one end) to help eliminate this problem.

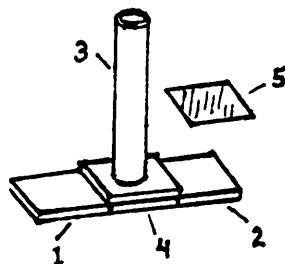
NOTE: It is best to use settling columns which hold the exact or nearly exact volume that is to be settled. In order to create a vacuum or "suction" seal, the column must be filled to capacity so that when the cover is placed on top there are no air bubbles and a suction is created. This suction seal is very helpful for preventing leakage. If the column capacity is much greater than the desired settling volume, try to at least make the seal between cover and column airtight by applying some silicon lubricant to the rim of the column. Such a seal will also retard the rate of water sample evaporation. A pan of water placed near the settling chambers will also help reduce evaporative loss.

For reasons explained in Section V, it is important to make an accurate measurement (to the nearest quarter of a millimeter, if possible) of the exact height of each water column. This value will later be used to convert cell counts to number of cells species A per unit volume. If possible, make this measurement beforehand using an equivalent volume of distilled H_2O .



Instructions have just been given for assembling and filling the settling apparatus. Before proceeding to Section III (Determination of Settling Volume and Settling Period Length), you must also know how to disassemble the apparatus in preparation for microscopic viewing of the chamber containing settled cells. It is a simple procedure but a certain amount of skill is required to prevent accidental leakage. To disassemble the apparatus:

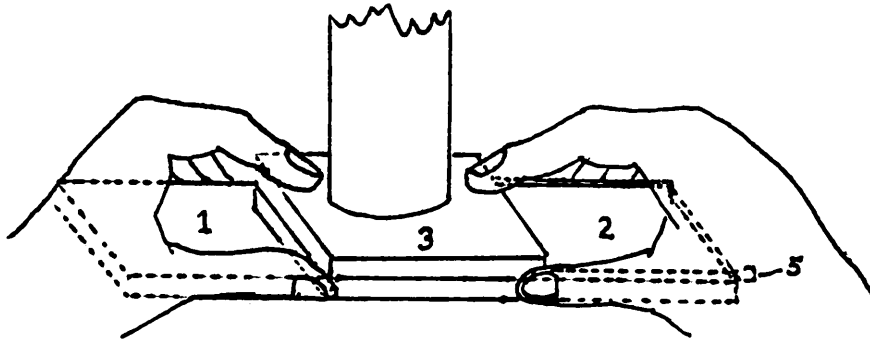
1. Place a plexiglas "block" ① and ② on each side of the settling column ③ and chamber ④.



Each block ① and ② must be the same height as the settling chamber ④

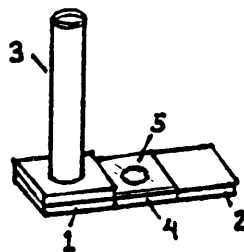
2. Place a square glass plate ⑤ on top of the right-hand block ② (left-handed people may prefer to do the reverse).

3. Using the fingertips and thumb of your left hand, keep a steady even pressure on the left block ① and base of the settling column ③.



With the fingertips and thumb of your right hand keep a steady even pressure on the right block ② and glass plate ⑤ and base of the settling column ③.

4. Using your index fingers slide the settling column ③ and glass plate ⑤ (as a unit) to the left until the column rests entirely on the adjoining block ①. During this process even a slight gap between the base of the column ③ and the glass plate ⑤ will result in a spurting leak. Always slide the two together as if their adjoining edges were glued together. At this point the glass plate ⑤ will cover the settling chamber ④ making it ready for viewing under an inverted microscope.



NOTE: Do not release any downward pressure from the settling column until it is emptied. The grease remaining between column and block is often insufficient to prevent profuse leakage.

5. Always keep the settling chamber level.

Section III. Determination of Settling Volume and Settling Period Length

Settling Volume

The amount of lake water that should be settled is usually determined by first making an "educated guess." That volume is then settled and the chamber viewed under a microscope in order to determine whether the resulting cell density is too great, too little, or just about right. A chamber overly crowded with algal cells is truly a phytoplankton enumerator's "nightmare." One that contains too few algal cells is extremely time consuming and tedious to count and may result in statistically unsound calculations of cell concentrations. If there are pronounced cell density fluctuations in the lake being studied, the settling volume will have to be adjusted accordingly.

Settling Period Length

Once you have found a desirable settling volume you must also determine the length of time needed to allow most algal cells, independent of size or form, to settle properly onto the chamber bottom. This can (and probably should) be done in more than one way.

Method 1:

The purpose of this method is to place a series of settling chambers beneath one settling column of lake water at certain time intervals to see how long it takes for the majority (e.g., 90 - 95%) of suspended algal cells to settle. First, settle a phytoplankton sample for a specified initial period of time based on the height of the water column:

<u>Trophic Level</u>	<u>Cell Density</u>	<u>Water Column Height</u>	<u>Recommended Length of Settling Period (days)</u>	
			<u>Initial</u>	<u>Total</u>
oligotrophic	low	~ 20 cm	5	10 - 14
mesotrophic	moderate	~ 10 cm	2 - 3	3 - 7
eutrophic	high	~ 2 cm	1	2 - 3

Upon termination of this initial period, carefully insert a new settling

chamber under the column of water, replacing the previous one. The new chamber should be pre-filled with distilled water so it will disturb as little as possible the column of suspended algae (insertion of an empty chamber will result in a large air bubble rising upward through the water column).

After waiting another period of time (e.g., one to several days), insert another chamber to replace the second. This may be repeated as often as necessary until a near zero cell density is reached. Finally, enumerate all chambers (see Section V. Cell Enumeration) to see what percentage of the total number of cells settles out during each interval.

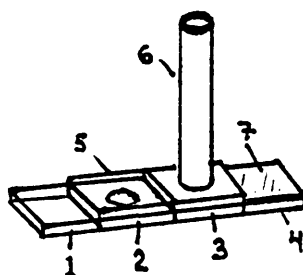
For example:

			<u>% of Total</u>			
first	5	days	85%	] 95%	] 100%	
second	5	days	10%			
third	5	days	5%	]		
fourth	5	days	0%			

In the example given above, ten to fifteen days of settling are required.

Inserting new chambers under a column can be tricky. Prepare a new chamber by applying a thicker than normal layer of grease to the upper surface. Then fill it with distilled water. Using the disassembling procedure outlined in Section II, make the following changes:

- Place the new chamber ② between the left block ① and the settling apparatus (column ⑥ + chamber ③).
- Place another block ⑤ on top of the new chamber ②.
- Slide the block ⑤, column ⑥, and glass plate ⑦ one position to the left. They must be moved as one unit or loss of water will occur.



Method 2:

In this method, a large (e.g., 500 to 1000 mls) phytoplankton sample is preserved, mixed thoroughly, then transferred by graduated cylinder to several identical settling units. Duplicate (or triplicate) columns are allowed to settle for different periods of time. For example:

<u>Settling Unit</u>	<u>Settling Period Length</u>
A	
B	1 day
C	
D	2 days
E	
F	3 days
G	
H	4 days

After carefully enumerating the cells in each chamber you can determine at what point an additional day of settling results in no further increase in the number of cells settled out.

The above settling rate experiments should be repeated periodically-- particularly if you notice an increase in the abundance of smaller, delicate forms of phytoplankton. These "micro-algae" often take considerably longer to settle out.

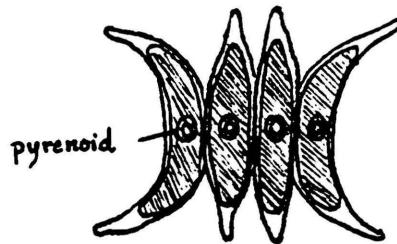
Section IV. Species Identification

Record Keeping

Before attempting to enumerate a chamber of settle phytoplankton it is a good idea to spend an hour or two scanning a chamber under both low and high magnification. Using your detective instincts, try to single out as many different species as you can. Some may appear very similar at first but later on you'll discover that they are actually different species. The most critical aspect of identifying and enumerating phytoplankton is to keep a detailed notebook. Allow one-half to one page for each species you find. It is very helpful to record the following information:

1. Draw a picture of the species. Try to include the general outline of the organism and any other distinguishing features (e.g., chloroplast structure, pyrenoids, spines, ridges, etc.);

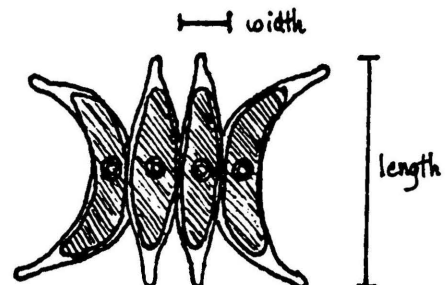
Example:



G. W. Prescott's How To Know the Freshwater Algae contains a glossary which describes distinguishing features of phytoplankton and defines unfamiliar terminology.

2. Several (~20 to 30) representative measurements of cell size. Example:

<u>Length</u>	<u>Width</u>
20 μ m	4 μ m
22 μ m	3.5 μ m
24 μ m	5 μ m
17 μ m	4 μ m



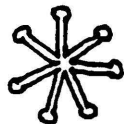
3. You may also want to note down the particular sample(s) in which the species was (were) found.

Example:



				<u>length</u>	<u>width</u>
Blue Lake	3 m	5·IV·80		10 μ	7 μ
"	10 m	6·V·80		12 μ	8.5 μ

4. Using the information recorded in 1.-3. you will want to identify the organism using one or more keys to the genera of phytoplankton. Prescott's How To Know the Freshwater Algae is a good one to begin with. Keying out phytoplankton specimens often requires a lot of patience and perseverance. Often you will give up trying to identify a specimen and later accidentally stumble on the correct identification while looking for something else in the key. For the purpose of enumerating the cells in your chambers, assign a letter, number, or "nickname" to each unknown species until it can be identified. Always keep a record of the name you have assigned the unknown with the picture you have drawn of it.



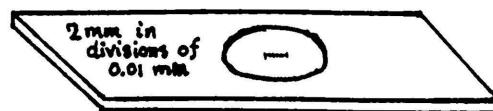
e.g. "Knobbed Star"

Measuring Cell Size

Before you can measure the size of a cell you must calibrate the ocular micrometer--a device inserted into one of the eyepiece tubes on the microscope and used to measure cell dimensions. To calibrate the ocular micrometer place the stage micrometer in the slide holder on the microscope stage.

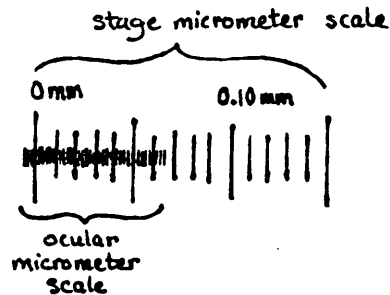


ocular
micrometer



Focus the scale at the magnification you will be counting at (e.g., 45x, 50x, etc.). The scale is usually 2 mm long in divisions of 0.01 mm.

Now remove one of the ordinary oculars and insert the ocular micrometer into the empty eyepiece tube. You should now see the ocular micrometer scale overlapping the stage micrometer scale. By lining up the two scale you can calculate the length of 1 division on the ocular micrometer scales (e.g., 1 div. = 0.60 microns).



Now that your ocular micrometer scale has been calibrated you can measure the lengths and widths of cells.

Calculating Cell Biomass Using Cell Volume or Surface Area

Cell volumes are sometimes used to estimate organic cellular carbon content according to the relationship stated by Mullin et al. (1966):

$$\text{Log}_{10} C = 0.76 \text{Log}_{10} V - 0.29$$

where C = carbon in picograms and V = cell volume in cubic microns. Carbon content of smaller cells (less than $50 \mu^3$) with little vacuolation is estimated to be 20% of cell volume. Strathman(1967) has suggested that cell carbon values for diatoms be estimated on the basis of plasma volume since diatoms, as a rule, have larger vacuoles than other algal taxa of comparable size. Mullin et al. (1966) also based carbon content on surface area measurements in accordance with Paashe's (1960) theory that such a relationship is better correlated with respect to photosynthesis. The revised equation now reads:

$$C = S \cdot 0.18$$

where C = carbon in picograms and S = surface area in μ^2 .

Biovolume and surface area can be estimated for each phytoplankton species on the basis of likeness to a particular geometric shape or combination of shapes. The following shapes are most commonly used:

	<u>Volume</u>	<u>Surface area</u>
 Sphere	$\frac{4}{3} \pi r^3 = \frac{1}{6} \pi d^3$ r : radius	$4 \pi r^2 = \pi d^2 \cdot 12.57 r^2$
 Prolate spheroid (ellipsoid)	$\frac{4}{3} \pi b^2 a$ where, a = semi-major axis b = semi-minor axis	$2 \pi b^2 + 2 \pi a b \frac{\sin^{-1} e}{e}$ e = eccentricity $= \sqrt{a^2 - b^2} / a$
 Oblate spheroid (ellipsoid)	$\frac{4}{3} \pi b a^2$	$2 \pi a^2 + \frac{\pi b^2}{e} \log_e \frac{1+e}{1-e}$
 Prism	$l w d$	$2 (l w + d w + d l)$
 Cone	$\frac{1}{3} \pi r^2 h$	$\pi r^2 + \pi r s$ where $s = \sqrt{r^2 + h^2}$
 Cylinder	$\pi r^2 h$	$2 \pi r^2 + 2 \pi r h$
 Elliptical Cylinder	$\pi a b h$	$2 \pi a b + (\text{circumference of ellipse} \times h)$

Section V. Cell Enumeration

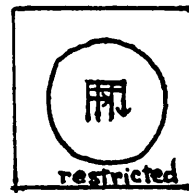
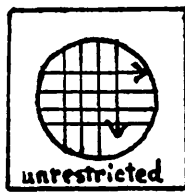
Data Sheets

Refer to the example on page 20.

Methods of Counting

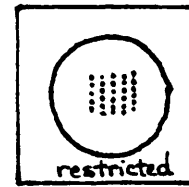
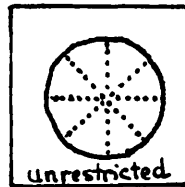
There are several ways to count cells on chamber bottoms.

a. transects (vertical and/or horizontal)



strips are generally more time-consuming and less precise than the use of non-overlapping random fields (see b. below).

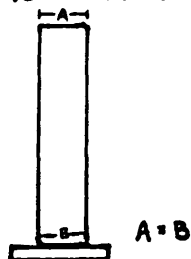
b. discreet fields (vertical, horizontal and/or diagonal)



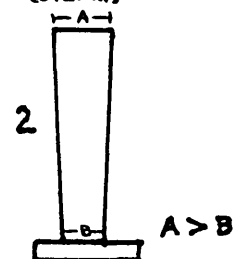
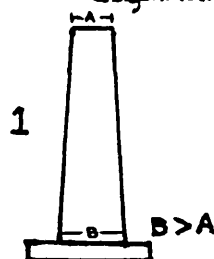
But because settling columns and chambers do not have perfectly symmetrical dimensions nor can they be aligned precisely, it is advisable to count restricted transects or restricted discreet fields. The following diagrams will show why "restricted counting" is used to eliminate column inconsistencies and imperfections as sources of error.

Asymmetrical columns (Note: aberrations have been exaggerated.)

perfect column

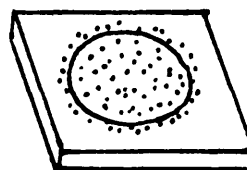


asymmetrical columns



Column 1 is wider at the bottom. Therefore, cells settle over a larger area on the chamber bottom. Some cells may even settle on the rim of the chamber bottom.

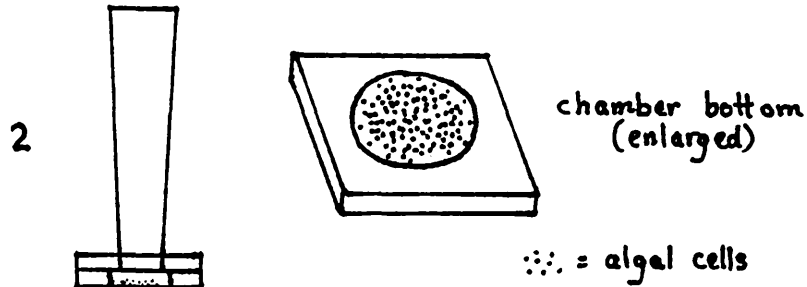
1



chamber bottom
(enlarged)

••• = algal cells

Column 2 is narrower at the bottom. Therefore, cells are more concentrated in the central area of the chamber bottom. A characteristic bare "ring" (visible only under a microscope) around the edge of the chamber bottom is a good indication of this type of column asymmetry.



In view of these types of asymmetry it is wise to avoid counting cells in the outer regions of chamber bottoms.

Converting Cell Counts to Cell Concentrations

It is common practice to equate the % of the chamber bottom counted with % of the total water volume counted.

Example:

$$\text{area of ch. bottom counted} = 1 \text{ cm}^2$$

$$\text{area of entire ch. bottom} = 2 \text{ cm}^2$$

$$\text{volume of sample settled} = 50 \text{ ml}$$

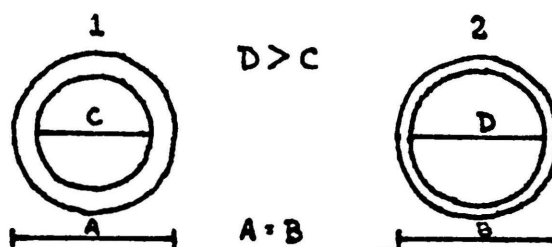
$$\frac{1 \text{ cm}^2}{2 \text{ cm}^2} = .50 = 50\%$$

$$50\% \text{ of } 50 \text{ ml} = 25 \text{ ml}$$

If n cells of Species A were found in 1 cm^2 then the concentration of Species A is n cells per 25 ml.

It is important to note that there are often significant differences in the inner diameters of columns. For the following reasons, these differences introduce error into the method of calculating cell concentration shown above.

Columns may have identical outside diameters but the inner diameters may differ markedly:



As a result, 50 ml of water may fill column ① to a height of 12 cm and column ② to a height of only 10 cm:



Consequently, counting an area of 1 cm^2 in the center of chamber ① will yield a larger number of cells than an area of 1 cm^2 in the center of chamber ②. It should now be clear why the height of the water column should be used in calculations rather than the volume of water settled. Simply multiply the area of the region counted on the chamber bottom by the height of the water column to get the number of milliliters counted.

Example:

area of the region counted = 1 cm^2

height of water column = 10 cm

volume of sample counted = $10 \text{ cm}^3 = 10 \text{ ml}$

If n cells of Species A were found in 1 cm^2 then the concentration of Species A is n cells per 10 ml.

Which Cells to Count

Cells which appear to have been viable (cytoplasm evident and intact) at the time of preservation and cells which consist merely of empty frustules, empty loricas, or remnant cellulosic cell walls should not be lumped together.

"Empty" cells may remain suspended in a lake for a considerable length of time. They should be enumerated separately or ignored.

To be consistent, cells more than half out of the field should not be counted.

How Many Cells to Count

Lund et al. (1958) recommended counting 100 cells to give a 95% confidence interval $\pm 20\% \bar{x}$ or 400 cells for a precision of $\pm 10\% \bar{x}$.

REFERENCES

- Lund, J. W. G., D. Kipling, and E. D. Le Cren. 1958. The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. *Hydrobiologia* 11: 143-170.
- Mullin, M. M., P. R. Sloan, and R. W. Eppley. 1966. Relationship between carbon content, cell volume, and area in phytoplankton. *Limnol. Oceanogr.* 11: 307-311.
- Paasche, E. 1960. On the relationship between primary production and standing stock of phytoplankton. *J. Conseil, Conseil Perm. Internat. Explor. Mer* 26: 33-48.
- Prescott, G. W. 1954. How to Know the Freshwater Algae. Wm. C. Brown Company Publishers.
- Strathman, R. R. 1967. Estimating the organic carbon content of phytoplankton from cell volume or plasma volume. *Limnol. Oceanogr.* 12: 411-418.

Appendix 9:

Water Chemistry Methodology Used in the
Limnology Program.

(The modified 'micro-methods' presented here for $\text{NH}_4\text{-N}$, $\text{NO}_3\text{-N}$, P and Fe analyses require considerably smaller sample volumes than those used at the Santa Cruz laboratory during the Limnology Program. The basic methodology remains the same, however).

NITRATE ANALYSES

Nitrate concentrations are determined by hydrazine reduction of nitrate to nitrite followed by a diazotization-coupling (dye forming) reaction. The absorbance of the red azo dye thus formed is then measured spectrophotometrically. The hydrazine reduction method of nitrate determination outlined by R. Leonard (1978 in C.R. Goldman, Standard Procedures #1) is designed for a 50-ml sample volume. However, when working in a remote laboratory where organic waste removal poses a problem, or when performing specific experiments where a large number of samples of limited volume must be analyzed simultaneously, such a large sample volume is inexpedient or impossible to obtain. Therefore, we have modified the "50-ml method" to accommodate a 10-ml sample volume. The following is a comparison of the procedures and results of the two methods.

A. Reagents

1. Stock hydrazine sulfate

Hydrazine sulfate - 1.20 g

QDW (quartz distilled water) - 250 ml

2. Copper solution

$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ - 0.040 g

QDW - 100 ml

3. Reducing solution

Stock hydrazine - 25 ml

Copper solution - 5 ml

QDW - to 50 ml

4. 1 N NaOH

NaOH - 40 g

QDW - 1000 ml

5. Sulfanilamide

Sulfanilamide - 5 g

Concentrated HCl - 50 ml

QDW to 500 ml

6. Naphthylethylenediamine dihydrochloride (NED)

NED - 0.5 g

QDW - 500 ml

7. Phenate buffer

Phenol - 1.8 g

1 N NaOH - to 100 ml

B. PROCEDURE

1. Measure and GF/C filter 10.0 $\pm$ 0.1 ml of sample into a clean test tube (2.0 cm x 12.5 cm, screwcap). The test tube, as well as all other glassware, must be immaculate since even a small amount of contaminant will affect the results. We found that the most efficient way to filter the sample was to use the exhaust of a millipore pump. Tygen tubing was attached to the exhaust part of the pump and the end was fitted with a No. 7 rubber stopper. A small millipore frit (2.4 cm) fitted with a 15 ml graduated flask was used to hold the filter. The sample is placed in the flask and the rubber stopper assembly is held over the open end forcing the sample through the filter.
2. Place samples in a 37 $\pm$ 0.5°C water bath and allow to equilibrate for at least 45 min. Samples should be placed in alternate compartments of a test tube rack to insure even heating during equilibration. We used strips of parafilm to cover the test tubes.
3. While the samples are still in the water bath add 0.400 $\pm$ 0.004 ml phenate buffer immediately followed by 0.200 $\pm$ 0.002 ml reducing solution. Vortex

samples thoroughly at high speed. We used Oxford adjustable pipettes for all reagent additions.

