Seventh Report of the Regular Limnological Survey of Lake Biwa (1973) (III) : Benthos

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Seventh Report of the Regular Limnological Survey of Lake Biwa (1973)
III. Benthos[1)]

By

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The regular limnological survey on benthos at four stations in Lake Biwa has been carrying on since 1965. The aim of the research is to detect quantitatively as well as qualitatively the changes of benthic communities extending over a long period.

The sampling stations and the methods for collection together with the results obtained during past 8 years have been described in the previous papers (Mori et al. 1967; Mori 1970, 1971, 1972, 1976; Suzuki and Mori 1967, 1968).

The number of individuals and fresh weight of them per 15×15 cm with three samples and their average values per m^2 are shown in Tables 1, 2, 3 and 4. In these tables the mark "-" means no specimen was collected.

It has to be noted in this report that there were some misidentification for *Corbicula* species in the former reports, that is, *Corbicula (Corbiculina) leana* Prime was sometimes misidentified as *Cor. sandai* Reinhardt in recent years. In this report it is corrected and the right illustration of the change in density is given in Fig. 5.

The series of reports were edited by the Director of the Station, Syuiti Mori, and the present part, on the benthos, was arranged by Syuiti Mori and Tetsuya Narita. The collection of samples was mainly performed by T. Narita, A. Kawabata and T. Ueda, and other members of the Station have assisted this survey in many ways.

A. Benthic community at Station Ie-1 (northern basin)

The result obtained at Station Ie-1 in the northern main basin, where the depth is about 74 m and the bottom is muddy, is shown in Table 1. Oligochaeta was most abundant and *Anisogammarus* and some chironomid larvae were collected sometimes.

1) Contribution from the Otsu Hydrobiological Station, Kyoto University, No. 267.

Table 1. Composition and abundance of benthic animal community at St. Ie-1

Date	January 17, 1973								February 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	12	344.5	11	357	18+1	816.4	621.6	22.464	16	574	15	400.5	17	460	710.4	21.232
Amphipoda *Anisogammarus annandalei* (Tattersall)	1	14.5	—	—	—	—	14.8	0.213	—	—	—	—	—	—	—	—
Date	**March 17, 1973**								**April 17, 1973**							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Turbellaria *Bdellocephala annandalei* Ijima et Kaburaki	—	—	—	—	—	—	—	—	—	—	1	13.2	—	—	14.8	0.195
Oligochaeta	10	510.2	21	814.4	20+1	858.8	768.12	32.314	8	255.7	9	244.3	11	190.5	412.92	10.221
Amphipoda *Anisogammarus annandalei* (Tattersall)	—	—	—	—	—	—	—	—	1	5.2	1	2.9	—	—	31.08	0.120
Chironomidae larvae *Spaniotoma sp. B*	—	—	—	—	—	—	—	—	1	0.4	3	3.3	—	—	57.72	0.053
Date	**May 14, 1973**								**June 14, 1973**							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	12	394.3	8	267.5	14	352.5	501.72	15.012	32	956.3	21	379.3	17+3	390.3	1078.92	25.543

Date	July 16, 1973								August 9, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Turbellaria *Bdellocephala annandalei* Ijima et Kaburaki	1	51.2	—	—	—	—	14.8	0.739	—	—	—	—	—	—	—	—
Oligochaeta	17	325.3	10	352.3	19	881.5	679.32	23.075	19+1	799.2	23	536.3	15	680.7	856.92	29.841
Amphipoda *Anisogammarus annandalei* (Tattersall)	—	—	2	33.6	—	—	29.6	0.497	—	—	—	—	1	14.0	14.8	0.209

Date	September 11, 1973								October 15, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg²	No.	mg	No./m²	g/m²
Oligochaeta	14	947.9	30	808.4	14	365.7	856.92	31.404	6	56.8	13	552.5	15	536.7	501.72	16.961
Chironomidae larvae Unidentified	—	—	—	—	—	—	—	—	1	0.1	—	—	—	—	14.8	0.001

Date	November 14, 1973								December 12, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Turbellaria *Bdellocephala annandalei* Ijima et Kaburaki	—	—	—	—	—	—	—	—	—	—	—	—	1	12.0	14.8	0.178
Oligochaeta	17	354.0	19	629.5	19	346.6	812.52	19.687	42+1	554.6	33	544.0	33+1	699.6	1629.48	26.613
Amphipoda *Anisogammarus annandalei* (Tattersall)	—	—	—	—	1	1.5	14.8	0.022	—	—	—	—	—	—	—	—
Isopoda *Asellus sp.*	—	—	—	—	1	0.5	14.8	0.009	—	—	—	—	—	—	—	—

B. Benthic communities at Stations Nb-2, Nb-5 and Na-3 (southern basin)

The results obtained at Stations Nb-2, Nb-5 and Na-3 in the southern sub-basin are shown in Tables 2, 3 and 4. Nb-2 (sand or sandy substratum) and Na-3 (mud substratum) are the stations of 0.1 km off the east and west coast of the lake respectively and both are about 2 m in depth, while Nb-5 (mud substratum) is in the central part about 4.5 m in depth.