4. Allow samples to react for exactly 30 min/tub taking into account the order and time of reagent addition.
5. Remove samples from water bath and let cool to room temperature (~40 min.) then add $0.400 \pm$ ml of a 1:1 mixture of sulfanilamide and NED to each test tube. Vortex samples thoroughly at high speed.
6. Allow color to develop for at least 45 min. but not longer than 2 hrs.
7. Read absorbance at 543 nm.
8. Standards are prepared in volumes of 100 ml or greater. 10.0 ± 0.1 mls of each standard are analyzed (in duplicate) as above.

C. **METHOD** (PRECISION OF THE 10-ml NO_3^-)

The following analysis was done on surface water collected from Castle Lake on 13 November 1980. The water was split into two aliquots and enriched with NaNO_3 to yield final concentrations of ~10 ppb-N and ~45 ppb-N, respectively. Nine replicates of each aliquot were then analyzed simultaneously by the previously described method. The results are given below

<u>0m ± ~5 ppb-N</u>		<u>0m ± ~45 ppb-N</u>	
<u>abs</u>	<u>conc (ppb)</u>	<u>abs</u>	<u>conc (ppb)</u>
0.040	11.4	0.104	42.8
0.037	9.9	0.107	44.3
0.037	9.9	0.100	40.9
0.038	10.4	0.106	43.8
0.040	11.4	0.105	43.3
0.039	10.9	0.111	46.3
0.038	10.4	0.108	44.8
0.039	10.9	0.104	42.8
0.039	10.9	0.105	43.3

TOTAL IRON ANALYSES

A Modified Ferrozine Method for Iron Determinations

(After Stookey 1970; modified by George Malyj/John Reuter 1979)

The determinations of iron are complicated by the many varied forms in which iron exists in water samples: colloidal and complexed ferric iron, insoluble iron minerals (sand, clay, etc.), soluble ferrous iron released under anaerobic conditions, soluble and particulate organic iron compounds, and insoluble ferric hydroxide. The procedure described here provides a measure of the iron that is released by a preliminary treatment with hydrochloric acid. This treatment is believed to release iron from each of the previously-mentioned sources that is likely to be available to phytoplankton. The measurement of the true total iron content of the sample would require a much more vigorous acid digestion process involving complete dissolution of all the above sources by HClO_4 and HF .

A. REAGENTS

1. Preparation of Purified Hydroxylamine Hydrochloride Solution:

This may be a lengthy, multi-step process, but careful adherence to the procedure is critical to the success of the method. Even analytical reagent grade $\text{NH}_2\text{OH}\cdot\text{HCl}$ contains appreciable amounts of iron which will cause high blank values.

First dissolve 0.175 ± 0.001 g of bathophenanthroline (4,7-diphenyl-1, 10-phenanthroline) in 250 ml of 95% ethanol. Then add 250 ml triple-distilled water and store in a tightly-stoppered polyethylene bottle that has been thoroughly acid-washed. Next, dissolve 20.0 g of analytical reagent grade $\text{NH}_2\text{OH}\cdot\text{HCl}$ in 200 ml of triple-distilled water in an acid leached separatory funnel (store funnels filled with dilute HCl). Add about 5 ml of the

bathophenanthroline solution, mix well, and wait 10 minutes. Then add 10 ml isopentyl alcohol and shake vigorously for 1 minute to extract as much of the red-orange iron complex as possible. Wait at least 10 minutes before draining. Extract two more times with additional 10 ml aliquots of isopentyl alcohol until the extracts are colorless. Add 5 ml of bathophenanthroline and repeat the extraction steps (4). Allow the 4th extraction mixture to separate overnight before draining the lower aqueous $\text{NH}_2\text{OH}\cdot\text{HCl}$ solution into a clean polyethylene bottle. Store in the refrigerator.

2. Ferrozine Acid Reagent Solution:

Prepare by dissolving 1.028 g of Ferrozine (HACH Chemical Co.) in the solution of hydroxylamine hydrochloride prepared earlier (20 g in 200 ml H_2O). To this, add 150 ml of 12N HCl (37%). After cooling to 20°C , the solution is diluted to 400 ml and left to stand for 24 hours. The precipitate which forms is removed by filtering through an acid-washed GF/C filter.

3. Ammonium Acetate Buffer Solution:

The buffer solution is prepared by dissolving 200 g of ammonium acetate and 175 ml of concentrated ammonium hydroxide in a sufficient amount of triple-distilled water to yield a final volume of 500 ml. Filter through acid-washed GF/C filter.

4. Standard Iron Solution (200 ppm Fe):

Weigh 1.4043 g of analytical reagent grade ferrous ammonium sulfate hexahydrate ($\text{FeSO}_4(\text{NH}_4)_6\text{H}_2\text{O}$). In a clean 1000 ml volumetric flask, dissolve the salt in about 100 ml triple-distilled water and 20 ml 12N reagent grade HCl. Add triple-distilled water to the 1000-ml mark and mix well. Store in a clean, tightly stoppered container.

B. PROCEDURE

(For iron concentrations < 100 ppb, use 20 ml samples and a 4 cm cuvet. Adjust reagent volumes accordingly.)

1. Mix the samples to resuspend solid matter uniformly. With a clean pipet (the tip of the pipet should be shortened approximately 2-3 mm to allow particulate material to pass through and promote rapid draining), measure 10 ml of sample into a test tube.
2. Add 0.4 ml of Ferrozine acid-reagent to each tube. Mix well and cover.
3. Autoclave the samples at 115-120°C for 15 minutes (total heating time is approximately 1 hour including depressurization and cooling cycles).
4. Cool the samples to room temperature. Add 0.6 ml of ammonium acetate buffer solution to each sample and mix well.
5. The absorbance is measured in a 1 cm cell at 562 nm in a spectrophotometer previously balanced against triple-distilled water. Duplicate reagent blanks and 10 ppb, 25 ppb, and 50 ppb Fe standards should be prepared with each batch of samples. (Standards will keep for 3 weeks. Stock iron will keep for about 1/2 year.)

C. CALCULATIONS

1. Prepare a standard curve of uncorrected absorbances versus ppb Fe.
2. Determine the iron concentration in each sample by finding the ppb Fe corresponding to the uncorrected sample absorbances.
3. In our analyses there is much evidence to support the idea that the reagents and not the triple-distilled water are fully responsible for the iron contamination observed in the blank samples. The above data treatment is therefore analogous to the more tedious process of subtracting the blank absorbance from all the standard absorbances, constructing a standard curve of corrected absorbances versus ppb Fe,

subtracting the blank absorbance from all of the sample absorbances, and finding the ppb Fe in each sample by comparing corrected absorbances to the corrected standard curve.

REFERENCE

Stookey, L.L. 1970. Ferrozine - a new spectrophotometric reagent for iron. Anal. Chem. 42:770-781.

SILICON ANALYSES

Dissolved silicon is determined spectrophotometrically by the formation of a yellow molybdosilicate complex according to the procedures described in Standard Methods for the Examination of Water and Wastewater (APHA, 13th edition, page 300, 1971). Interference from orthophosphate and arsenate ions is eliminated by the addition of oxalic acid. Contamination from silica in glassware is minimized by the use of polyethylene sample and reagent containers; polypropylene pipettes, graduated cylinders, and beakers; and freshly-deionized, non-distilled water. The steps suggested for the conversion of "molybdate-unreactive silica" to "molybdate-reactive silica" by a one-hour digestion process with sodium carbonate have been eliminated because no significant difference between these two types of soluble silicon has been found in samples of Lake Tahoe water. It has not been necessary to resort to more sensitive or more involved analytical methods that require the reduction of the heteropoly anion of molybdenum and silicon to the blue form which exhibits strong electronic absorption bands in the region from 650-800 nm. Typical reducing agents required for the latter procedures include solutions of copper (I), mercury (I), iron (II) and tin (II) salts and benzidine.

A. APPARATUS

1. Polypropylene beakers, 100 ml, with covers.
2. Polypropylene graduated cylinders, 100 ml.
3. Graduated polypropylene pipettes: One 1 ml and two 2 ml.
4. Clock or timer.

B. REAGENTS

1. 6 N. Hydrochloric Acid:

Mix 500 ml concentrated HCl with 500 ml of freshly-deionized water. Store in an acid-washed polyethylene bottle.

2. Ammonium Molybdate Solution:

Dissolve 50.0 gm reagent grade $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ in deionized water. Dilute to 500 ml. Adjust pH to 7.8-8.1 with reagent grade pellets of NaOH. Store in a polyethylene bottle.

3. Oxalic Acid Solution:

Dissolve 50.0 gm reagent grade $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ in deionized water and dilute to 500 ml. Store in a polyethylene bottle.

4. Stock Silicon Standard Solution:

A 500 ppm $\text{SiO}_3^{2-}\text{-Si}$ solution is prepared by dissolving 5.0595 g reagent grade sodium meta-silicate ($\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$; formula weight = 284.20) in freshly-deionized water in a 100-ml volumetric flask. Because of the deliquescent nature of this solid compound, this solution must be standardized by gravimetric analysis to determine the silicon content via the weight loss as volatile SiF_4 when aliquots of this concentrated stock solution are treated with HF and heated to a constant weight at 1200°C . Store this stock solution in a polyethylene bottle.

5. Standard Silicon Solution:

For routine use, a more dilute standard solution is prepared. A 5 ppm $\text{SiO}_3^{2-}\text{-Si}$ standard solution is prepared by pipetting 10.0 ml of the stock Si solution into a 1000-ml volumetric flask and diluting to the mark with fresh deionized water. After mixing, the solution is transferred to an acid-washed polyethylene bottle for storage. As needed, less concentrated standard solutions are prepared by dilution of this 5 ppm standard.

C. PROCEDURE

1. All beakers, cylinders, pipettes, etc. should be acid-washed, deionized water-rinsed, and stored in a dust-free environment.
2. Carefully measure a 50.0 ml sample into a plastic beaker using a graduated cylinder.

3. In rapid succession, add 1.0 ml 6NHC1 and 2.0 ml ammonium molybdate solutions using the plastic pipettes.
4. Mix well and allow the solution to stand for 5 minutes while the yellow color develops.
5. Add 1.5 ml oxalic acid solution and mix thoroughly again.
6. Measure the absorbance of the yellow solution at a wavelength of 410 nm 5-10 minutes after the addition of the oxalic acid (the color begins to fade significantly after approximately 15-20 minutes). For concentrations below about 5 ppm $\text{SiO}_3^{2-}\text{-Si}$, 4-cm pathlength cells should be used.
7. If two people are available, it is most convenient for one person to measure samples and develop the color while the second person measures the absorbances at appropriate time intervals.

D. STANDARDS

Prepare a standard curve from a series of 4 or more standards plus a blank covering the range of concentrations expected in the water samples. For example, the following solutions were prepared from a 5 ppm $\text{SiO}_3^{2-}\text{-Si}$ standard solution:

<u>ml of 5 ppm std</u>	<u>ml deionized H₂O added</u>	<u>Final Volume</u>	<u>Final Concentration</u>
50.0	0.0	50.0 ml	5.00 ppm
40.0	10.0	50.0	4.00 ppm
30.0	20.0	50.0	3.00 ppm
20.0	30.0	50.0	2.00 ppm
10.0	40.0	50.0	1.00 ppm
0.0 (blank)	50.0	50.0	0.00 ppm

These 50.0 ml samples were treated according to Steps 1-7 in the procedure. When the absorbances of these solutions were measured in a 4-cm cell at 410 nm, a standard curve such as that shown in the following figure resulted.

E. CALCULATIONS

The absorbances of the standards and blank are plotted against the SiO_3^{2-} -Si concentration and the best straight line is drawn. From this curve, the sample absorbances are read directly and converted to ppm SiO_3^{2-} -Si. At least one sample, selected at random, should be run in triplicate for each series of determinations to provide an estimate of precision.

AMMONIA (LOW LEVEL) ANALYSES

A new modification of the blue indophenol reaction between ammonia, phenol and hypochlorite at high pH was reported by Lucia Solórzano (1969). Although the reaction has been known since 1850 (Berthelot), it could not be applied to the determination of ammonia in natural waters containing high concentrations of Ca^{2+} or Mg^{2+} . In this new procedure, calcium and magnesium interference is eliminated by complexing with sodium citrate. Other advantages of this method are the elimination of distillation or solvent extraction steps, improved sensitivity over the Nesslerization method, speed, stability of blue coloration and absence of reaction with other forms of nitrogen. It is reported that glycine, alanine, lysine, histidine, arginine, tyrosine, glutamic acid, urea and nucleic acids do not interfere. The method is applicable in the range of ammonia concentrations from 0-500 $\mu\text{g/l NH}_3\text{-N}$. The limit of detection is approximately 5 $\mu\text{g/l NH}_3\text{-N}$.

A. REAGENTS (refrigerate):

1. Phenyl-Ethanol Solution

Dissolve 10.0 ± 0.1 g of A.R. grade phenol in 100 ml 95% ethyl alcohol.

Avoid chemical burns from phenol! Refrigerate.

2. Potassium ferrocyanide, 0.5% Solution

Dissolve 0.5 g $\pm$ 0.005 g of A.R. grade potassium ferrocyanide ($\text{K}_4\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$) in 100 ml distilled water. Make fresh daily.

3. Alkaline Citrate Solution

Dissolve 100 ± 1 g A.R. grade trisodium citrate dihydrate and 5.00 ± 0.05 g A.R. grade sodium hydroxide in 500 ml distilled water. Replace monthly.

4. Sodium Hypochlorite Solution

Use A.R. grade sodium hypochlorite solution (Mallinckrodt No. 7216). Commercial bleach such as Chlorox may be used if it is fresh. Store this

reagent in a dark bottle in the refrigerator.

5. Oxidizing Solution

Mix 100 ml of sodium citrate-sodium hydroxide solution with 25 ml of Chlorox or sodium hypochlorite solution (or other appropriate volumes in a 4:1 ratio). Prepare this mixture fresh daily.

6. Standard Ammonia Solution (50 mg/l atomic nitrogen)

Weigh out 0.1909 grams NH_4Cl (oven dried at 100°C) and dissolve in quartz distilled water. With QDW dilute to 1000 ml in a volumetric flask. (Alternatively, use 0.2850 g/L NH_4NO_3 which can be used as a standard for ammonia and nitrate analyses, ± 50 ppm $\text{NH}_4\text{-N}$ and 50 ppm $\text{NO}_3\text{-N}$).

B. **PROCEDURE**

1. Measure 10.0 ± 0.1 ml of sample into a clean test tube (2.0 cm x 12.5 cm, screwcap). (Filter if necessary to remove turbidity.)
2. Add 0.4 ± 0.004 ml of the phenol-ethanol solution. Vortex.
3. Add 0.4 ± 0.004 ml of the potassium Ferrocyanide solution. Vortex.
4. Add 1.0 ± 0.01 ml of the oxidizing solution. Vortex and allow the blue color to develop for 45 min. under UV light.
5. Measure absorbance (640 nm) in a 4 cm cell.
6. Prepare a series of standards from the stock NH_4Cl solution. Select at least 3 different concentrations spanning the expected range of values for the samples plus a blank. Treat these standard solutions as in steps 1-5. Prepare standard curves and read the sample concentration from uncorrected absorbances.

REFERENCE

Solórzano, L. 1969. Determination of ammonia in natural waters by the phenol-hypochlorite method. *Limnology and Oceanography* 14:799-801.

PHOSPHORUS ANALYSES

INTRODUCTION

Depending upon the type of preliminary treatment, different types of phosphorus may be determined:

1. Total phosphorus by acid hydrolysis of unfiltered samples,
2. Soluble reactive phosphorus by analysis of filtered (or decanted for stream water) sample without acid hydrolysis, and
3. Total soluble phosphorus by analysis of filtered sample with acid hydrolysis.

Acid hydrolysis releases soluble orthophosphate from insoluble inorganic phosphates, organic phosphorus compounds, and pyrophosphates. The following procedure is used by hydrolysis:

1. Add 0.05 H_2SO_4 (10.8 N) to 10 ml sample.
2. Autoclave at 240°F for 15 minutes.
3. Neutralize with 0.05 ml NaOH (10.8 N) per 10 ml sample after initial cooling upon removal from autoclave.
4. Continue with procedure for analysis.

The following method depends on the reduction of stable phosphomolybdate complex by ascorbic acid in the presence of antimony. An intensely-colored blue sol ("molybdenum blue") is produced whose absorbance at 675 nm varies linearly with the orthophosphate content of the sample. The results of analyses should be reported in terms of ppb elemental phosphorus (i.e., micrograms of elemental phosphorus present as PO_4^{3-} per liter of sample).

REAGENTS

Unless otherwise specified all chemicals should be analytical reagent grade. All reagent bottles and glassware should be thoroughly acid-leached with a dilute HCl solution prepared from about 10 ml concentrated HCl in 1000 ml

distilled water; soap or detergent should never be used to clean glassware used for phosphate analyses. The purest distilled or deionized water available should be used for the preparation of reagents.

1. Acid Molybdate Solution

Cautiously add 244 ml concentrated H_2SO_4 to about 1500 ml distilled water in a 2000 ml volumetric flask. Mix well and allow the solution to cool to room temperature. Weigh out 21.0 ± 0.1 g ammonium molybdate and 0.60 ± 0.1 g antimony potassium tartrate. Dissolve in the sulfuric acid solution and dilute to the 2000 ml mark with distilled water. Mix thoroughly, and store in a glass-stoppered reagent bottle.

2. Ascorbic Acid Solution

Dissolve 3.0 ± 0.1 g ascorbic acid in 100 ml 95% ethanol; store in refrigerator. An alternative is to dissolve the ascorbic acid in 100 ml distilled water. The aqueous solution must be prepared fresh daily.

3. 10.8 N Sulfuric Acid Solution

Add 300 ml of reagent grade concentrated acid (36 N) to about 500 ml distilled water in a 1000 ml volumetric flask. Mix well and allow to cool to room temperature. Dilute to the 1000 ml mark with distilled water.

4. 10.8 N Sodium Hydroxide Solution

In a clean, dry beaker, weigh out 432 ± 1 g reagent grade NaOH. Transfer quantitatively to a 1000 ml volumetric flask containing about 500 ml distilled water. Mix well to dissolve the NaOH; allow to cool to room temperature. Dilute to the 1000 ml mark with distilled water; mix well. Store in a polyethylene bottle as concentrated NaOH solutions often "fuse" glass-stoppered reagent bottles closed.

5. Standard Phosphate Solution (50 mg/l elemental P)

Oven dry analytical reagent grade potassium dihydrogen phosphate to constant weight at $105-110^\circ\text{C}$. Weigh out 0.2197 g of the dry salt.

Dissolve in a 1000 ml volumetric flask with distilled water. Mix the solution thoroughly and store in a glass bottle.

PROCEDURE

1. To 10 ml of sample water in a screwcap test tube add 1.0 ml of the acid molybdate reagent and 0.10 ml ascorbic acid solution. Mix well.
2. Wait 20-30 minutes for the blue color to develop.
3. Measure the absorbances of the samples at 675 nm in a 1 cm pathlength cell.
4. Standards having at least three different phosphate concentrations and spanning the full range of phosphate concentrations in the samples should be prepared for each day's runs. A reagent blank should also be run. Replication of standards and blanks is recommended.
5. Determine sample concentrations using standard curve and corrections for reagent and/or QDW contamination according to current lab conditions. Usually there is no contamination in our QDW so the corrected curve would be used.

REFERENCE

Murphy, J. and J.R. Riley. 1962. A modified single solution method for the determination of phosphate in natural waters. *Analytica Chimica Acta* 27:31-36.

Appendix 10: Depth Profiles of Oxygen, Temperature, Conductivity,
Primary Productivity and Light, L. Yure and
L. de Yojoa.

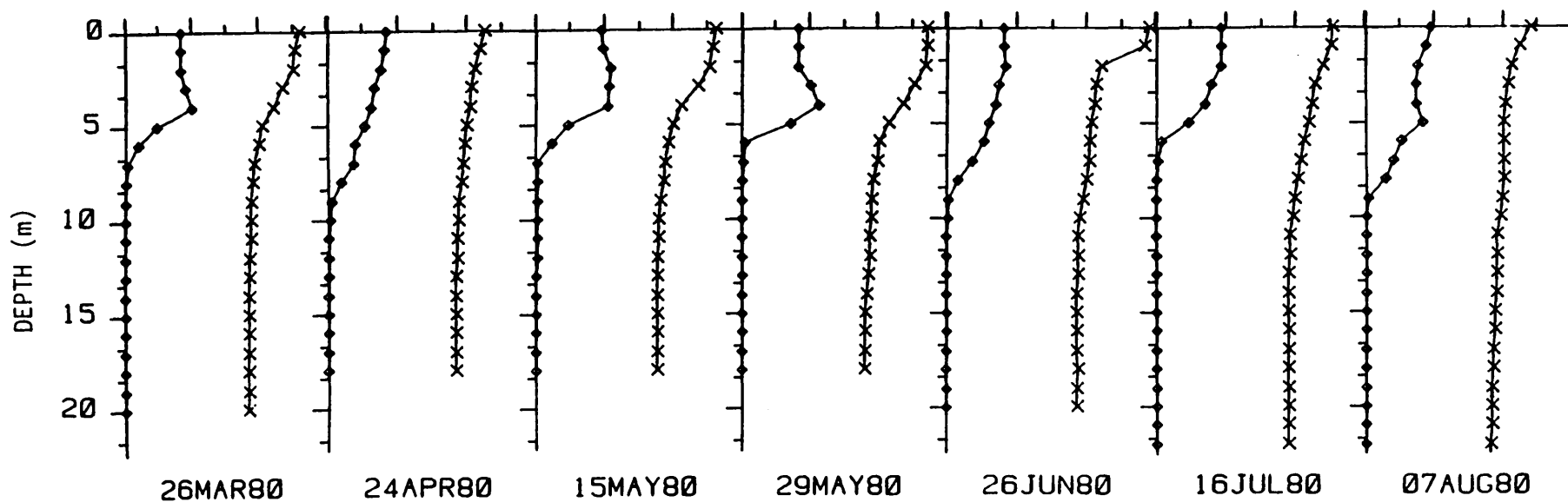


Table A10.1 (cont.)

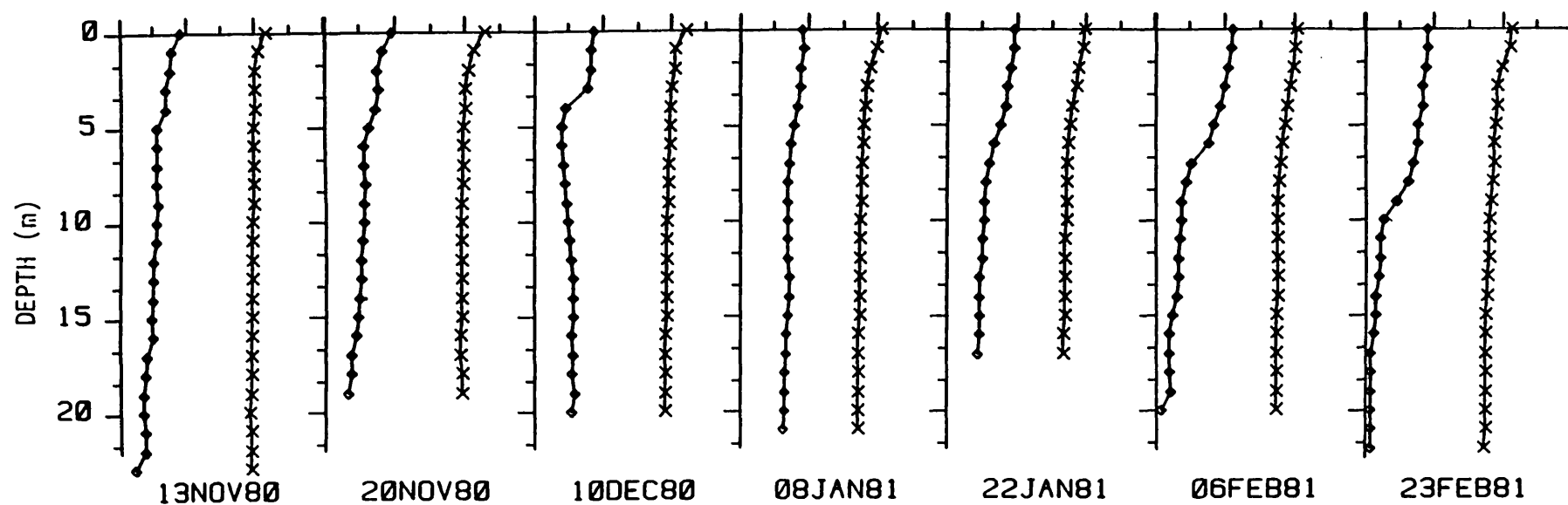
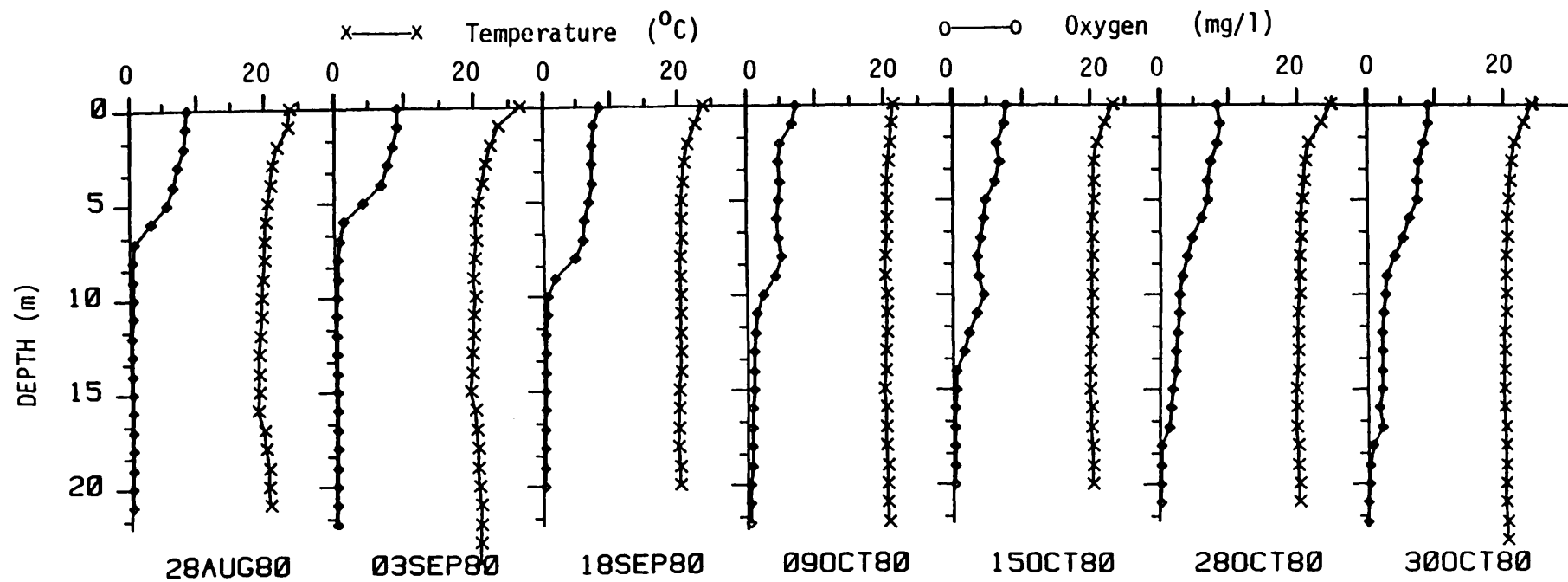


Table A10.1 (cont.)

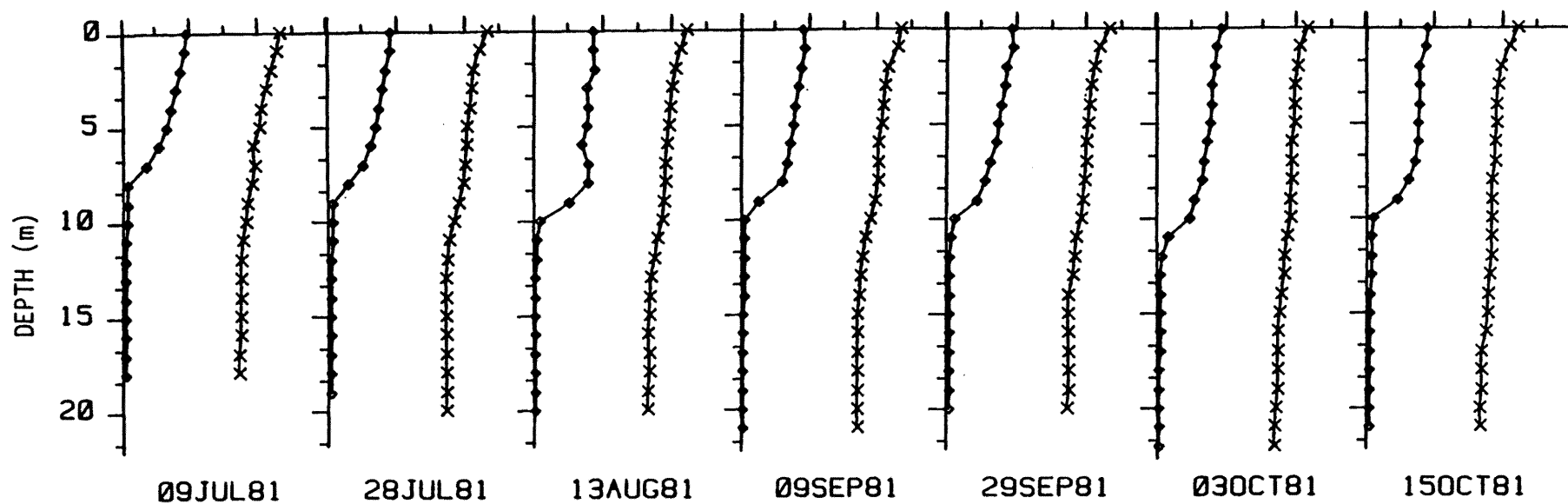
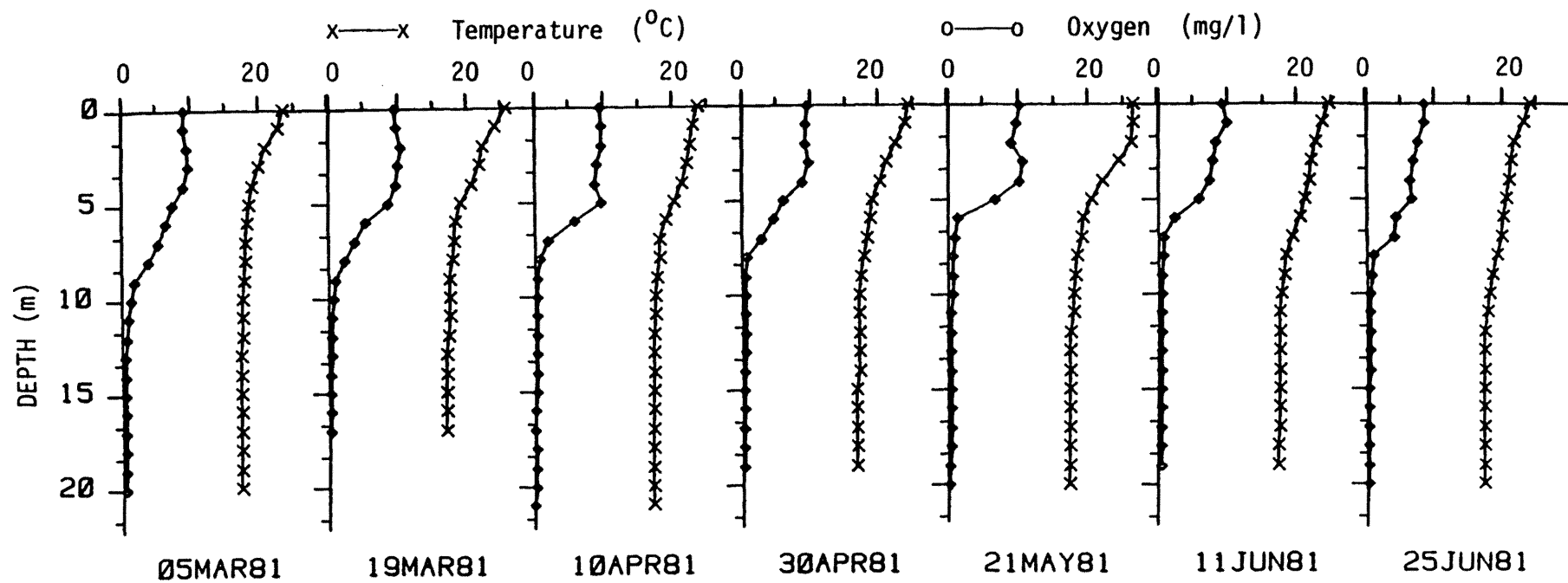


Table A10.1 (cont.)

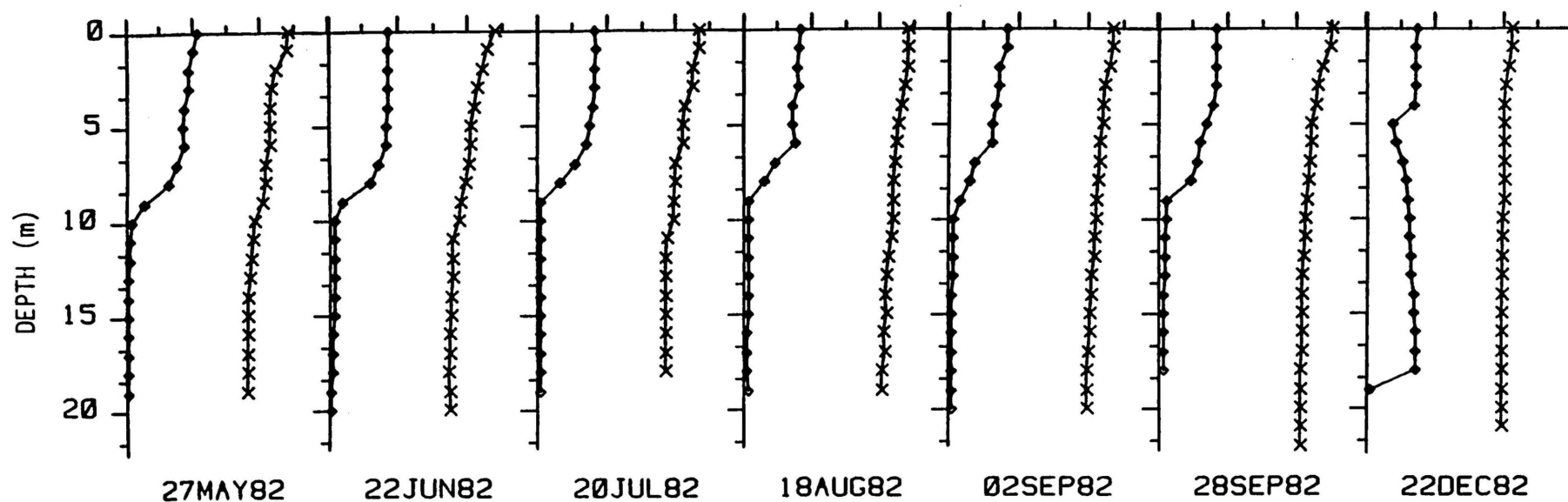
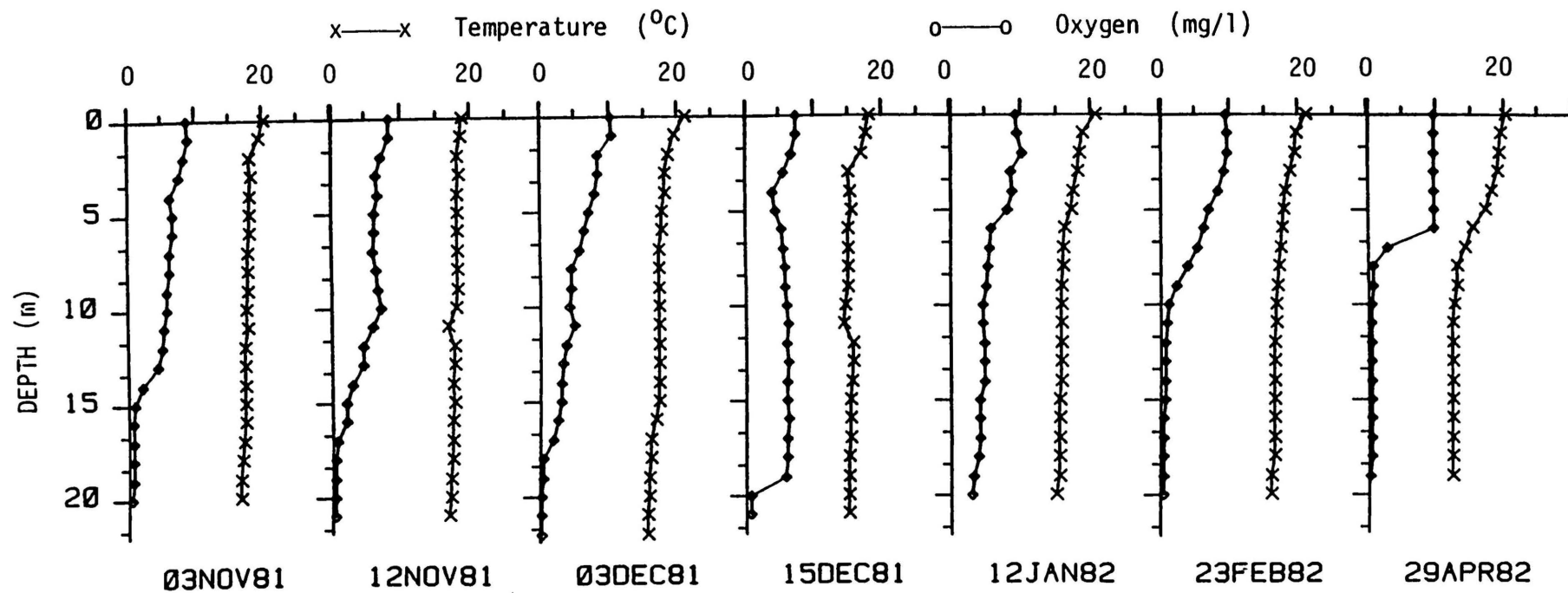


Table A10.2

Temperature and oxygen profiles, L. de Yojoa, 1979-1982.

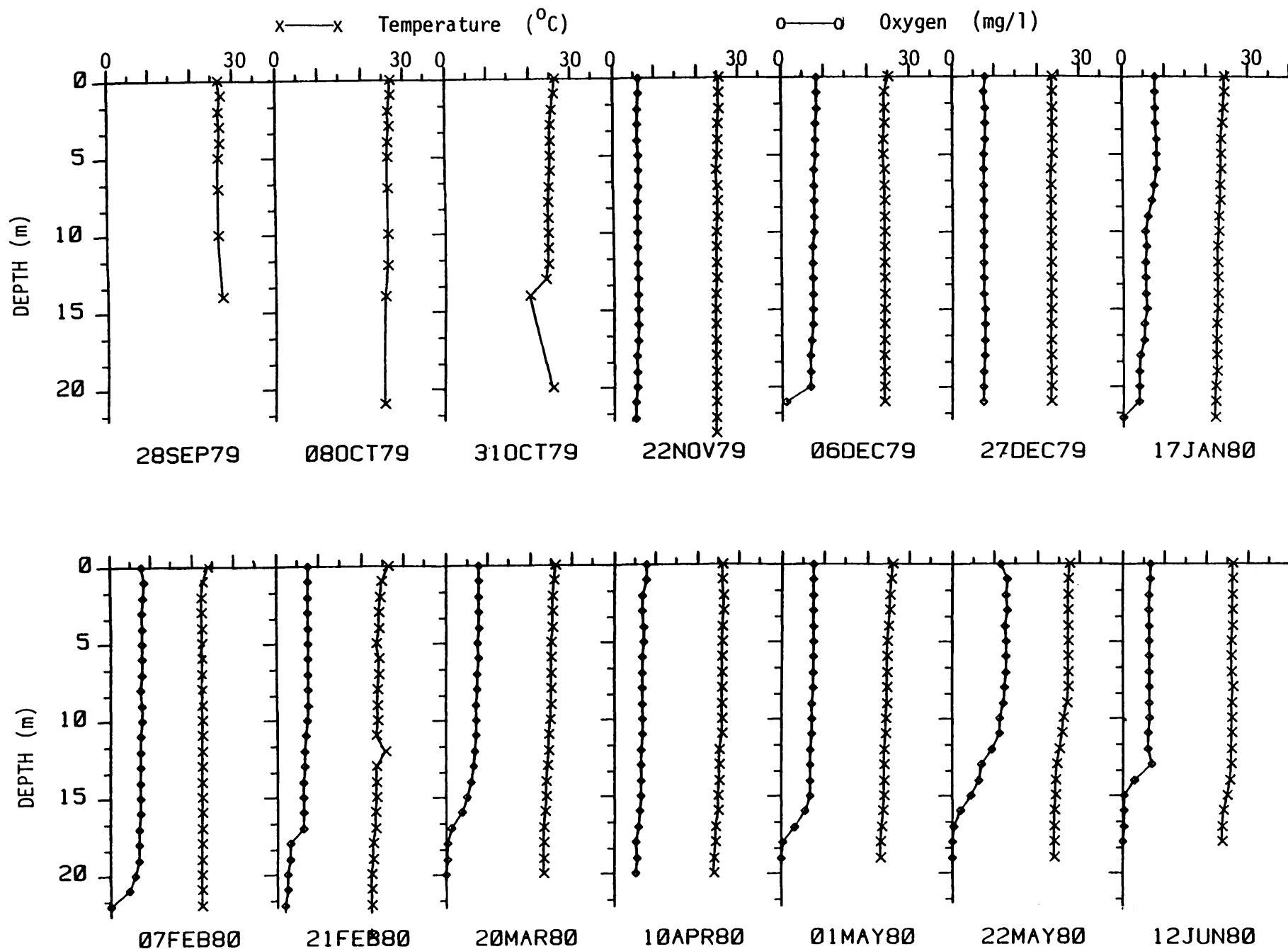


Table A10.2 (cont.)