Results are shown in Tables 2, 3 and 4. Animals found were Oligochaeta, Hirudinea, Chironomidae larvae (more than 6 spp.), Odonata (1 sp.), Crustacea (2 spp.), Gastropoda (7 spp.), Pelecypoda (6 spp.) and Pisces (1 sp.).

Table 2. Composition and abundance of benthic animal community at St. Nb-2

Date	January 17, 1973								Feburuary 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	6	20.6	17	47.1	10	21.7	488	1.3	24	83.4	3	9.4	35	88.2	919	2.7
Chironomidae larvae																
Spaniotoma akamusii Tokunaga	—	—	—	—	—	—	—	—	—	—	—	—	1	0.5	15	0.009
Spaniotoma sp. c	—	—	—	—	—	—	—	—	1	2.4	—	—	1	1.0	31	0.05
Chironomus plumosus (Meigen)	—	—	—	—	—	—	—	—	—	—	1	26.2	—	—	15	0.4
Einfeldia sp.	—	—	1	0.9	—	—	15	0.01	—	—	—	—	1	1.1	15	0.02
Gastropoda																
Semisulcospira decipiens (Wsterlund)	—	—	—	—	—	—	—	—	—	—	—	—	1	20	15	0.3
Pelecypoda																
Corbicula (*Corbiculina*) *leana* Prime	—	—	1	1630	—	—	15	24.1	—	—	—	—	—	—	—	—
Sphaerium japonicum biwaense Mori	—	—	—	—	1	1	15	0.01	2	11	—	—	10	150	178	2.4

Date	March 17, 1973								Apri 17, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	34	135.8	25	138.6	39	99.6	1452	5.5	4	4.2	3	3.2	4	6.2	164	0.2
Amphipoda																
Anisogammarus annandalei (Tattersall)	—	—	—	—	—	—	—	—	—	—	1	10.3	—	—	14.8	0.15
Chironomidae larvae																
Spaniotoma sp. C	—	—	1	1.2	1	1.0	31	0.03	—	—	—	—	—	—	—	—
Einfeldia sp.	2	2.0	—	—	1	1.0	44	0.04	—	—	—	—	—	—	—	—
Chironomid pupae	—	—	—	—	—	—	—	—	—	—	1	1.0	—	—	15	0.01
Gastropoda																
Sinotaia histrica (Gould)	1	1120	—	—	—	—	15	16.6	—	—	—	—	—	—	—	—
Semisulcospira decipiens (Westerlund)	1	180	—	—	1	200	30	5.6	—	—	2	1460	—	—	30	21.6

Pelecypoda																
Unio biwae Kobelt	—	—	1	370	—	—	15	5.5	—	—	2	880	—	—	30	13
Corbicula (*Corbiculina*) *leana* prime	—	—	1	1080	—	—	15	16.0	—	—	—	—	—	—	—	—
Corbicula sandai Reinhardt	—	—	—	—	—	—	—	—	—	—	1	5000	—	—	15	74
Sphaerium japonicum biwaense Mori	1	10	—	—	—	—	15	0.1	4	230	10	375	1+1	10	235	9.1
Date	May 14, 1973								June 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m^2	g/m^2	No.	mg	No.	mg	No.	mg	No./m^2	g/m^2
Oligochaeta	—	—	—	—	4+1	10.6	75	0.2	7	13.8	12+8	5.0	11	11.5	564	0.45
Chironomidae larvae																
Procladius sp.	—	—	—	—	—	—	—	—	—	—	—	—	1	0.7	15	0.01
Chironomus plumosus (Meigen)	1	4.3	1	4.2	4	33.3	89	0.62	—	—	—	—	—	—	—	—
Gastropoda																
Sinotaia historica (Gould)	1	4600	—	—	1	20	30	68.4	2	320	1	30	2	460	75	12
Semisulcospira decipiens (Westerlund)	—	—	—	—	1	1	15	0.01	—	—	2	1200	—	—	30	18
Pelecypoda																
Unio biwae Kobelt	—	—	—	—	—	—	—	—	—	—	1	30	—	—	15	0.44
Corbicula (*Corbiculina*) *leana* prime	—	—	4+5	4	1+2	1	178	0.08	3+3	80	12	600	14	530	475	18
Sphaerium japonicum biwaense Mori	—	—	(1)	—	—	—	—	—	—	—	1	80	1	50	29.6	2.9
Date	July 16, 1973								August 9, 1973							
Sampling	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m^2	g/m^2	No.	mg	No.	mg	No.	mg	No./m^2	g/m^2
Oligochaeta	2	2.4	3	3.8	2	1.0	102	0.11	2	9.9	3	6.2	1	0.5	89	0.24
Chironomidae larvae																
Spaniotoma sp. c	1	0.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Chironomus plumosus (Meigen)	—	—	1	0.6	1	0.7	31	0.02	—	—	—	—	1	0.7	15	1.3
Gastropoda																
Sinotaia historica (Gould)	2	370	—	—	3	800	75	17.3	—	—	1	820	—	—	15	12.1