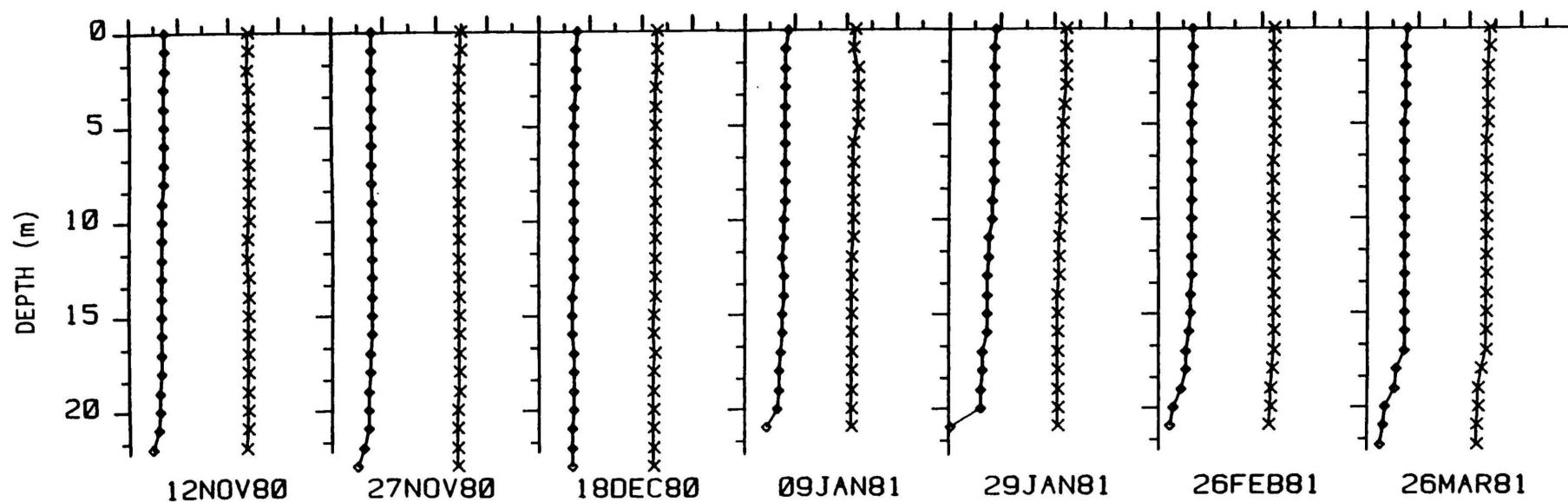
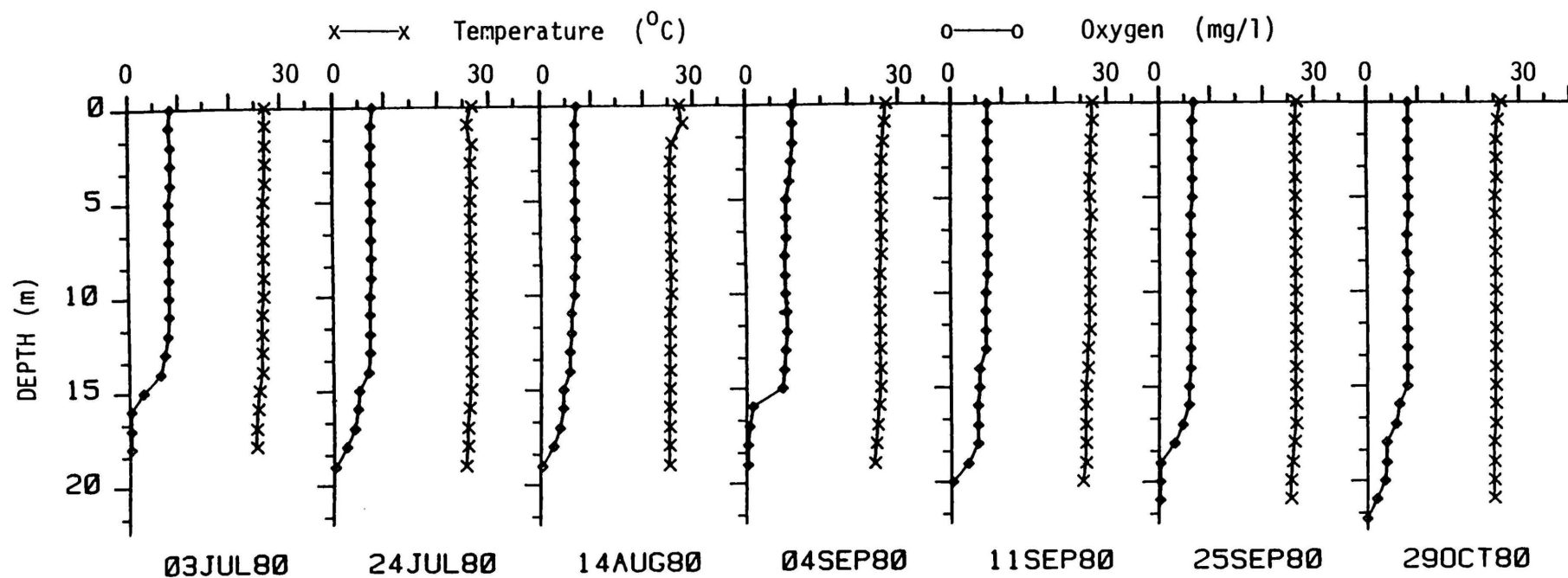


Table A10.2 (cont.)

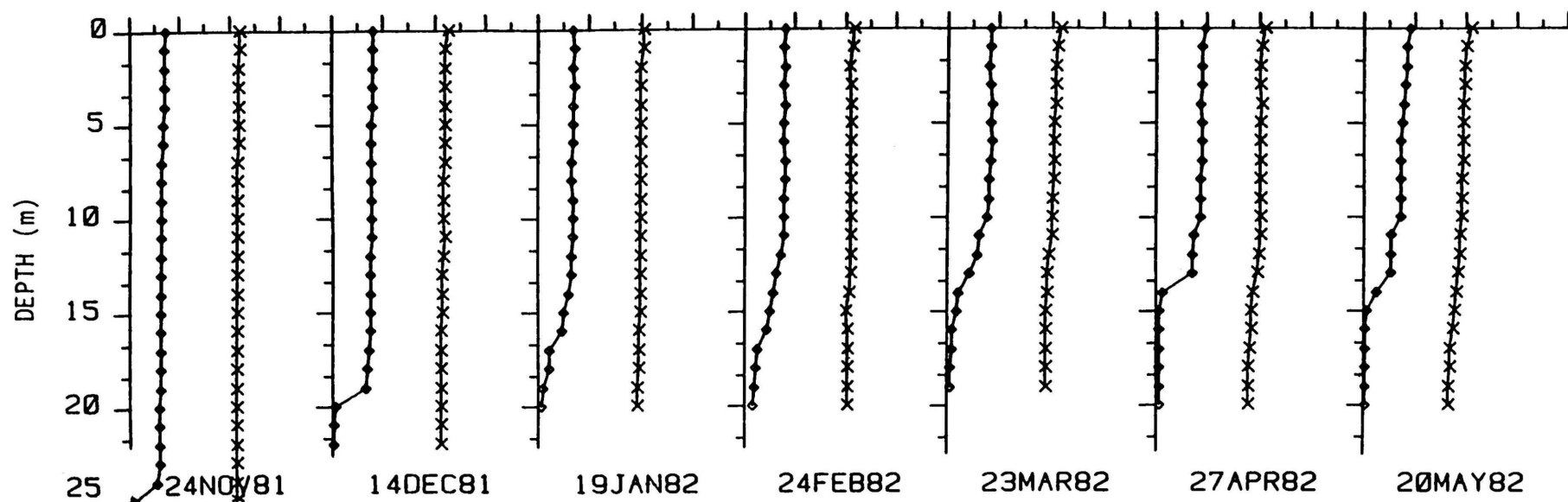
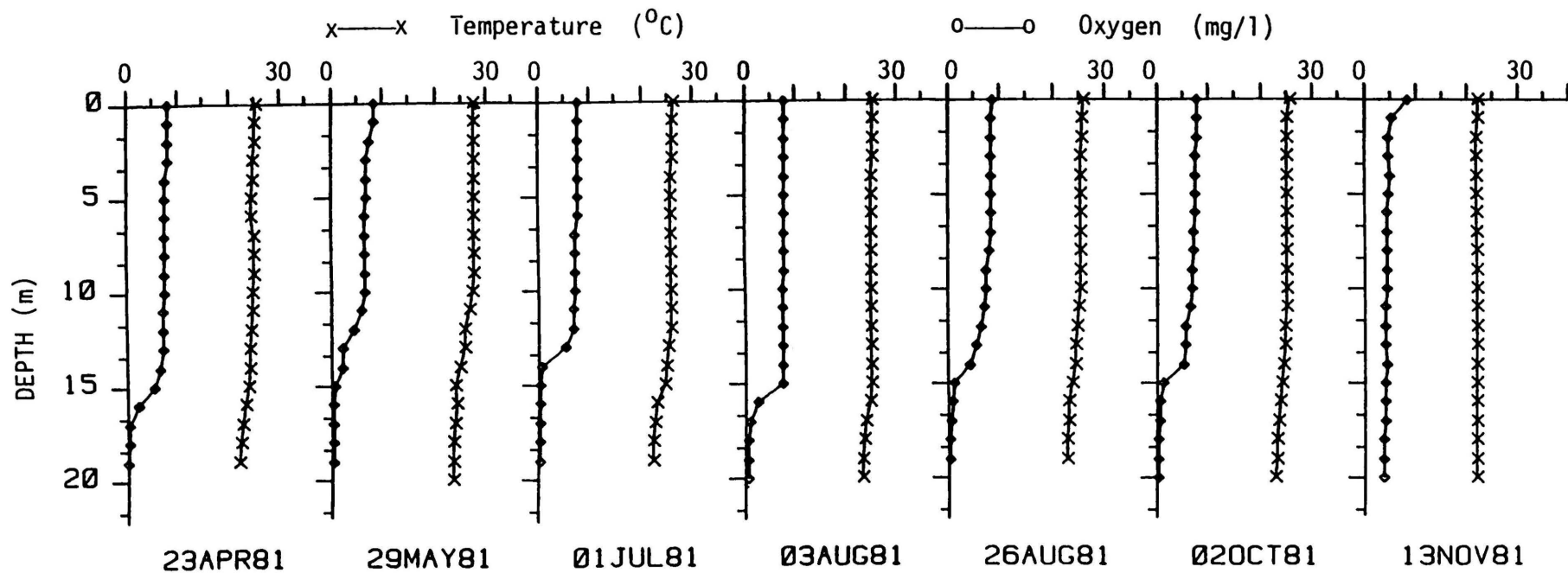
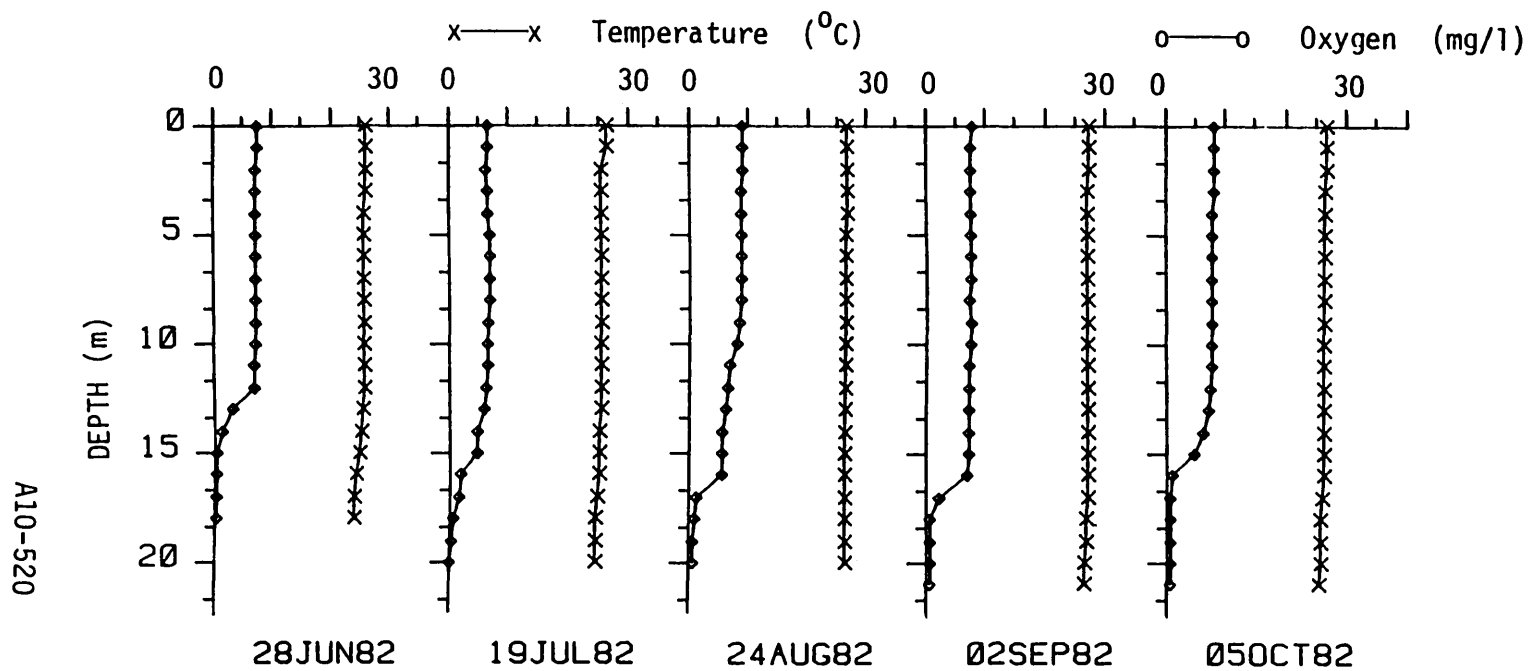


Table A10.2 (cont.)



LAGO YURE

18-OCT-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	26.8	41	-	-
1	-	24.1	49	-	-
2	-	22.1	42	-	-
3	-	21.7	43	-	-

07-NOV-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	22.1	35	-	-
1	-	21.8	36	-	-
2	-	21.8	36	-	-
3	-	21.1	42	-	-
4	-	20.9	43	-	-
5	-	20.9	43	-	-
6	-	20.1	40	-	-
7	-	20.0	45	-	-
8	-	20.0	45	-	-
9	-	20.0	43	-	-
10	-	20.7	45	-	-
11	-	20.4	51	-	-
12	-	20.5	52	-	-
13	-	20.7	62	-	-
14	-	20.1	74	-	-
15	-	20.0	74	-	-

LAGO YURE

29-NOV-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.5	23.3	45	-	-
1	6.6	22.0	44	-	-
2	7.4	21.0	44	-	-
3	3.4	20.5	43	-	-
4	3.1	20.2	44	-	-
5	2.6	20.0	44	-	-
6	2.6	20.0	45	-	-
7	2.6	19.9	46	-	-
8	2.5	19.8	47	-	-
9	2.6	19.7	47	-	-
10	2.6	19.7	48	-	-
11	2.4	19.8	49	-	-
12	2.6	19.7	50	-	-
13	2.8	19.7	50	-	-
14	2.8	19.6	51	-	-
15	2.8	19.5	51	-	-
16	3.0	19.5	52	-	-
17	2.8	19.5	53	-	-
18	2.4	19.3	55	-	-
19	2.6	19.3	56	-	-
20	2.1	19.3	64	-	-
21	0.1	19.3	83	-	-

13-DEC-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	22.5	45	-	-
1	7.9	21.2	45	-	-
2	7.6	20.5	45	-	-
3	7.9	20.2	39	-	-
4	6.6	20.0	39	-	-
5	4.8	19.8	41	-	-
6	4.3	19.7	42	-	-
7	3.6	19.7	43	-	-
8	4.0	19.6	43	-	-
9	3.4	19.5	44	-	-
10	3.1	19.4	46	-	-
11	3.2	19.4	46	-	-
12	2.7	19.3	46	-	-
13	2.9	19.3	46	-	-
14	3.1	19.3	46	-	-
15	3.1	19.2	47	-	-
16	3.1	19.2	48	-	-
17	2.8	19.1	49	-	-
18	2.3	19.0	51	-	-
19	2.1	19.0	52	-	-
20	2.2	19.0	52	-	-
21	2.1	19.0	54	-	-
22	2.0	19.0	55	-	-
23	1.7	19.0	56	-	-
24	0.2	19.0	59	-	-

LAGO YURE

11-JAN-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.1	22.0	42	-	-
1	8.0	21.6	42	-	-
2	8.1	20.2	43	-	-
3	7.9	20.0	39	-	-
4	6.5	19.1	40	-	-
5	5.4	19.0	41	-	-
6	5.1	18.9	46	-	-
7	5.0	18.8	46	-	-
8	5.0	18.7	49	-	-
9	4.8	18.6	48	-	-
10	4.9	18.5	45	-	-
11	4.9	18.5	48	-	-
12	4.9	18.5	48	-	-
13	4.3	18.5	52	-	-
14	3.8	18.5	56	-	-
15	3.3	18.5	57	-	-
16	3.0	18.5	57	-	-
17	2.9	18.5	57	-	-
18	2.7	18.5	57	-	-

30-JAN-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	23.8	43	-	-
1	8.7	23.0	43	-	-
2	8.2	22.0	43	-	-
3	8.7	20.8	43	-	-
4	6.6	19.8	44	-	-
5	4.2	19.1	44	-	-
6	3.3	18.8	44	-	-
7	3.0	18.7	44	-	-
8	2.8	18.5	45	-	-
9	2.6	18.4	45	-	-
10	2.5	18.2	47	-	-
11	2.9	18.2	47	-	-
12	2.8	18.2	47	-	-
13	2.8	18.1	47	-	-
14	2.8	18.2	47	-	-
15	2.7	18.2	48	-	-
16	2.2	18.2	49	-	-
17	2.1	18.2	49	-	-
18	2.0	18.2	49	-	-
19	2.0	18.2	50	-	-
20	1.5	18.2	53	-	-

LAGO YURE

14-FEB-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.9	23.3	42	-	-
1	7.5	22.0	45	-	-
2	8.3	20.9	44	-	-
3	7.8	19.9	43	-	-
4	5.4	19.4	42	-	-
5	3.8	19.0	44	-	-
6	2.6	18.8	44	-	-
7	2.1	18.8	44	-	-
8	2.0	18.6	45	-	-
9	1.9	18.6	45	-	-
10	2.0	18.5	46	-	-
11	2.4	18.5	46	-	-
12	2.4	18.5	47	-	-
13	2.5	18.5	49	-	-
14	2.0	18.3	49	-	-
15	1.6	18.3	50	-	-
16	1.3	18.3	51	-	-
17	1.2	18.3	54	-	-
18	1.2	18.3	55	-	-
19	0.3	18.3	56	-	-
20	0.2	18.3	57	-	-
21	0.1	18.3	58	-	-

28-FEB-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.2	23.2	47	-	-
1	9.2	22.7	49	-	-
2	9.4	22.0	47	-	-
3	8.7	21.3	48	-	-
4	9.8	20.6	47	-	-
5	7.7	20.0	47	-	-
6	3.2	19.0	47	-	-
7	1.4	18.7	47	-	-
8	1.2	18.4	49	-	-
9	0.9	18.3	49	-	-
10	0.8	18.2	51	-	-
11	0.8	18.3	49	-	-
12	0.8	18.0	51	-	-
13	0.6	18.0	53	-	-
14	0.3	18.0	54	-	-
15	0.3	18.2	56	-	-
16	0.2	18.1	57	-	-
17	0.1	18.0	58	-	-
18	0.1	18.1	57	-	-
19	0.1	18.0	59	-	-
20	0.1	18.1	60	-	-
21	0.1	18.1	60	-	-

LAGO YURE

13-MAR-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.9	25.8	48	-	100.00
1	9.1	25.0	49	-	30.63
2	8.9	23.9	50	-	15.34
3	10.7	22.6	47	-	7.55
4	9.5	20.8	48	-	2.94
5	5.6	20.1	47	-	1.50
6	3.0	19.5	47	-	0.66
7	1.3	19.0	47	-	-
8	0.8	18.8	47	-	-
9	0.3	18.6	50	-	-
10	0.2	18.6	51	-	-
11	0.2	18.6	52	-	-
12	0.2	18.6	53	-	-
13	0.2	18.5	57	-	-
14	0.2	18.5	56	-	-
15	0.2	18.5	57	-	-
16	0.2	18.4	71	-	-
17	0.2	18.4	71	-	-
18	0.2	18.4	71	-	-
19	0.2	18.3	76	-	-
20	0.2	18.3	76	-	-

26-MAR-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.2	25.8	49	-	100.00
1	8.3	25.1	50	-	30.23
2	8.3	24.9	50	-	10.12
3	9.1	23.2	51	-	4.65
4	9.9	21.9	48	-	2.62
5	4.6	20.3	48	-	1.34
6	1.8	19.8	47	-	0.74
7	0.2	19.2	48	-	-
8	0.1	18.9	50	-	-
9	0.1	18.7	50	-	-
10	0.1	18.6	51	-	-
11	0.1	18.6	53	-	-
12	0.1	18.4	54	-	-
13	0.1	18.4	56	-	-
14	0.1	18.4	57	-	-
15	0.1	18.4	57	-	-
16	0.1	18.4	58	-	-
17	0.1	18.4	59	-	-
18	0.1	18.4	59	-	-
19	0.1	18.4	61	-	-
20	0.1	18.4	61	-	-

LAGO YURE

24-APR-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.2	22.3	48	-	100.00
1	8.1	21.8	48	-	24.68
2	7.6	21.1	47	-	10.87
3	6.8	20.5	48	-	5.25
4	6.3	20.2	45	-	2.60
5	5.4	19.9 -	45	-	1.20
6	3.9	19.6	45	-	0.49
7	3.7	19.4	47	-	0.17
8	1.8	19.2	48	-	0.04
9	0.4	18.7	51	-	-
10	0.2	18.6	56	-	-
11	0.1	18.4	57	-	-
12	0.1	18.4	57	-	-
13	0.1	18.3	58	-	-
14	0.1	18.3	61	-	-
15	0.1	18.3	62	-	-
16	0.1	18.3	63	-	-
17	0.1	18.2	63	-	-
18	0.0	18.2	66	-	-

15-MAY-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.5	26.0	49	-	100.00
1	9.7	25.7	49	-	31.03
2	10.8	25.1	50	-	14.83
3	10.5	23.5	50	-	6.90
4	10.3	21.0	51	-	2.53
5	4.6	19.9 -	45	-	1.04
6	2.2	19.1	46	-	0.51
7	0.3	18.7	46	-	-
8	0.3	18.4	51	-	-
9	0.2	18.0	56	-	-
10	0.2	17.8	59	-	-
11	0.2	17.7	60	-	-
12	0.2	17.6	64	-	-
13	0.1	17.6	65	-	-
14	0.1	17.6	66	-	-
15	0.1	17.6	69	-	-
16	0.1	17.6	71	-	-
17	0.1	17.6	71	-	-
18	0.1	17.5	72	-	-

LAGO YURE

29-MAY-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	27.0	50	17.83	100.00
1	8.3	27.0	49	12.00	37.00
2	8.2	26.8	50	9.68	21.30
3	10.1	25.1	51	13.62	10.80
4	11.2	23.6	50	6.28	4.60
5	7.1	21.5	49	11.87	1.79
6	0.4	20.1	49	23.75	0.73
7	0.2	19.8	50	-	0.40
8	0.1	19.2	55	-	-
9	0.1	19.0	57	-	-
10	0.1	19.0	61	-	-
11	0.0	18.8	61	-	-
12	0.0	18.6	63	-	-
13	0.0	18.5	66	-	-
14	0.0	18.3	67	-	-
15	0.0	18.1	70	-	-
16	0.0	18.0	70	-	-
17	0.0	18.0	70	-	-
18	0.0	18.0	72	-	-

26-JUN-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.1	28.8	36	38.49	100.00
1	8.1	28.2	36	25.38	21.82
2	8.4	22.0	44	20.04	8.18
3	7.3	21.3	44	17.55	2.75
4	7.0	20.9	41	7.20	0.98
5	5.9	20.6	42	1.11	1.01
6	5.4	20.3	45	0.57	0.41
7	3.8	20.2	45	-	-
8	1.5	19.9	46	-	-
9	0.2	19.4	58	-	-
10	0.2	19.0	66	-	-
11	0.1	18.8	68	-	-
12	0.1	18.7	69	-	-
13	0.1	18.7	71	-	-
14	0.1	18.5	73	-	-
15	0.1	18.5	74	-	-
16	0.1	18.5	78	-	-
17	0.1	18.5	79	-	-
18	0.1	18.6	79	-	-
19	0.1	18.5	80	-	-
20	0.1	18.5	80	-	-

LAGO YURE

16-JUL-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	25.1	45	44.73	100.00
1	9.2	25.0	44	39.28	21.14
2	9.2	23.8	45	23.67	8.67
3	7.8	22.7	45	14.75	2.84
4	7.0	22.1	44	6.81	1.35
5	4.5	21.7	43	2.48	0.76
6	0.8	21.0	44	0.78	0.41
7	0.3	20.6	57	-	-
8	0.1	20.1	54	-	-
9	0.1	19.7	66	-	-
10	0.1	19.3	66	-	-
11	0.1	19.0	83	-	-
12	0.1	18.9	85	-	-
13	0.1	18.8	83	-	-
14	0.1	18.8	87	-	-
15	0.1	18.7	90	-	-
16	0.1	18.7	93	-	-
17	0.1	18.7	89	-	-
18	0.1	18.7	90	-	-
19	0.1	18.7	86	-	-
20	0.1	18.7	87	-	-
21	0.1	18.6	90	-	-
22	0.1	18.6	92	-	-

07-AUG-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	23.8	39	42.90	100.00
1	8.6	22.3	40	20.16	8.37
2	7.5	21.0	41	3.24	0.86
3	7.3	20.6	42	0.18	0.08
4	7.3	20.2	48	-	-
5	8.1	20.0	52	-	-
6	5.1	20.0	51	-	-
7	4.1	20.0	46	-	-
8	2.9	19.9	46	-	-
9	0.2	19.7	57	-	-
10	0.1	19.5	58	-	-
11	0.1	19.0	59	-	-
12	0.1	19.0	61	-	-
13	0.1	18.9	66	-	-
14	0.1	18.9	66	-	-
15	0.0	18.8	69	-	-
16	0.0	18.8	72	-	-
17	0.0	18.5	78	-	-
18	0.0	18.4	79	-	-
19	0.0	18.2	82	-	-
20	0.0	18.2	82	-	-
21	0.0	18.2	83	-	-
22	0.0	18.1	117	-	-
23	-	18.1	-	-	-

LAGO YURE

28-AUG-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.6	23.5	39	-	100.00
1	8.3	23.2	40	-	7.52
2	8.0	21.6	43	-	1.90
3	7.2	21.1	44	-	0.55
4	6.4	20.7	44	-	0.09
5	5.6	20.4	42	-	-
6	3.3	20.1	39	-	-
7	0.6	19.9	43	-	-
8	0.4	19.8	46	-	-
9	0.4	19.5	56	-	-
10	0.4	19.4	57	-	-
11	0.4	19.3	58	-	-
12	0.3	19.2	59	-	-
13	0.3	19.0	64	-	-
14	0.3	18.9	69	-	-
15	0.3	18.9	70	-	-
16	0.3	18.8	73	-	-
17	0.2	19.6	74	-	-
18	0.2	19.8	54	-	-
19	0.2	20.2	45	-	-
20	0.2	20.2	45	-	-
21	0.2	20.5	43	-	-

03-SEP-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.9	26.5	32	-	-
1	9.0	23.2	36	-	-
2	8.4	22.2	37	-	-
3	7.6	21.4	44	-	-
4	6.7	20.9	44	-	-
5	4.2	20.4	40	-	-
6	1.3	20.1	44	-	-
7	0.6	20.0	45	-	-
8	0.5	19.9	51	-	-
9	0.4	19.6	54	-	-
10	0.3	19.8	57	-	-
11	0.3	19.6	66	-	-
12	0.3	19.6	60	-	-
13	0.3	19.3	61	-	-
14	0.2	19.3	61	-	-
15	0.2	19.1	65	-	-
16	0.3	19.8	64	-	-
17	0.3	20.0	54	-	-
18	0.2	20.3	48	-	-
19	0.2	20.3	47	-	-
20	0.2	20.6	47	-	-
21	0.2	20.8	53	-	-
22	0.2	20.8	54	-	-
23	0.2	20.8	55	-	-
24	0.2	20.8	55	-	-

LAGO YURE

18-SEP-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	23.6	37	46.53	100.00
1	7.3	22.4	38	33.15	5.87
2	7.2	21.2	36	2.26	1.42
3	7.2	20.8	42	0.60	0.31
4	7.2	20.6	43	-	0.11
5	6.6	20.4	39	-	-
6	6.0	20.3	37	-	-
7	5.7	20.3	38	-	-
8	4.5	20.1	38	-	-
9	1.6	20.1	43	-	-
10	0.4	20.1	47	-	-
11	0.4	20.1	55	-	-
12	0.3	20.0	53	-	-
13	0.3	20.0	53	-	-
14	0.3	20.0	55	-	-
15	0.3	19.9	58	-	-
16	0.3	19.8	60	-	-
17	0.3	19.8	62	-	-
18	0.3	19.9	56	-	-
19	0.3	20.0	58	-	-
20	0.3	20.0	55	-	-

09-OCT-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.1	21.3	91	27.25	100.00
1	6.8	21.0	94	4.41	5.77
2	4.9	20.7	91	0.21	0.98
3	4.6	20.5	90	0.07	0.09
4	4.8	20.4	90	-	-
5	4.6	20.3	96	-	-
6	4.3	20.2	92	-	-
7	4.5	20.2	95	-	-
8	5.1	20.1	98	-	-
9	4.1	20.1	95	-	-
10	2.4	20.2	95	-	-
11	1.4	20.3	99	-	-
12	1.2	20.3	99	-	-
13	1.0	20.1	101	-	-
14	0.9	20.0	101	-	-
15	0.9	19.9	101	-	-
16	0.8	20.0	101	-	-
17	0.7	20.0	101	-	-
18	0.6	20.1	99	-	-
19	0.6	20.2	95	-	-
20	0.5	20.3	89	-	-
21	0.5	20.4	89	-	-
22	0.4	20.5	89	-	-

LAGO YURE

15-OCT-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.7	23.0	42	-	-
1	7.4	21.9	43	-	-
2	6.2	20.8	44	-	-
3	6.8	20.3	46	-	-
4	6.0	20.2	46	-	-
5	4.6	20.2	45	-	-
6	4.4	20.1	45	-	-
7	3.9	20.0	44	-	-
8	3.4	20.0	44	-	-
9	3.6	20.0	45	-	-
10	4.4	20.0	45	-	-
11	3.4	20.0	45	-	-
12	2.2	20.0	46	-	-
13	1.5	19.9	48	-	-
14	0.4	19.9	52	-	-
15	0.4	19.9	51	-	-
16	0.3	20.0	56	-	-
17	0.2	20.1	57	-	-
18	0.2	20.2	57	-	-
19	0.2	20.2	58	-	-
20	0.2	20.3	59	-	-

28-OCT-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.4	24.8	44	-	-
1	8.7	23.2	45	-	-
2	8.2	21.4	46	-	-
3	7.4	20.9	45	-	-
4	6.9	20.7	45	-	-
5	6.9	20.5	45	-	-
6	6.0	20.4	45	-	-
7	4.7	20.2	45	-	-
8	4.0	20.0	45	-	-
9	3.2	20.0	45	-	-
10	2.7	20.0	45	-	-
11	2.7	19.9	46	-	-
12	2.6	19.8	47	-	-
13	2.4	19.8	47	-	-
14	2.4	19.8	47	-	-
15	1.8	19.7	50	-	-
16	1.7	19.7	51	-	-
17	1.4	19.7	53	-	-
18	0.3	19.8	59	-	-
19	0.2	19.9	63	-	-
20	0.2	20.0	64	-	-
21	0.2	20.0	65	-	-

LAGO YURE

30-OCT-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.9	24.1	40	47.94	100.00
1	8.9	23.0	40	38.62	11.47
2	8.3	21.6	43	6.86	2.02
3	7.6	21.1	44	0.80	0.17
4	7.3	20.9	43	-	-
5	7.2	20.7	42	-	-
6	6.1	20.5	43	-	-
7	5.2	20.3	45	-	-
8	4.0	20.2	46	-	-
9	2.9	20.1	46	-	-
10	2.5	20.1	47	-	-
11	2.4	20.1	48	-	-
12	2.2	20.0	52	-	-
13	2.2	20.0	53	-	-
14	2.2	20.0	53	-	-
15	2.2	20.0	53	-	-
16	1.6	20.0	54	-	-
17	2.0	20.1	54	-	-
18	0.7	20.1	55	-	-
19	0.2	20.1	57	-	-
20	0.2	20.1	59	-	-
21	0.1	20.2	63	-	-
22	0.1	20.3	67	-	-
23	0.1	20.3	82	-	-

13-NOV-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.1	21.5	39	-	-
1	7.5	20.3	41	-	-
2	7.3	19.9	43	-	-
3	6.8	19.9	43	-	-
4	6.7	19.8	45	-	-
5	5.4	19.7	43	-	-
6	5.3	19.7	41	-	-
7	5.4	19.6	41	-	-
8	5.4	19.5	42	-	-
9	5.5	19.5	42	-	-
10	5.4	19.4	43	-	-
11	5.2	19.4	43	-	-
12	4.9	19.4	46	-	-
13	4.9	19.3	46	-	-
14	4.8	19.3	46	-	-
15	4.7	19.3	46	-	-
16	4.9	19.3	46	-	-
17	4.0	19.3	48	-	-
18	3.8	19.3	48	-	-
19	3.5	19.3	50	-	-
20	3.5	19.2	71	-	-
21	3.7	19.3	71	-	-
22	3.6	19.3	80	-	-
23	2.0	19.3	80	-	-

LAGO YURE

20-NOV-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	22.5	43	52.71	100.00
1	8.1	21.0	44	32.64	11.40
2	7.3	20.2	44	5.01	2.15
3	7.5	19.9	45	1.08	0.51
4	7.2	19.9	45	-	0.15
5	6.3	19.7	44	-	0.04
6	5.6	19.6	44	-	0.01
7	5.6	19.5	44	-	-
8	5.7	19.5	44	-	-
9	5.5	19.4	46	-	-
10	5.5	19.3	46	-	-
11	5.4	19.3	46	-	-
12	5.1	19.3	46	-	-
13	5.0	19.3	47	-	-
14	4.8	19.3	47	-	-
15	4.6	19.3	47	-	-
16	4.4	19.2	48	-	-
17	3.8	19.2	49	-	-
18	3.6	19.3	50	-	-
19	3.2	19.3	51	-	-

10-DEC-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.5	21.9	44	43.30	100.00
1	8.0	20.4	46	30.00	16.32
2	8.0	20.3	42	13.98	5.37
3	7.6	19.9	45	5.02	2.62
4	4.4	19.7	42	1.22	0.73
5	4.0	19.6	42	0.24	0.21
6	4.0	19.5	43	-0.19	0.04
7	4.1	19.4	43	-	-
8	4.3	19.4	44	-	-
9	4.6	19.3	46	-	-
10	4.8	19.2	46	-	-
11	5.1	19.2	46	-	-
12	5.2	19.2	47	-	-
13	5.6	19.1	47	-	-
14	5.5	19.1	47	-	-
15	5.6	19.1	48	-	-
16	5.2	19.0	49	-	-
17	5.6	19.0	49	-	-
18	5.2	19.0	51	-	-
19	5.7	19.0	51	-	-
20	5.4	19.0	-	-	-

LAGO YURE

08-JAN-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.1	20.3	79	45.08	100.00
1	9.2	19.6	75	46.33	33.99
2	9.8	18.8	71	44.41	15.79
3	8.8	18.2	68	34.84	7.37
4	8.2	18.0	65	35.14	3.03
5	7.8	17.8	60	16.84	1.93
6	7.3	17.8	56	9.63	1.10
7	7.1	17.6	53	-	0.65
8	7.0	17.5	52	-	0.38
9	6.9	17.5	50	-	0.20
10	6.9	17.3	50	-	0.12
11	6.9	17.2	51	-	0.08
12	7.0	17.2	53	-	0.04
13	7.2	17.2	53	-	-
14	7.2	17.2	55	-	-
15	7.0	17.2	55	-	-
16	6.6	17.1	55	-	-
17	6.6	17.1	55	-	-
18	6.5	17.1	56	-	-
19	6.5	17.1	56	-	-
20	6.5	17.0	58	-	-
21	6.3	17.0	-	-	-

22-JAN-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.5	19.7	40	29.94	100.00
1	9.5	19.3	41	38.66	24.32
2	9.1	18.8	44	28.80	17.63
3	8.5	18.4	43	18.34	9.89
4	8.4	17.8	40	9.76	5.20
5	7.6	17.5	40	6.01	3.06
6	6.8	17.3	42	3.50	1.95
7	6.0	17.1	40	1.79	1.06
8	5.5	17.0	43	1.83	0.67
9	5.2	17.0	46	0.45	0.40
10	5.2	17.0	46	0.18	0.25
11	5.1	16.9	47	-	0.15
12	5.0	16.8	47	-	-
13	4.6	16.8	61	-	-
14	4.6	16.8	59	-	-
15	4.5	16.8	89	-	-
16	4.5	16.7	-	-	-
17	4.4	16.6	-	-	-

LAGO YURE

06-FEB-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	11.0	20.0	41	44.33	100.00
1	10.8	19.8	43	43.67	26.79
2	10.4	19.5	39	22.31	10.00
3	9.9	19.1	44	8.76	4.76
4	9.3	18.7	44	4.54	2.38
5	8.4	18.4	44	1.58	1.29
6	7.6	18.0	45	0.47	0.81
7	5.0	17.8	45	-	0.43
8	4.4	17.5	45	-	-
9	3.6	17.4	46	-	-
10	3.6	17.3	48	-	-
11	3.5	17.3	48	-	-
12	3.2	17.2	49	-	-
13	3.3	17.2	62	-	-
14	2.9	17.2	61	-	-
15	2.2	17.1	62	-	-
16	1.9	17.1	-	-	-
17	1.9	17.1	-	-	-
18	1.9	17.1	-	-	-
19	2.0	17.1	38	-	-
20	0.8	17.1	-	-	-

23-FEB-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.9	21.1	44	43.97	100.00
1	9.9	20.9	44	31.38	9.71
2	9.6	19.7	43	12.79	9.17
3	9.3	19.1	45	10.92	6.15
4	8.2	18.9	39	5.62	3.30
5	7.5	18.8	40	2.38	2.03
6	7.4	18.6	41	0.84	0.99
7	6.8	18.4	42	-	0.50
8	6.0	18.2	43	-	-
9	4.4	18.1	46	-	-
10	2.5	17.8	46	-	-
11	2.1	17.7	47	-	-
12	2.0	17.7	47	-	-
13	1.8	17.5	48	-	-
14	1.5	17.5	49	-	-
15	1.5	17.4	49	-	-
16	1.1	17.4	49	-	-
17	0.8	17.4	50	-	-
18	0.8	17.3	50	-	-
19	0.8	17.3	50	-	-
20	0.8	17.3	50	-	-
21	0.8	17.3	50	-	-
22	0.8	17.2	50	-	-

LAGO YURE

05-MAR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.0	23.4	44	24.97	100.00
1	9.1	22.7	44	31.84	38.46
2	9.4	20.7	45	26.75	17.65
3	9.6	19.8	43	20.56	9.71
4	8.9	19.0	44	14.94	5.29
5	7.4	18.4	43	11.62	3.18
6	6.4	18.2	43	5.35	1.65
7	5.3	18.1	46	-	1.16
8	4.0	18.0	45	-	0.65
9	1.9	17.8	47	-	0.40
10	1.3	17.6	47	-	0.19
11	1.0	17.5	48	-	0.10
12	0.6	17.5	49	-	-
13	0.5	17.4	49	-	-
14	0.5	17.3	50	-	-
15	0.5	17.4	50	-	-
16	0.5	17.3	51	-	-
17	0.4	17.3	51	-	-
18	0.4	17.3	51	-	-
19	0.4	17.3	51	-	-
20	0.4	17.3	52	-	-

19-MAR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	25.7	47	30.39	100.00
1	9.8	24.1	47	25.43	30.00
2	10.4	22.1	45	23.61	13.24
3	9.9	21.7	44	12.58	6.00
4	9.8	20.5	43	5.99	2.92
5	8.6	19.0	44	5.57	1.40
6	5.2	18.2	44	2.89	0.76
7	3.6	18.1	45	-	0.49
8	2.4	17.8	45	-	0.29
9	0.9	17.4	48	-	0.05
10	0.6	17.2	49	-	-
11	0.5	17.2	49	-	-
12	0.4	17.1	49	-	-
13	0.4	16.9	51	-	-
14	0.2	16.9	51	-	-
15	0.2	16.9	51	-	-
16	0.2	16.9	52	-	-
17	0.2	16.9	53	-	-

LAGO YURE

20-MAR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	11.6	22.6	53	41.68	100.00
1	11.6	22.4	53	30.12	19.33
2	10.9	21.4	53	16.06	8.88
3	10.1	20.8	55	5.87	3.50
4	10.0	20.2	56	3.10	1.71
5	9.5	19.3	49	2.26	0.73
6	7.0	18.6	46	0.84	0.42
7	4.0	18.1	47	-	0.26
8	1.8	17.8	48	-	-
9	0.6	17.5	49	-	-
10	0.4	17.3	60	-	-
11	0.2	17.2	54	-	-
12	0.2	17.1	54	-	-
13	0.2	17.1	54	-	-
14	0.2	17.1	54	-	-
15	0.2	17.1	54	-	-
16	0.1	17.0	54	-	-
17	0.1	17.0	54	-	-
18	0.1	17.0	54	-	-
19	0.1	17.0	59	-	-
20	0.1	17.0	60	-	-
21	0.1	17.0	60	-	-
22	0.1	17.0	60	-	-

21-MAR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	24.0	-	19.54	100.00
1	-	23.8	-	67.08	17.20
2	-	23.3	-	56.96	7.32
3	-	21.5	-	38.84	3.54
4	-	20.5	-	22.27	1.74
5	-	19.3	-	22.64	0.92
6	-	18.6	-	12.77	0.53
7	-	18.1	-	-	-
8	-	17.8	-	-	-
9	-	17.5	-	-	-
10	-	17.3	-	-	-
11	-	17.2	-	-	-
12	-	17.1	-	-	-
13	-	17.1	-	-	-
14	-	17.1	-	-	-
15	-	17.0	-	-	-
16	-	17.0	-	-	-
17	-	17.0	-	-	-
18	-	17.0	-	-	-
19	-	17.0	-	-	-
20	-	17.0	-	-	-

LAGO YURE

10-APR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	23.5	53	26.86	100.00
1	9.7	22.8	54	71.12	30.86
2	9.6	22.3	52	56.71	11.85
3	9.0	22.0	54	30.28	3.95
4	8.8	21.2	50	16.62	1.91
5	9.6	20.0	46	6.95	0.79
6	5.8	18.9	47	-	0.54
7	1.8	18.1	48	-	0.31
8	0.8	18.0	48	-	0.21
9	0.2	17.5	53	-	0.11
10	0.2	17.2	54	-	0.04
11	0.2	17.2	57	-	0.02
12	0.2	17.1	57	-	-
13	0.2	17.1	57	-	-
14	0.2	17.1	60	-	-
15	0.2	17.1	57	-	-
16	0.1	17.1	59	-	-
17	0.1	17.1	60	-	-
18	0.2	17.1	60	-	-
19	0.2	17.1	60	-	-
20	0.2	17.1	60	-	-
21	0.1	17.1	87	-	-

30-APR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	24.2	49	70.74	100.00
1	9.3	23.8	49	74.11	19.29
2	9.3	22.4	47	46.62	9.00
3	9.8	21.1	45	29.82	3.31
4	8.7	20.0	44	12.67	1.56
5	6.1	19.0	45	6.72	0.87
6	4.6	18.7	45	2.03	0.50
7	2.8	18.3	48	-	-
8	0.7	17.8	51	-	-
9	0.5	17.3	56	-	-
10	0.5	17.1	57	-	-
11	0.5	17.0	58	-	-
12	0.4	17.0	58	-	-
13	0.4	17.0	60	-	-
14	0.3	17.0	60	-	-
15	0.2	16.7	63	-	-
16	0.2	16.7	64	-	-
17	0.2	16.7	64	-	-
18	0.2	16.7	64	-	-
19	0.2	16.7	64	-	-

LAGO YURE

21-MAY-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	10.1	26.3	51	59.03	100.00
1	9.8	26.3	51	43.64	21.70
2	8.9	26.1	52	47.34	10.22
3	10.6	24.3	50	21.73	4.64
4	10.2	22.0	47	9.27	2.06
5	6.6	20.2	46	3.32	0.98
6	1.4	19.2	47	7.12	0.50
7	0.9	18.9	48	-	-
8	0.7	18.3	55	-	-
9	0.6	18.0	58	-	-
10	0.6	17.8	58	-	-
11	0.5	17.7	60	-	-
12	0.5	17.4	61	-	-
13	0.4	17.3	61	-	-
14	0.4	17.3	62	-	-
15	0.4	17.3	63	-	-
16	0.4	17.3	64	-	-
17	0.4	17.2	65	-	-
18	0.4	17.2	66	-	-
19	0.3	17.2	66	-	-
20	0.3	17.2	82	-	-

11-JUN-81

DEPTH (M)	OXYGEN (MG/L)	% Sat.	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	113.6	24.5	44	40.57	100.00
1	10.0	120.0	23.5	44	96.45	12.66
2	8.2	96.8	22.6	45	24.39	2.00
3	7.8	91.1	22.0	43	5.12	0.21
4	7.3	84.8	21.7	43	2.42	0.03
5	5.8	66.7	21.1	44	2.42	-
6	2.4	27.1	20.2	50	1.28	-
7	0.7	7.8	19.2	52	-	-
8	0.6	6.5	18.3	56	-	-
9	0.5	5.4	17.9	58	-	-
10	0.4	~2	17.5	58	-	-
11	0.4	~0	17.3	61	-	-
12	0.4		17.3	61	-	-
13	0.4		17.2	62	-	-
14	0.4		17.2	63	-	-
15	0.4		17.2	63	-	-
16	0.4		17.2	65	-	-
17	0.4		17.2	66	-	-
18	0.4		17.1	66	-	-
19	0.4		17.1	67	-	-

LAGO YURE

25-JUN-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	24.0	43	32.89	100.00
1	8.4	23.0	42	23.48	9.60
2	7.4	21.5	44	11.44	9.35
3	6.9	21.0	44	3.06	1.23
4	6.4	20.8	42	-	0.39
5	6.6	20.5	42	-	-
6	4.2	20.0	45	-	-
7	4.1	19.8	45	-	-
8	1.0	19.0	55	-	-
9	0.6	18.2	59	-	-
10	0.5	17.8	59	-	-
11	0.4	17.5	65	-	-
12	0.4	17.0	66	-	-
13	0.4	17.0	70	-	-
14	0.4	17.0	70	-	-
15	0.3	17.0	70	-	-
16	0.3	17.0	72	-	-
17	0.3	17.0	72	-	-
18	0.3	17.0	72	-	-
19	0.3	17.0	72	-	-
20	0.2	17.0	72	-	-

09-JUL-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.5	23.0	46	10.21	100.00
1	9.2	22.5	45	13.59	42.11
2	8.6	21.7	46	20.58	5.13
3	7.8	20.9	46	7.29	2.36
4	7.1	20.3	44	3.25	1.18
5	6.5	20.0	43	1.01	0.50
6	5.4	19.2	43	0.70	0.14
7	3.4	19.3	45	-	0.03
8	0.8	19.0	50	-	-
9	0.6	18.2	60	-	-
10	0.6	17.9	63	-	-
11	0.5	17.5	67	-	-
12	0.4	17.2	68	-	-
13	0.4	17.2	71	-	-
14	0.4	17.2	71	-	-
15	0.4	17.2	71	-	-
16	0.4	17.2	73	-	-
17	0.4	17.1	74	-	-
18	0.4	17.1	74	-	-

LAGO YURE

28-JUL-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.0	23.0	44	60.43	100.00
1	9.0	22.0	44	65.81	7.50
2	8.3	21.0	47	16.10	2.40
3	7.9	20.8	46	11.41	0.86
4	7.3	20.5	45	3.31	0.26
5	6.9	20.1	45	0.56	0.02
6	6.3	20.0	45	-0.10	-
7	5.1	19.8	44	-	-
8	3.1	19.5	46	-	-
9	0.8	19.0	51	-	-
10	0.6	18.2	61	-	-
11	0.6	17.5	68	-	-
12	0.5	17.2	71	-	-
13	0.5	17.1	73	-	-
14	0.5	17.0	74	-	-
15	0.5	17.0	75	-	-
16	0.5	17.0	75	-	-
17	0.5	17.0	77	-	-
18	0.5	17.0	77	-	-
19	0.5	17.0	77	-	-
20	-	17.0	77	-	-

13-AUG-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.6	22.0	42	21.56	100.00
1	8.5	21.0	43	51.19	16.15
2	8.8	20.2	44	29.73	4.21
3	7.6	19.8	44	12.12	1.44
4	7.8	19.7	46	0.25	0.32
5	7.7	19.4	46	2.54	0.14
6	7.0	19.2	46	0.23	0.06
7	7.8	19.0	47	-	-
8	7.9	19.0	47	-	-
9	5.0	18.8	46	-	-
10	1.0	18.5	50	-	-
11	0.5	17.8	51	-	-
12	0.4	17.3	54	-	-
13	0.3	16.8	56	-	-
14	0.3	16.6	56	-	-
15	0.2	16.5	53	-	-
16	0.2	16.4	59	-	-
17	0.2	16.6	65	-	-
18	0.2	16.5	77	-	-
19	0.2	16.4	78	-	-
20	0.2	16.3	79	-	-

LAGO YURE

09-SEP-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.1	23.2	41	34.13	100.00
1	9.2	22.8	41	75.79	18.07
2	8.8	21.5	43	32.60	3.86
3	8.2	21.0	36	1.05	0.61
4	7.9	20.8	43	0.06	0.01
5	7.6	20.5	44	0.04	-
6	7.2	20.1	45	0.03	-
7	6.7	20.0	45	-	-
8	6.0	20.0	45	-	-
9	2.5	19.6	46	-	-
10	0.5	19.0	50	-	-
11	0.5	18.2	70	-	-
12	0.4	17.8	73	-	-
13	0.4	17.5	76	-	-
14	0.4	17.2	79	-	-
15	0.3	17.1	80	-	-
16	0.3	17.1	84	-	-
17	0.3	17.0	85	-	-
18	0.3	17.0	85	-	-
19	0.2	17.0	85	-	-
20	0.2	17.0	85	-	-
21	0.2	17.0	133	-	-

29-SEP-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	23.1	42	-	100.00
1	9.4	21.8	43	-	29.51
2	8.6	20.9	43	-	9.50
3	8.3	20.5	42	-	1.64
4	7.8	20.3	40	-	0.47
5	7.4	20.0	43	-	0.31
6	7.1	19.9	43	-	-
7	6.3	19.9	43	-	-
8	5.6	19.6	43	-	-
9	4.3	19.3	46	-	-
10	1.1	19.1	48	-	-
11	0.6	18.5	70	-	-
12	0.5	18.2	74	-	-
13	0.5	17.9	78	-	-
14	0.4	17.4	81	-	-
15	0.4	17.3	95	-	-
16	0.4	17.2	96	-	-
17	0.4	17.2	96	-	-
18	0.4	17.2	96	-	-
19	0.4	17.2	98	-	-
20	0.4	17.1	106	-	-

LAGO YURE

03-OCT-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	21.4	43	25.15	100.00
1	8.6	20.3	44	66.54	6.67
2	8.4	20.0	44	8.15	1.01
3	7.9	19.5	44	-	0.13
4	7.9	19.5	46	-	-
5	7.6	19.5	44	-	-
6	7.1	19.2	46	-	-
7	6.7	19.2	45	-	-
8	6.4	19.2	45	-	-
9	5.2	19.0	46	-	-
10	4.7	19.0	46	-	-
11	1.6	18.5	48	-	-
12	0.6	18.0	59	-	-
13	0.4	18.0	71	-	-
14	0.4	17.5	77	-	-
15	0.4	17.2	82	-	-
16	0.4	17.0	84	-	-
17	0.4	17.0	84	-	-
18	0.3	17.0	84	-	-
19	0.3	17.0	85	-	-
20	0.3	16.8	86	-	-
21	0.3	16.5	136	-	-
22	0.3	16.5	-	-	-

15-OCT-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.9	22.0	41	28.40	100.00
1	8.6	20.9	42	36.02	6.92
2	7.8	19.8	45	3.75	2.39
3	7.8	19.3	43	-	0.76
4	7.7	18.9	44	-	0.17
5	7.4	18.9	44	-	-
6	7.4	18.8	44	-	-
7	7.0	18.7	44	-	-
8	6.0	18.3	44	-	-
9	4.4	18.3	47	-	-
10	0.9	18.3	47	-	-
11	0.6	18.3	68	-	-
12	0.6	18.3	68	-	-
13	0.7	18.0	68	-	-
14	0.5	17.8	68	-	-
15	0.5	17.7	71	-	-
16	0.5	17.5	71	-	-
17	0.5	16.8	75	-	-
18	0.4	16.9	78	-	-
19	0.4	16.8	82	-	-
20	0.4	16.7	84	-	-
21	0.4	16.7	87	-	-

LAGO YURE

03-NOV-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.8	20.1	44	24.04	100.00
1	8.9	19.4	44	41.66	9.62
2	8.4	19.1	45	41.85	3.63
3	7.6	18.3	43	23.10	1.35
4	6.2	18.0	43	3.49	0.57
5	6.6	18.0	43	0.62	0.16
6	6.6	18.0	43	0.10	-
7	6.2	17.8	45	-	-
8	6.3	17.8	45	-	-
9	5.8	17.8	45	-	-
10	5.8	17.6	46	-	-
11	5.3	17.8	46	-	-
12	5.0	17.3	47	-	-
13	4.4	17.3	49	-	-
14	2.0	17.3	50	-	-
15	1.0	17.3	63	-	-
16	0.8	17.2	68	-	-
17	0.7	17.0	76	-	-
18	0.6	16.9	79	-	-
19	0.6	16.7	83	-	-
20	0.5	16.5	85	-	-

12-NOV-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.2	18.7	49	40.65	100.00
1	8.4	18.5	49	44.74	20.00
2	7.1	17.9	51	26.04	7.07
3	6.4	18.2	49	16.17	3.43
4	6.8	18.0	48	5.34	1.48
5	6.3	18.0	48	1.27	0.66
6	6.2	18.0	48	0.43	-
7	6.1	17.9	48	-	-
8	6.4	17.9	53	-	-
9	6.7	17.9	84	-	-
10	7.1	17.8	85	-	-
11	6.1	16.7	87	-	-
12	4.6	17.5	87	-	-
13	4.7	17.5	88	-	-
14	3.1	17.3	89	-	-
15	2.1	17.5	89	-	-
16	2.1	17.3	74	-	-
17	0.6	17.3	81	-	-
18	0.5	17.2	85	-	-
19	0.4	17.1	85	-	-
20	0.4	17.0	90	-	-
21	0.4	16.9	91	-	-

LAGO YURE

03-DEC-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	10.2	20.9	50	88.53	100.00
1	10.3	19.4	48	43.70	11.69
2	8.4	18.5	48	12.38	3.05
3	8.2	18.0	47	4.93	1.16
4	7.8	18.0	47	0.98	0.51
5	6.9	17.6	47	-	0.23
6	6.2	17.5	48	-	0.10
7	5.5	17.0	48	-	-
8	4.3	17.0	48	-	-
9	4.3	17.0	48	-	-
10	4.2	17.0	48	-	-
11	4.8	17.0	50	-	-
12	3.8	17.0	53	-	-
13	3.3	17.0	55	-	-
14	3.1	17.0	60	-	-
15	2.9	17.0	63	-	-
16	2.5	16.5	71	-	-
17	1.9	16.0	83	-	-
18	0.5	16.0	86	-	-
19	0.4	15.8	101	-	-
20	0.3	15.6	103	-	-
21	0.3	15.5	103	-	-
22	0.3	15.5	103	-	-

15-DEC-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.4	18.0	49	-	100.00
1	7.4	17.5	50	-	20.83
2	6.6	16.8	49	-	10.54
3	5.6	15.0	50	-	5.16
4	3.9	15.2	50	-	2.04
5	4.3	15.5	48	-	0.43
6	5.2	15.0	49	-	-
7	5.6	15.0	49	-	-
8	5.8	15.0	49	-	-
9	5.8	15.1	49	-	-
10	6.0	14.6	49	-	-
11	6.2	14.3	49	-	-
12	6.0	15.8	48	-	-
13	6.2	15.6	48	-	-
14	6.0	15.5	48	-	-
15	6.0	15.3	48	-	-
16	6.2	15.3	48	-	-
17	6.0	15.3	48	-	-
18	6.0	15.0	50	-	-
19	5.8	15.0	49	-	-
20	0.8	15.0	49	-	-
21	0.8	15.0	-	-	-

LAGO YURE

12-JAN-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.3	20.5	70	30.00	100.00
1	9.4	18.8	73	71.77	27.06
2	10.1	18.2	75	38.25	10.79
3	8.5	17.9	75	20.30	5.06
4	8.8	17.3	75	18.42	2.86
5	9.0	17.0	76	27.17	1.53
6	5.8	16.2	76	17.46	0.73
7	5.5	16.0	75	-	0.40
8	5.3	16.0	75	-	-
9	5.1	15.8	76	-	-
10	4.5	15.8	79	-	-
11	4.5	15.8	82	-	-
12	4.8	15.8	84	-	-
13	4.9	15.8	85	-	-
14	4.9	15.8	86	-	-
15	4.2	15.5	88	-	-
16	4.2	15.5	88	-	-
17	4.2	15.5	93	-	-
18	3.9	15.5	94	-	-
19	3.3	15.5	97	-	-
20	3.0	15.0	139	-	-

23-FEB-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	20.9	50	39.53	100.00
1	9.6	19.7	50	82.11	16.33
2	9.8	19.3	50	43.14	7.11
3	9.3	18.7	50	22.13	3.06
4	8.2	18.1	49	14.75	1.30
5	6.9	17.8	50	5.13	0.68
6	6.2	17.5	49	2.11	-
7	5.2	17.3	49	-	-
8	4.0	17.0	49	-	-
9	2.4	16.9	49	-	-
10	1.2	16.7	50	-	-
11	0.9	16.5	50	-	-
12	0.8	16.4	50	-	-
13	0.7	16.4	50	-	-
14	0.6	16.4	50	-	-
15	0.6	16.4	51	-	-
16	0.5	16.3	52	-	-
17	0.5	16.3	52	-	-
18	0.5	16.3	52	-	-
19	0.5	16.0	92	-	-
20	0.4	15.9	92	-	-

LAGO YURE

18-MAR-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	-	-	35.45	100.00
1	-	-	-	91.01	27.59
2	-	-	-	82.70	15.82
3	-	-	-	40.41	7.58
4	-	-	-	19.59	3.30
5	-	-	-	19.48	1.47
6	-	-	-	10.88	0.84
7	-	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-

29-APR-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.5	20.2	49	101.87	100.00
1	9.7	19.5	50	138.99	16.15
2	9.7	19.2	50	147.40	11.90
3	9.6	18.9	50	82.72	7.33
4	9.6	18.0	50	117.33	4.35
5	9.6	17.0	48	57.58	2.39
6	9.6	15.3	45	47.29	1.23
7	2.7	14.1	46	-	0.47
8	0.8	13.0	47	-	-
9	0.6	12.8	48	-	-
10	0.5	12.4	49	-	-
11	0.5	12.3	50	-	-
12	0.5	12.3	53	-	-
13	0.4	12.3	54	-	-
14	0.4	12.2	55	-	-
15	0.4	12.2	55	-	-
16	0.4	12.2	56	-	-
17	0.4	12.2	58	-	-
18	0.4	12.2	68	-	-
19	0.3	12.1	69	-	-

LAGO YURE

27-MAY-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	10.5	23.9	45	71.36	100.00
1	10.0	23.8	44	116.84	7.96
2	9.3	22.2	51	104.94	3.43
3	9.2	21.4	48	32.66	0.37
4	8.5	21.3	47	15.46	-
5	8.4	21.3	44	3.40	-
6	8.5	21.2	44	0.25	-
7	7.4	20.6	44	-	-
8	6.2	20.5	43	-	-
9	2.5	20.1	47	-	-
10	0.8	18.9	52	-	-
11	0.5	18.7	52	-	-
12	0.4	18.4	56	-	-
13	0.2	18.2	57	-	-
14	0.2	18.1	57	-	-
15	0.2	18.0	59	-	-
16	0.2	18.0	59	-	-
17	0.2	18.0	60	-	-
18	0.2	18.0	60	-	-
19	0.2	18.0	71	-	-

22-JUN-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.6	23.7	44	32.82	100.00
1	8.6	22.7	44	58.82	22.68
2	8.6	21.9	45	63.72	6.19
3	8.6	21.3	47	21.74	1.96
4	8.6	20.7	48	5.31	0.62
5	8.4	20.4	43	0.94	0.20
6	8.3	20.4	43	0.11	-
7	7.2	20.0	44	-	-
8	6.0	19.5	36	-	-
9	1.8	18.9	39	-	-
10	0.7	18.7	58	-	-
11	0.6	17.8	61	-	-
12	0.6	17.8	61	-	-
13	0.6	17.8	63	-	-
14	0.6	17.5	65	-	-
15	0.6	17.5	69	-	-
16	0.5	17.2	69	-	-
17	0.5	17.2	69	-	-
18	0.4	17.1	69	-	-
19	0.3	17.2	69	-	-
20	0.3	17.2	94	-	-

LAGO YURE

20-JUL-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	23.2	50	25.96	100.00
1	8.2	23.2	50	11.76	22.83
2	8.1	22.4	51	10.59	13.50
3	8.1	22.3	51	4.05	8.46
4	7.9	21.3	48	3.52	5.73
5	7.4	20.9	47	2.60	3.60
6	6.9	20.9	47	1.78	2.40
7	5.3	19.9	48	-	1.51
8	3.3	19.8	49	-	1.03
9	0.4	19.5	55	-	-
10	0.4	19.5	60	-	-
11	0.4	18.6	64	-	-
12	0.4	18.5	64	-	-
13	0.4	18.5	65	-	-
14	0.4	18.5	67	-	-
15	0.4	18.5	69	-	-
16	0.4	18.5	70	-	-
17	0.4	18.5	70	-	-
18	0.4	18.5	70	-	-
19	0.4	-	-	-	-

19-AUG-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	24.1	39	4.81	100.00
1	8.0	24.0	38	4.33	23.91
2	7.8	24.0	37	10.44	6.77
3	8.0	23.6	39	6.50	1.48
4	7.2	23.1	39	1.03	0.41
5	7.2	22.7	41	0.26	0.17
6	7.7	22.4	39	0.01	-
7	4.5	22.1	35	-	-
8	2.9	22.0	36	-	-
9	0.8	22.0	38	-	-
10	0.7	21.9	40	-	-
11	0.7	21.6	45	-	-
12	0.7	21.2	46	-	-
13	0.7	21.0	52	-	-
14	0.7	20.8	54	-	-
15	0.6	21.0	56	-	-
16	0.4	20.6	53	-	-
17	0.5	20.7	60	-	-
18	0.5	20.4	60	-	-
19	0.6	20.2	64	-	-

LAGO YURE

02-SEP-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	23.2	46	-	-
1	8.2	23.2	46	-	-
2	7.2	22.9	44	-	-
3	7.1	22.2	45	-	-
4	6.8	21.9	45	-	-
5	6.2	21.9	44	-	-
6	6.2	21.5	44	-	-
7	3.6	21.5	45	-	-
8	3.1	21.2	46	-	-
9	1.5	21.0	51	-	-
10	0.6	21.0	53	-	-
11	0.6	20.8	56	-	-
12	0.6	20.8	64	-	-
13	0.6	20.2	67	-	-
14	0.5	20.2	75	-	-
15	0.5	20.1	76	-	-
16	0.5	20.0	77	-	-
17	0.5	19.9	79	-	-
18	0.4	19.7	80	-	-
19	0.4	19.7	81	-	-
20	0.4	19.7	91	-	-

28-SEP-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.2	25.0	42	14.40	100.00
1	8.4	24.8	43	15.88	29.23
2	8.2	23.5	45	8.30	49.23
3	8.2	22.9	44	9.34	6.00
4	7.8	22.5	45	4.61	2.88
5	7.0	22.0	43	1.15	1.13
6	6.1	22.0	43	0.24	0.40
7	5.5	21.8	44	-	0.15
8	4.6	21.4	45	-	0.04
9	1.2	21.2	50	-	0.02
10	1.1	21.0	54	-	-
11	1.0	21.0	61	-	-
12	1.0	20.8	76	-	-
13	0.9	20.5	81	-	-
14	0.8	20.5	98	-	-
15	0.8	20.5	98	-	-
16	0.8	20.5	100	-	-
17	0.8	20.5	100	-	-
18	0.8	20.3	101	-	-
19	-	20.2	101	-	-
20	-	20.2	103	-	-
21	-	20.2	103	-	-
22	-	20.2	104	-	-

LAGO YURE

12-NOV-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	-	-	-	-
3	-	-	-	-	-
5	-	-	-	-	-
10	-	-	-	-	-
15	-	-	-	-	-
19	0.5	-	-	-	-

22-DEC-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.2	21.0	66	-	100.00
1	7.0	21.0	66	-	20.00
2	7.0	20.7	66	-	11.25
3	7.0	20.2	68	-	5.15
4	6.8	20.0	72	-	2.94
5	3.8	20.0	73	-	0.68
6	4.2	19.9	71	-	0.21
7	5.2	19.9	70	-	0.09
8	5.6	19.9	70	-	-
9	5.8	19.9	71	-	-
10	6.0	19.8	70	-	-
11	6.2	19.8	70	-	-
12	6.3	19.8	73	-	-
13	6.4	19.8	78	-	-
14	6.8	19.8	78	-	-
15	6.8	19.8	79	-	-
16	7.0	19.8	79	-	-
17	7.0	19.8	79	-	-
18	7.0	19.8	79	-	-
19	0.4	19.8	79	-	-
20	-	19.8	81	-	-
21	-	19.8	81	-	-

LAGO DE YOJOA

28-SEP-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	26.5	156	-	-
1	-	27.0	158	-	-
2	-	26.5	160	-	-
3	-	26.7	161	-	-
4	-	26.7	163	-	-
5	-	26.5	166	-	-
6	-	-	-	-	-
7	-	26.5	167	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	26.5	171	-	-
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	27.5	197	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-

08-OCT-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	26.7	161	-	-
1	-	26.7	161	-	-
2	-	26.3	161	-	-
3	-	26.5	157	-	-
4	-	26.2	159	-	-
5	-	26.3	160	-	-
6	-	-	-	-	-
7	-	26.2	163	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	26.2	164	-	-
11	-	-	-	-	-
12	-	26.2	167	-	-
13	-	-	-	-	-
14	-	25.5	212	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-
21	-	25.5	188	-	-

LAGO DE YOJOA

31-OCT-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	-	26.3	158	-	-
1	-	25.8	160	-	-
2	-	25.2	159	-	-
3	-	25.0	164	-	-
4	-	24.9	167	-	-
5	-	24.9	167	-	-
6	-	24.8	169	-	-
7	-	24.6	171	-	-
8	-	24.4	172	-	-
9	-	24.3	172	-	-
10	-	24.3	174	-	-
11	-	24.2	176	-	-
12	-	24.2	179	-	-
13	-	23.7	229	-	-
14	-	19.9	249	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
20	-	25.5	216	-	-

22-NOV-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.3	25.3	159	-	-
1	6.0	25.3	163	-	-
2	5.9	25.1	165	-	-
3	5.9	24.9	167	-	-
4	5.8	24.9	168	-	-
5	6.0	24.8	170	-	-
6	6.1	24.7	170	-	-
7	6.0	24.8	170	-	-
8	5.9	24.8	170	-	-
9	5.9	24.8	171	-	-
10	5.9	24.6	174	-	-
11	5.9	24.5	174	-	-
12	5.8	24.5	174	-	-
13	5.7	24.5	175	-	-
14	5.8	24.4	176	-	-
15	5.8	24.3	177	-	-
16	5.7	24.3	178	-	-
17	5.7	24.3	183	-	-
18	5.5	24.2	179	-	-
19	5.5	24.3	181	-	-
20	5.4	24.3	181	-	-
21	5.3	24.3	181	-	-
22	5.3	24.3	182	-	-
23	0.5	24.3	229	-	-

LAGO DE YOJOA

06-DEC-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	24.9	170	-	-
1	8.4	24.0	172	-	-
2	8.2	23.9	174	-	-
3	8.1	23.9	174	-	-
4	8.0	23.8	174	-	-
5	7.9	23.8	174	-	-
6	7.8	23.9	175	-	-
7	7.8	23.9	175	-	-
8	7.7	23.9	175	-	-
9	7.6	23.9	175	-	-
10	7.6	24.0	175	-	-
11	7.4	24.0	176	-	-
12	7.3	24.0	176	-	-
13	7.3	24.0	177	-	-
14	7.3	24.0	178	-	-
15	7.3	24.0	179	-	-
16	7.3	24.0	180	-	-
17	7.1	24.0	182	-	-
18	6.9	24.1	182	-	-
19	6.7	24.0	182	-	-
20	6.9	24.0	183	-	-
21	0.9	24.0	-	-	-

27-DEC-79

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.6	23.5	157	-	-
1	7.4	23.5	159	-	-
2	7.6	23.5	161	-	-
3	7.6	23.5	162	-	-
4	7.6	23.5	165	-	-
5	7.5	23.5	165	-	-
6	7.5	23.0	168	-	-
7	7.5	23.0	168	-	-
8	7.5	23.0	169	-	-
9	7.5	23.0	170	-	-
10	7.4	23.0	170	-	-
11	7.4	23.0	171	-	-
12	7.4	23.0	171	-	-
13	7.4	23.0	172	-	-
14	7.5	23.0	173	-	-
15	7.7	23.0	174	-	-
16	7.7	23.0	175	-	-
17	7.6	23.0	175	-	-
18	7.6	23.0	176	-	-
19	7.5	23.0	177	-	-
20	7.5	23.0	179	-	-
21	7.5	23.0	179	-	-

LAGO DE YOJOA

17-JAN-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.8	24.5	167	-	-
1	7.9	24.5	169	-	-
2	7.9	24.0	171	-	-
3	7.9	23.8	172	-	-
4	8.0	23.5	173	-	-
5	8.0	23.5	173	-	-
6	8.0	23.3	175	-	-
7	7.5	23.0	175	-	-
8	6.8	23.0	176	-	-
9	6.0	22.8	178	-	-
10	5.3	22.8	177	-	-
11	5.6	22.5	178	-	-
12	5.4	22.5	181	-	-
13	5.4	22.4	181	-	-
14	5.4	22.5	182	-	-
15	5.6	22.4	183	-	-
16	5.0	22.2	184	-	-
17	4.9	22.1	185	-	-
18	4.0	22.1	188	-	-
19	3.8	22.1	189	-	-
20	3.7	22.0	190	-	-
21	3.7	22.0	191	-	-
22	0.0	22.0	192	-	-

07-FEB-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.8	23.6	169	-	-
1	8.3	22.5	177	-	-
2	8.0	22.3	178	-	-
3	7.8	22.2	178	-	-
4	7.8	22.2	179	-	-
5	7.8	22.1	180	-	-
6	7.8	22.1	180	-	-
7	7.6	22.2	181	-	-
8	7.5	22.2	181	-	-
9	7.6	22.2	183	-	-
10	7.6	22.2	183	-	-
11	7.5	22.2	183	-	-
12	7.5	22.2	184	-	-
13	7.4	22.2	184	-	-
14	7.4	22.2	185	-	-
15	7.3	22.2	185	-	-
16	7.3	22.2	186	-	-
17	7.2	22.2	187	-	-
18	7.1	22.2	188	-	-
19	7.0	22.2	189	-	-
20	6.2	22.2	191	-	-
21	4.6	22.1	214	-	-
22	0.0	22.0	215	-	-

LAGO DE YOJOA

21-FEB-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.3	26.0	168	-	-
1	7.3	24.7	170	-	-
2	7.3	24.3	172	-	-
3	7.3	24.1	173	-	-
4	7.3	24.0	174	-	-
5	7.4	23.5	175	-	-
6	7.4	24.0	174	-	-
7	7.4	24.0	174	-	-
8	7.5	23.7	175	-	-
9	7.5	23.6	176	-	-
10	7.0	23.6	177	-	-
11	6.7	23.5	177	-	-
12	6.5	23.4 23.4	178	-	-
13	6.4	23.4	179	-	-
14	6.0	23.3	179	-	-
15	6.0	23.3	180	-	-
16	6.2	23.2	183	-	-
17	6.2	23.2	183	-	-
18	3.2	22.6	187	-	-
19	3.0	22.6	188	-	-
20	2.6	22.0	191	-	-
21	2.6	22.1	192	-	-
22	1.8	22.2	209	-	-
23	1.8	22.2	209	-	-
24	1.8	22.3	210	-	-

20-MAR-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.7	25.8	171	-	100.00
1	7.6	25.6	171	-	45.22
2	7.7	25.2	173	-	35.65
3	7.6	25.1	173	-	28.70
4	7.6	25.1	174	-	23.48
5	7.5	24.9	174	-	18.52
6	7.6	24.9	178	-	14.87
7	7.5	24.9	177	-	12.52
8	7.4	24.9	178	-	9.65
9	7.2	24.8	178	-	7.48
10	7.2	24.7	178	-	5.91
11	7.0	24.4	181	-	4.44
12	6.9	24.2	184	-	3.30
13	6.5	24.0	184	-	2.52
14	5.8	23.8	185	-	1.84
15	4.8	23.7	180	-	1.32
16	3.8	23.3	187	-	1.00
17	1.2	23.1	191	-	0.70
18	0.3	23.0	192	-	0.30
19	0.2	23.0	193	-	0.10
20	0.1	23.0	194	-	0.04

LAGO DE YOJOA

10-APR-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.6	25.8	244	-	100.00
1	7.6	25.8	219	-	17.52
2	6.9	26.0	221	-	17.48
3	6.8	26.0	222	-	17.54
4	7.0	25.9	207	-	17.44
5	7.0	25.8	204	-	1.75
6	6.9	25.8	191	-	1.76
7	6.8	25.8	181	-	1.77
8	6.9	25.8	189	-	0.18
9	6.8	25.7	194	-	0.18
10	6.8	25.7	178	-	0.18
11	6.7	25.7	181	-	0.18
12	6.5	25.3	185	-	0.17
13	6.5	25.2	182	-	0.02
14	6.6	25.3	182	-	0.02
15	6.4	24.9	183	-	0.02
16	6.2	24.9	183	-	0.02
17	5.7	24.3	186	-	0.00
18	5.1	24.3	188	-	0.00
19	5.5	24.0	190	-	0.00
20	5.1	24.0	192	-	0.00

01-MAY-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.5	25.9	171	-	100.00
1	7.5	25.5	176	-	48.15
2	7.5	25.3	177	-	41.77
3	7.5	25.2	178	-	34.18
4	7.4	24.9	178	-	26.30
5	7.3	24.6	180	-	18.52
6	7.3	24.6	181	-	15.77
7	7.3	24.5	181	-	12.31
8	7.3	24.5	182	-	9.37
9	7.2	24.5	182	-	7.44
10	7.2	24.4	183	-	5.82
11	7.1	24.3	183	-	4.43
12	6.9	24.1	187	-	3.42
13	6.8	24.0	188	-	2.61
14	6.7	24.0	189	-	2.07
15	6.7	24.0	189	-	1.53
16	5.6	23.8	191	-	1.05
17	3.0	23.4	194	-	0.63
18	0.3	23.0	198	-	-
19	0.1	23.0	221	-	-
20	-	-	-	-	-

LAGO DE YOJOA

22-MAY-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	11.4	27.5	169	-	100.00
1	12.8	27.0	171	-	59.04
2	12.7	27.0	174	-	38.55
3	12.8	27.0	171	-	30.12
4	12.2	27.0	176	-	24.10
5	12.6	27.0	176	-	19.88
6	12.6	27.0	176	-	16.27
7	12.6	27.0	175	-	13.01
8	12.4	27.0	175	-	10.48
9	12.1	26.8	176	-	8.43
10	11.2	25.8	178	-	6.75
11	11.0	25.4	182	-	5.18
12	9.2	24.8	184	-	4.10
13	6.9	24.4	185	-	3.13
14	6.2	24.0	185	-	2.04
15	4.2	23.9	185	-	1.39
16	1.8	23.8	185	-	0.83
17	0.4	23.6	195	-	0.37
18	0.1	23.6	195	-	-
19	0.0	23.6	202	-	-
20	-	-	-	-	-

12-JUN-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.6	26.2	168	14.39	100.00
1	6.5	26.2	171	-	39.62
2	6.4	26.2	173	7.40	29.43
3	6.3	26.2	173	-	22.64
4	6.3	26.2	174	10.35	17.55
5	6.3	26.0	185	-	13.58
6	6.3	26.0	182	-	10.38
7	6.3	26.0	176	5.89	7.92
8	6.3	26.1	176	-	6.04
9	6.2	26.0	176	-	4.53
10	6.2	26.0	177	3.79	3.37
11	6.0	26.0	181	-	2.46
12	6.0	26.0	182	-	1.83
13	6.9	26.0	183	1.95	1.51
14	2.7	25.6	189	-	0.87
15	0.4	24.9	194	-	0.43
16	0.2	24.2	199	3.52	-
17	0.2	23.8	222	-	-
18	0.1	23.7	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-

LAGO DE YOJOA

03-JUL-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	26.8	164	16.28	100.00
1	8.0	26.8	166	-	37.11
2	8.2	26.8	167	19.01	25.77
3	8.2	26.8	168	-	21.65
4	8.2	26.7	170	22.67	17.52
5	8.1	26.5	171	-	14.09
6	8.1	26.5	173	-	11.00
7	8.1	26.5	173	20.03	8.93
8	8.1	26.5	173	-	7.08
9	8.0	26.5	174	-	5.62
10	8.0	26.5	175	9.27	4.80
11	7.9	26.3	177	-	3.60
12	7.8	26.3	179	-	2.80
13	7.2	26.2	182	4.89	2.12
14	6.0	26.0	185	-	1.57
15	2.8	25.5	188	-	1.18
16	0.4	25.2	190	1.23	0.64
17	0.2	25.0	198	-	-
18	0.2	24.8	223	-	-
19	-	-	-	-	-
20	-	-	-	-	-

24-JUL-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.7	26.5	164	15.22	100.00
1	7.5	25.4	169	-	43.53
2	7.5	26.4	169	9.28	36.14
3	7.5	26.3	166	-	27.44
4	7.4	26.4	167	9.65	23.13
5	7.4	26.3	168	-	18.07
6	7.3	26.3	170	-	13.37
7	7.3	26.2	171	9.38	11.22
8	7.3	26.2	172	-	8.89
9	7.3	26.2	173	-	6.90
10	7.2	26.2	173	6.19	5.49
11	7.2	26.2	174	-	4.27
12	7.1	26.2	175	-	3.33
13	7.1	26.2	175	3.70	2.61
14	6.9	26.2	175	-	2.01
15	5.0	26.0	172	-	1.21
16	4.5	25.7	176	1.83	0.91
17	4.0	25.6	182	-	0.53
18	2.6	25.5	189	-	-
19	0.2	25.1	217	-	-
20	-	-	-	-	-

LAGO DE YOJOA

14-AUG-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.0	27.0	162	4.65	100.00
1	6.8	27.6	158	-	49.76
2	6.8	25.5	167	7.20	31.94
3	6.8	25.3	169	-	26.13
4	6.8	25.3	170	7.73	18.37
5	6.8	25.3	171	-	14.15
6	6.8	25.3	171	-	9.44
7	6.8	25.3	172	7.74	6.80
8	6.7	25.2	172	-	8.21
9	6.6	25.2	173	-	7.04
10	6.6	25.2	174	7.10	5.50
11	5.7	25.0	178	-	4.31
12	5.7	25.0	177	-	3.38
13	5.6	25.0	180	6.82	2.58
14	5.4	25.0	181	-	1.87
15	4.3	24.9	182	-	1.49
16	4.3	24.9	186	4.80	0.84
17	3.8	24.9	190	-	-
18	2.4	24.9	207	-	-
19	0.2	24.9	215	-	-
20	-	-	-	-	-

04-SEP-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.2	27.3	163	12.53	100.00
1	9.2	27.1	164	-	43.06
2	9.2	26.8	164	8.95	29.17
3	9.0	26.6	165	-	19.17
4	8.7	26.5	166	12.40	12.92
5	8.1	26.5	166	-	8.36
6	7.9	26.5	167	-	5.34
7	7.9	26.4	167	17.62	3.89
8	7.8	26.4	168	-	2.50
9	7.6	26.3	169	-	1.72
10	7.7	26.3	171	3.64	1.18
11	7.9	26.3	173	-	0.77
12	7.9	26.3	174	-	0.56
13	7.7	26.3	174	1.35	0.37
14	7.4	26.3	174	-	0.26
15	7.1	26.3	175	-	0.15
16	1.2	25.8	179	13.70	0.10
17	0.5	25.4	190	-	0.06
18	0.4	25.2	197	-	0.04
19	0.3	25.0	203	-	0.02
20	-	-	-	-	0.01

LAGO DE YOJOA

11-SEP-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.1	27.2	156	-	-
1	7.0	27.0	159	-	-
2	7.0	26.7	160	-	-
3	7.2	26.7	158	-	-
4	7.2	26.6	158	-	-
5	7.1	26.5	161	-	-
6	7.0	26.7	168	-	-
7	7.0	26.5	163	-	-
8	7.0	26.5	163	-	-
9	7.0	26.5	164	-	-
10	6.8	26.5	164	-	-
11	6.8	26.4	166	-	-
12	6.8	26.4	174	-	-
13	6.7	26.3	176	-	-
14	5.4	26.0	178	-	-
15	5.4	25.9	180	-	-
16	5.3	25.9	181	-	-
17	5.3	25.9	184	-	-
18	5.3	25.9	185	-	-
19	3.4	25.8	189	-	-
20	0.3	25.3	197	-	-

25-SEP-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.7	26.4	156	20.28	100.00
1	6.6	26.3	158	-	43.06
2	6.6	26.3	159	20.38	29.17
3	6.6	26.3	159	-	19.17
4	6.4	26.2	161	13.01	12.92
5	6.4	26.2	162	-	8.36
6	6.3	26.1	163	-	5.34
7	6.2	26.2	163	6.05	3.89
8	6.3	26.2	164	-	2.50
9	6.2	26.2	164	-	1.72
10	6.2	26.2	165	1.99	1.18
11	6.1	26.2	165	-	0.77
12	6.2	26.2	166	-	0.56
13	6.2	26.2	167	0.65	0.37
14	6.1	26.2	168	-	0.26
15	5.9	26.2	170	-	0.15
16	5.9	26.1	171	0.08	0.10
17	4.5	26.0	176	-	0.06
18	3.2	25.9	177	-	0.04
19	0.4	25.4	189	-	0.02
20	0.3	25.3	194	-	0.01
21	0.3	25.1	200	-	-

LAGO DE YOJOA

29-OCT-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.1	26.1	159	10.35	100.00
1	8.1	25.5	161	-	48.57
2	8.2	25.3	162	19.19	34.25
3	8.1	25.2	164	-	21.92
4	8.2	25.2	166	20.29	18.00
5	8.1	25.1	168	-	12.55
6	8.1	25.1	168	-	9.20
7	7.9	25.0	169	14.95	6.84
8	7.8	25.0	170	-	5.00
9	8.0	25.1	171	-	3.59
10	7.9	25.1	172	8.18	2.86
11	7.8	25.1	173	-	2.12
12	7.8	25.1	176	-	1.59
13	7.7	25.1	177	2.69	1.20
14	7.7	25.1	178	-	0.89
15	7.8	25.1	178	-	0.77
16	6.1	25.0	179	1.35	0.50
17	5.7	24.9	180	-	-
18	3.7	24.8	181	-	-
19	3.9	24.7	182	-	-
20	3.4	24.7	184	-	-
21	2.0	24.7	189	-	-
22	0.0	-	233	-	-

12-NOV-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.2	23.8	165	19.35	100.00
1	7.1	23.8	166	-	11.10
2	7.0	23.5	167	19.30	9.30
3	6.9	23.7	167	-	7.19
4	6.9	23.7	168	16.62	7.59
5	6.8	23.7	169	-	6.39
6	6.7	23.7	172	-	5.25
7	6.7	23.7	172	6.61	4.21
8	6.7	23.7	173	-	3.10
9	6.6	23.7	174	-	2.14
10	6.6	23.6	176	3.22	1.68
11	6.6	23.5	177	-	1.46
12	6.6	23.5	182	-	0.84
13	6.6	23.6	181	0.78	0.59
14	6.5	23.6	182	-	0.47
15	6.5	23.6	183	-	-
16	6.5	23.7	183	0.26	-
17	6.5	23.7	184	-	-
18	6.4	23.7	184	-	-
19	6.3	23.7	184	-	-
20	6.1	23.7	186	-	-
21	5.8	23.7	189	-	-
22	4.5	23.5	195	-	-

A10-562

LAGO DE YOJOA

27-NOV-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.8	24.7	162	22.94	100.00
1	7.8	24.7	162	-	27.93
2	7.7	24.4	164	20.85	22.76
3	7.7	24.3	166	-	17.93
4	7.7	24.3	167	17.54	13.10
5	7.7	24.3	168	-	9.66
6	7.7	24.3	167	-	7.00
7	7.7	24.3	168	7.86	5.27
8	7.7	24.3	169	-	3.93
9	7.7	24.3	170	-	2.82
10	7.7	24.3	170	3.78	2.82
11	7.7	24.3	171	-	1.52
12	7.7	24.2	172	-	1.14
13	7.7	24.2	173	0.94	0.78
14	7.7	24.2	173	-	0.57
15	7.6	24.2	173	-	0.37
16	7.6	24.2	174	0.08	0.33
17	7.5	24.2	175	-	0.24
18	7.3	24.2	176	-	-
19	7.2	24.2	176	-	-
20	7.0	24.1	178	-	-
21	7.0	24.1	178	-	-
22	6.1	24.0	183	-	-
23	4.8	24.0	210	-	-

18-DEC-80

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.3	22.8	165	20.33	100.00
1	7.2	22.8	166	-	35.21
2	7.1	22.7	166	36.27	18.50
3	7.0	22.6	172	-	11.39
4	6.9	22.5	171	19.96	6.92
5	6.9	22.5	171	-	3.73
6	6.8	22.4	170	-	2.39
7	6.7	22.5	173	5.61	1.33
8	6.7	22.4	174	-	0.86
9	6.7	22.4	175	-	0.50
10	6.7	22.4	175	1.02	0.30
11	6.7	22.4	176	-	0.19
12	6.7	22.4	179	-	0.10
13	6.7	22.4	180	0.27	-
14	6.6	22.4	180	-	-
15	6.6	22.3	181	-	-
16	6.6	22.3	183	0.18	-
17	6.7	22.4	182	-	-
18	6.7	22.3	183	-	-
19	6.7	22.3	183	-	-
20	6.7	22.3	183	-	-
21	6.6	22.3	199	-	-
22	6.6	22.3	-	-	-
23	6.5	22.3	-	-	-

LAGO DE YOJOA

09-JAN-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.6	21.6	164	11.61	100.00
1	8.1	21.3	165	-	44.62
2	8.1	22.3	162	15.55	30.99
3	8.1	22.2	162	-	13.52
4	8.1	22.2	163	16.08	10.99
5	8.1	22.2	164	-	7.46
6	8.0	21.2	169	-	5.35
7	7.9	21.1	169	10.62	3.33
8	7.9	21.1	170	-	2.77
9	7.9	21.1	171	-	2.00
10	7.8	21.1	172	5.98	1.49
11	7.8	21.1	173	-	1.13
12	7.5	21.0	176	-	0.78
13	7.7	21.0	176	2.32	0.58
14	7.6	21.0	176	-	0.41
15	7.5	21.0	177	-	0.24
16	7.3	21.0	177	0.83	0.16
17	7.2	21.0	178	-	0.12
18	6.9	21.0	178	-	0.06
19	6.8	20.9	180	-	0.05
20	6.6	20.9	182	-	-
21	4.3	20.9	198	-	-

29-JAN-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.9	22.2	168	2.16	100.00
1	8.7	22.1	169	-	15.19
2	8.7	22.1	171	-	22.06
3	8.7	22.0	171	6.74	13.70
4	8.7	21.8	172	-	17.73
5	8.7	21.6	171	-	14.06
6	8.6	21.4	172	9.23	11.67
7	8.6	21.4	172	-	7.31
8	8.5	21.3	173	-	6.11
9	8.4	21.3	174	7.32	5.67
10	8.2	21.1	175	-	3.89
11	7.7	20.9	175	-	2.91
12	7.6	20.8	176	2.49	1.97
13	7.5	20.8	176	-	1.32
14	7.5	20.7	176	-	0.91
15	7.5	20.7	176	0.74	0.53
16	7.3	20.7	177	-	0.39
17	6.4	20.6	178	-	0.20
18	6.4	20.6	179	0.23	0.11
19	6.3	20.5	179	-	0.06
20	6.3	20.5	179	-	0.03
21	0.4	20.5	219	-	-

LAGO DE YOJOA

24-FEB-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.9	22.3	179	3.39	100.00
1	6.8	22.3	179	-	46.99
2	6.8	22.3	179	-	34.94
3	6.7	22.2	179	6.74	26.51
4	6.6	22.1	180	-	19.16
5	6.6	22.0	181	-	13.73
6	6.6	22.0	181	9.23	10.37
7	6.5	21.9	182	-	7.41
8	6.5	21.9	182	-	5.56
9	6.5	21.9	183	7.32	4.02
10	6.4	21.9	183	-	2.93
11	6.4	21.9	183	-	2.07
12	6.4	21.9	183	2.49	1.55
13	6.4	21.8	184	-	1.16
14	6.3	21.8	184	-	0.83
15	6.3	21.8	184	0.74	0.59
16	5.9	21.8	185	-	0.39
17	5.3	21.7	185	-	0.23
18	5.1	21.6	186	0.23	0.14
19	4.2	21.3	188	-	-
20	2.7	21.2	189	-	-
21	2.3	21.0	190	-	-

26-MAR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.7	23.8	171	9.67	100.00
1	7.4	23.7	169	-	39.68
2	7.4	23.5	169	-	29.00
3	7.4	23.4	169	13.23	20.00
4	7.4	23.3	169	-	19.03
5	7.3	23.3	169	-	10.00
6	7.3	23.2	171	9.01	7.33
7	7.3	23.2	172	-	5.22
8	7.3	23.2	172	-	4.07
9	7.3	23.2	172	3.26	2.66
10	7.3	23.2	172	-	1.89
11	7.3	23.2	173	-	1.31
12	7.2	23.2	171	0.90	0.96
13	7.2	23.2	172	-	0.59
14	7.2	23.2	172	-	0.38
15	7.2	23.1	173	0.23	0.26
16	7.1	23.1	173	-	0.15
17	7.1	23.1	174	-	0.10
18	5.7	22.1	178	0.05	0.06
19	5.2	21.7	180	-	-
20	3.4	21.5	182	-	-
21	3.1	21.4	198	-	-
22	2.6	21.4	-	-	-

% sat

LAGO DE YOJOA

23-APR-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	98.7 25.1	171	14.81	100.00
1	8.1	99.6 24.9	171	-	27.71
2	8.0	98.4 24.9	171	-	20.48
3	7.9	96.8 24.7	172	7.21	13.21
4	7.4	90.4 24.5	173	-	9.40
5	7.4	90.2 24.4	174	-	7.02
6	7.4	89.9 24.2	174	11.07	5.24
7	7.4	90.8 24.8	172	-	4.00
8	7.4	90.8 24.8	172	-	2.94
9	7.3	89.6 24.8	172	5.36	2.14
10	7.3	89.4 24.7	172	-	1.57
11	7.1	89.2 24.5	173	-	1.18
12	7.2	88.6 24.3	178	1.75	0.88
13	7.0	88.4 24.0	178	-	-
14	6.4	89.3 24.0	175	-	-
15	5.2	83.8 23.8	176	0.32	-
16	2.1	25.0 23.0	179	-	-
17	0.4	4.5 22.5	255	-	-
18	0.2	2.3 22.0	258	-1.31	-
19	0.1	1.2 21.9	291	-	-
20	-	2.0 -	-	-	-

29-MAY-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.4	27.5	164	6.97	100.00
1	8.4	27.5	164	-	30.65
2	7.4	27.5	164	-	25.43
3	6.8	27.4	166	12.81	18.51
4	6.8	27.4	166	-	12.55
5	6.8	27.4	166	-	9.13
6	6.6	27.4	166	5.86	6.74
7	6.6	27.3	166	-	4.98
8	6.6	27.3	166	-	3.50
9	6.5	27.3	166	1.27	2.56
10	6.4	27.2	169	-	1.93
11	5.8	26.4	172	-	1.33
12	4.4	25.6	175	0.28	0.89
13	2.2	25.4	183	-	0.61
14	2.2	24.6	188	-	0.47
15	0.6	23.8	192	0.16	0.27
16	0.4	24.0	191	-	0.15
17	0.4	23.8	192	-	0.04
18	0.4	23.5	225	0.05	-
19	0.4	23.5	236	-	-
20	-	23.5	236	-	-

LAGO DE YOJOA

01-JUL-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.7	26.0	155	148.99	100.00
1	7.8	25.8	157	-	41.18
2	7.8	25.8	158	-	30.88
3	7.7	25.7	158	13.87	23.53
4	7.6	25.6	159	-	17.65
5	7.7	25.6	159	-	13.24
6	7.6	25.6	159	4.01	10.15
7	7.2	25.6	160	-	7.50
8	7.2	25.5	161	-	5.88
9	7.0	25.5	162	4.78	4.71
10	7.0	25.5	161	-	3.56
11	6.8	25.5	161	-	2.81
12	6.9	25.5	160	2.69	2.09
13	5.2	25.0	165	-	1.56
14	0.7	24.5	187	-	0.89
15	0.4	24.3	188	1.29	0.50
16	0.4	22.8	198	-	0.15
17	0.3	22.5	190	-	-
18	0.3	22.2	205	-	-
19	0.3	22.0	-	-	-
20	-	-	-	-	-

03-AUG-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.8	25.3	158	14.84	100.00
1	7.8	25.2	157	-	44.30
2	7.8	25.1	158	-	35.23
3	7.7	25.1	158	19.15	25.00
4	7.6	25.0	160	-	19.77
5	7.6	25.0	161	-	13.57
6	7.6	25.0	161	17.87	11.01
7	7.6	25.0	161	-	8.05
8	7.6	24.9	163	-	5.71
9	7.6	24.9	163	6.21	4.68
10	7.5	24.9	163	-	3.23
11	7.5	24.9	165	-	2.52
12	7.5	24.9	166	3.73	1.89
13	7.5	24.9	166	-	1.46
14	7.4	24.9	166	-	1.04
15	7.3	24.9	168	0.74	0.79
16	2.6	24.5	172	-	-
17	0.9	23.8	191	-	-
18	0.7	23.3	203	0.29	-
19	0.5	23.0	205	-	-
20	0.5	23.0	263	-	-

LAGO DE YOJOA

26-AUG-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.5	25.7	155	4.54	100.00
1	8.2	25.5	179	-	36.67
2	8.2	25.4	158	-	34.43
3	8.2	25.2	160	6.65	25.81
4	8.2	25.2	160	-	20.32
5	8.2	25.1	161	-	15.47
6	8.2	25.1	162	6.25	12.19
7	8.2	25.1	162	-	9.23
8	8.0	25.1	162	-	7.54
9	7.5	25.1	162	5.47	5.85
10	7.5	25.1	161	-	4.62
11	7.1	25.0	162	-	3.21
12	6.4	24.6	166	3.92	2.26
13	5.5	24.4	172	-	1.69
14	4.3	24.2	174	-	1.18
15	1.3	23.6	187	1.06	0.79
16	0.8	23.2	193	-	-
17	0.5	23.0	208	-	-
18	0.4	22.8	210	0.24	-
19	0.4	22.8	211	-	-
20	-	-	-	-	-

02-OCT-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.8	25.5	158	4.98	100.00
1	7.6	25.0	160	-	45.28
2	7.6	25.0	160	-	33.00
3	7.3	25.0	161	10.50	25.93
4	7.4	25.0	161	-	20.00
5	7.3	25.0	161	-	16.00
6	7.3	24.9	162	9.70	12.00
7	7.0	24.9	162	-	9.20
8	7.2	24.9	162	-	7.07
9	6.9	24.9	164	6.35	5.27
10	6.8	24.9	164	-	3.68
11	6.6	24.9	164	-	2.64
12	5.6	24.7	168	3.40	2.06
13	5.4	24.5	168	-	1.62
14	5.2	24.2	171	-	1.10
15	1.3	24.0	174	2.33	0.72
16	0.6	23.8	180	-	-
17	0.5	23.5	189	-	-
18	0.4	23.2	199	-	-
19	0.4	23.0	206	-	-
20	0.4	22.8	211	-	-

LAGO DE YOJOA

13-NOV-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.4	22.3	163	2.85	100.00
1	5.4	22.2	164	-	48.48
2	4.8	22.0	170	-	35.14
3	4.8	22.0	170	4.75	25.71
4	5.0	22.0	171	-	20.27
5	4.8	21.9	171	-	15.29
6	4.4	21.9	172	2.66	10.56
7	4.3	21.9	172	-	7.86
8	4.3	21.9	173	-	4.69
9	4.3	21.9	173	1.27	4.07
10	4.5	21.9	173	-	3.21
11	4.2	21.9	175	-	2.09
12	4.2	21.9	176	0.79	1.62
13	4.2	21.8	176	-	1.22
14	4.3	21.8	176	-	0.94
15	4.1	21.8	177	0.62	-
16	4.1	21.8	177	-	-
17	4.1	21.8	178	-	-
18	3.8	21.8	178	0.04	-
19	3.7	21.8	178	-	-
20	3.6	21.8	178	-	-

24-NOV-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.0	21.8	172	-	-
1	6.9	21.7	172	-	-
2	6.7	21.5	173	-	-
3	6.7	21.5	173	-	-
4	6.7	21.5	173	-	-
5	6.5	21.4	174	-	-
6	6.4	21.4	174	-	-
7	6.3	21.3	175	-	-
8	6.2	21.3	175	-	-
9	6.1	21.3	176	-	-
10	6.1	21.2	176	-	-
11	6.1	21.2	176	-	-
12	6.1	21.2	177	-	-
13	6.1	21.2	177	-	-
14	6.1	21.2	177	-	-
15	6.1	21.2	178	-	-
16	6.0	21.2	178	-	-
17	6.0	21.2	178	-	-
18	6.0	21.2	178	-	-
19	6.0	21.2	178	-	-
20	5.9	21.2	180	-	-
21	5.9	21.2	180	-	-
22	5.9	21.2	180	-	-
23	5.7	21.2	180	-	-
24	5.3	21.2	178	-	-
25	0.7	21.2	224	-	-

LAGO DE YOJOA

14-DEC-81

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	22.5	169	19.50	100.00
1	8.0	21.9	171	-	41.18
2	8.0	21.9	170	-	25.76
3	7.9	21.7	171	33.23	17.29
4	7.9	21.7	171	-	14.12
5	7.8	21.7	171	-	8.94
6	7.8	21.7	171	27.15	6.35
7	7.8	21.7	171	-	4.35
8	7.8	21.6	171	-	3.29
9	7.6	21.6	171	15.32	2.21
10	7.6	21.6	174	-	1.60
11	7.6	21.7	173	-	1.16
12	7.4	21.5	174	4.57	0.80
13	7.4	21.3	175	-	-
14	7.4	21.3	175	-	-
15	7.4	21.3	175	1.67	-
16	7.4	21.0	177	-	-
17	7.2	21.0	177	-	-
18	6.9	21.0	176	0.69	-
19	6.4	21.0	176	-	-
20	0.5	21.0	176	-	-
21	0.4	20.9	176	-	-
22	0.3	20.9	176	-	-

19-JAN-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.7	20.2	179	9.06	100.00
1	7.0	20.2	170	-	34.44
2	6.7	19.8	180	-	21.00
3	7.0	19.8	180	14.43	15.67
4	6.9	19.8	180	-	9.22
5	6.9	19.8	180	-	6.11
6	6.9	19.7	180	11.57	4.29
7	6.6	19.8	181	-	2.93
8	6.6	19.8	181	-	2.03
9	6.7	19.8	181	3.08	1.41
10	6.7	19.7	181	-	0.94
11	6.7	19.7	181	-	-
12	6.6	19.7	181	2.08	-
13	6.4	19.7	182	-	-
14	5.9	19.6	184	-	-
15	4.9	19.6	184	0.59	-
16	4.6	19.5	184	-	-
17	2.2	19.4	185	-	-
18	2.2	19.3	186	0.09	-
19	0.8	19.2	188	-	-
20	0.6	19.2	189	-	-

LAGO DE YOJOA

24-FEB-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.0	21.4	174	6.43	100.00
1	7.6	21.2	175	-	41.11
2	7.9	20.5	178	-	27.67
3	7.8	21.0	176	17.65	23.08
4	7.9	21.0	176	-	17.47
5	7.8	21.0	177	-	13.00
6	7.8	21.0	177	16.56	9.22
7	7.9	20.8	179	-	7.11
8	8.0	20.9	179	-	5.38
9	7.7	20.9	179	12.10	4.29
10	7.8	20.9	180	-	3.19
11	7.7	20.8	180	-	2.39
12	7.2	20.8	182	5.69	1.78
13	6.2	20.8	188	-	1.40
14	5.4	20.6	189	-	1.06
15	5.0	20.0	191	1.97	0.78
16	4.4	20.3	190	-	-
17	2.5	20.3	191	-	-
18	2.1	20.2	192	0.16	-
19	1.8	20.2	193	-	-
20	1.4	20.2	193	-	-

23-MAR-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.3	21.5	179	12.57	100.00
1	8.3	20.8	180	-	28.37
2	8.1	20.5	181	-	20.97
3	8.2	20.5	181	25.80	15.33
4	8.5	20.5	182	-	8.91
5	8.3	20.4	184	-	6.85
6	8.5	20.4	185	17.07	5.60
7	8.3	20.3	187	-	4.40
8	7.9	20.3	188	-	2.86
9	7.9	20.1	189	12.79	2.23
10	7.6	20.0	189	-	1.60
11	6.0	19.9	188	-	1.23
12	5.9	19.5	189	7.93	1.01
13	4.3	19.1	189	-	-
14	2.0	19.0	192	-	-
15	1.9	18.9	194	2.08	-
16	0.9	18.8	194	-	-
17	0.8	18.8	195	-	-
18	0.7	18.8	195	0.51	-
19	0.6	18.7	197	-	-
20	-	-	-	-	-

LAGO DE YOJOA

27-APR-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.4	20.8	186	12.61	100.00
1	8.9	20.2	188	-	36.36
2	8.9	20.1	187	-	29.52
3	8.9	20.0	189	21.17	21.29
4	8.7	20.2	189	-	15.23
5	8.8	20.1	190	-	10.72
6	8.8	20.1	190	16.89	7.54
7	8.8	20.1	191	-	5.21
8	8.7	20.1	191	-	3.83
9	8.5	20.1	191	7.93	2.64
10	8.6	19.9	193	-	1.88
11	7.4	19.9	193	-	1.26
12	7.2	19.8	194	2.23	0.78
13	7.0	19.5	196	-	-
14	1.2	18.5	200	-	-
15	0.6	18.2	202	0.07	-
16	0.6	18.0	200	-	-
17	0.5	17.7	201	-	-
18	0.5	17.5	208	0.11	-
19	0.5	17.4	209	-	-
20	0.5	17.4	259	-	-

20-MAY-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	9.1	20.8	152	7.78	100.00
1	8.5	19.9	157	-	40.14
2	8.4	19.8	155	-	26.91
3	8.2	19.6	156	18.84	16.03
4	7.9	19.4	157	-	10.00
5	7.5	19.4	159	-	6.80
6	7.3	19.4	159	16.08	4.55
7	7.1	19.3	159	-	2.89
8	7.1	19.2	161	-	2.06
9	7.3	19.1	161	4.94	1.40
10	7.2	19.0	162	-	0.96
11	5.4	18.9	164	-	-
12	5.4	18.8	164	1.82	-
13	5.4	18.5	166	-	-
14	2.6	18.2	167	-	-
15	0.7	17.7	171	-1.09	-
16	0.4	17.6	176	-	-
17	0.4	17.0	182	-	-
18	0.4	16.8	183	0.62	-
19	0.4	16.5	184	-	-
20	0.3	16.5	233	-	-

LAGO DE YOJOA

28-JUN-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.4	25.8	158	11.98	100.00
1	7.5	25.8	159	-	30.00
2	7.2	25.7	160	-	23.86
3	7.1	25.7	160	21.79	17.50
4	7.1	25.6	162	-	12.00
5	7.2	25.4	162	-	8.09
6	7.2	25.4	163	19.52	5.99
7	7.0	25.6	163	-	4.10
8	7.0	25.4	164	-	2.97
9	7.0	25.4	164	7.33	2.21
10	7.0	25.4	165	-	1.55
11	6.9	25.4	166	-	1.05
12	6.8	25.4	166	2.21	0.80
13	3.2	25.1	170	-	-
14	1.2	25.0	171	-	-
15	0.2	24.6	180	0.39	-
16	0.2	24.0	190	-	-
17	0.2	23.6	191	-	-
18	0.2	23.6	195	-	-
19	-	-	-	-	-
20	-	-	-	-	-

19-JUL-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	6.4	26.1	209	14.76	100.00
1	6.4	26.1	204	-	38.04
2	6.3	25.3	199	-	29.35
3	6.4	25.3	199	26.94	20.65
4	6.6	25.3	197	-	14.35
5	6.9	25.1	196	-	10.76
6	6.8	25.1	180	21.62	7.17
7	6.8	25.1	185	-	5.33
8	6.7	25.1	178	-	3.80
9	6.6	25.1	168	9.55	2.61
10	6.6	25.1	172	-	1.85
11	6.4	25.1	170	-	1.30
12	6.2	25.1	170	3.73	0.87
13	5.8	25.1	170	-	-90.00
14	4.6	25.0	170	-	-
15	4.6	24.8	173	1.30	-
16	1.8	24.8	179	-	-
17	1.5	24.5	180	-	-
18	0.6	24.4	183	-0.01	-
19	0.2	24.4	195	-	-
20	0.0	24.4	201	-	-

LAGO DE YOJOA

24-AUG-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.8	26.5	156	15.25	100.00
1	8.8	26.5	156	-	45.00
2	8.8	26.4	156	-	30.00
3	8.7	26.4	156	49.39	19.50
4	8.7	26.4	156	-	14.21
5	8.6	26.3	156	-	9.79
6	8.6	26.3	156	30.13	6.95
7	8.6	26.3	156	-	4.53
8	8.5	26.2	156	-	3.47
9	8.4	26.2	156	15.38	2.52
10	7.9	26.2	156	-	1.88
11	6.7	26.2	156	-	1.39
12	6.4	26.2	158	4.17	0.96
13	6.1	26.2	158	-	-
14	5.5	26.2	158	-	-
15	5.4	26.2	158	0.63	-
16	5.4	26.2	158	-	-
17	1.2	26.2	158	-	-
18	0.8	26.2	158	0.01	-
19	0.6	26.2	158	-	-
20	0.6	26.2	158	-	-

02-SEP-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	7.6	27.2	158	-	-
1	7.4	27.1	163	-	-
2	7.5	27.1	161	-	-
3	7.4	26.9	161	-	-
4	7.4	26.9	162	-	-
5	7.4	26.8	163	-	-
6	7.3	26.8	163	-	-
7	7.3	26.7	165	-	-
8	7.2	26.7	165	-	-
9	7.3	26.7	167	-	-
10	7.3	26.7	169	-	-
11	7.2	26.7	173	-	-
12	7.2	26.8	175	-	-
13	7.2	26.9	177	-	-
14	7.1	26.9	179	-	-
15	7.1	26.9	178	-	-
16	6.9	26.9	178	-	-
17	2.1	26.8	185	-	-
18	0.7	26.5	187	-	-
19	0.5	26.4	193	-	-
20	0.5	26.3	193	-	-
21	0.5	26.3	239	-	-

LAGO DE YOJOA

05-OCT-82

DEPTH (M)	OXYGEN (MG/L)	TEMPERATURE (CELSIUS)	CONDUCTIVITY (UMHO/CM)	PRIMARY PROD. (MG C M-3 HR-1)	% SURFACE LIGHT
0	8.1	26.5	161	14.11	100.00
1	8.1	26.4	162	-	34.62
2	8.0	26.4	162	-	29.43
3	8.0	26.2	162	17.73	21.05
4	7.9	26.2	162	-	15.61
5	7.8	26.2	162	-	12.69
6	7.7	26.2	163	11.17	8.70
7	7.7	26.2	163	-	6.79
8	7.7	26.2	164	-	5.08
9	7.6	26.2	165	4.58	3.81
10	7.6	26.2	165	-	2.87
11	7.6	26.2	166	-	2.16
12	7.5	26.2	166	1.72	1.67
13	7.2	26.2	169	-	1.33
14	6.2	26.2	173	-	1.03
15	4.6	26.0	175	1.26	0.83
16	1.0	26.0	178	-	0.65
17	0.6	25.8	187	-	0.39
18	0.6	25.5	191	0.05	0.26
19	0.6	25.5	191	-	0.14
20	0.6	25.4	195	-	-
21	0.6	25.3	197	-	-