Semisulcospira decipiens (Westerlund)	2	1110	—	—	—	—	30	14.9	1	150	—	—	—	—	15	2.22
Pelecypoda																
Corbicula (*Corbiculina*) *leana* prime	9	2550	2	600	—	—	164	46.9	4	3090	3	2910	3	1960	147	117.8

Date	September 11, 1973								October 15, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	—	—	2	8.0	2	0.7	58	0.13	5	17.5	4	5.9	—	—	133	0.35
Hirudinea	—	—	—	—	1	32.3	15	0.48	—	—	—	—	—	—	—	—
Chironomidae larvae																
Chironomus plumosus (Meigen)	—	—	2	1.4	—	—	30	0.02	—	—	—	—	—	—	—	—
Gastropoda																
Sinotaia histrica (Gould)	5	2970	1	500	5	5030	164	125.8	—	—	1	20	—	—	15	0.30
Semisulcospira decipiens (Westerlund)	4	1750	—	—	1	180	75	28.6	—	—	2	900	—	—	30	13.3
pelecypoda																
Unio biwae kobelt	—	—	—	—	—	—	—	—	1	120	2	1530	—	—	44	24.4
Corbicula (*Corbiculina*) *leana* prime	—	—	—	—	—	—	—	—	2	2300	13	14200	—	—	222	244

Date	November 14, 1973								December 12, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	7	2.8	16	22.1	18+4	14	666	0.58	8	9.0	3	4.0	12	37.4	342	0.75
Hirudinea	—	—	1	7.2	1	4.6	30	0.17	—	—	1	87.9	—	—	15	1.3
Chironomidae larvae																
Einfeldia sp.	—	—	1	0.4	—	—	15	0.004	—	—	—	—	—	—	—	—
Gastropoda																
Sinotaia histrica (Gould)	—	—	—	—	—	—	—	—	—	—	—	—	1	880	15	13.02
Semisulcospira decipiens (Westerlund)	2	510	—	—	—	—	30	7.5	—	—	—	—	—	—	—	—

Pelecypoda																
Unio biwae Kobelt	—	—	1	650	—	—	15	9.6	—	—	—	—	—	—	—	—
Corbicula (*Corbiculina*) *leana* prime	2	2280	1	1020	4	4800	102	119.9	—	—	2	1990	1	750	44	40.6

Table 3. Composition and abundance of benthic animal community at St. Nb-5.

Date	January 17, 1973								February 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oigochaeta	28	746.3	46	469.6	40	380.1	1687	23.6	37	387.7	25	381.0	41	309.8	1523	16
Hirudinea	—	—	—	—	1	283.1	15	4.2	2	17.0	2	27.6	—	—	58	0.7
Chironomidae larvae																
Procladius sp.	1	1.0	2	2.8	1	1.0	58	0.07	—	—	1	1.4	3	2.0	58	0.05
Clinctanypus sp.	—	—	—	—	—	—	—	—	2	6.9	—	—	—	—	30	0.1
Spaniotoma akamusii (Tokunaga)	12	81.5	32	203.5	14	155.8	857	6.5	21	337.5	17	274.2	26	302.7	946	13.5
Chironomus plumosus (Meigen)	4	77.2	4	177.7	2	74.8	147	4.9	2	69.2	—	—	—	—	30	1.03
Einfeldia sp.	1	4.0	1	2.2	2	2.8	58	0.13	3	8.5	4	9.3	6	12.4	191	0.44
Unidentified	1	0.6	—	—	—	—	15	0.009	—	—	—	—	—	—	—	—
Pelecypoda																
Unio biwae Kobelt	—	—	—	—	—	—	—	—	—	—	—	—	1	2620	15	28.8

Date	March 17, 1973								April 17, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	20	161.5	27	352.8	30	299.3	1141	12.1	15	343.2	13	300.0	16	143.0	653	12.1
Chironomidae larvae																
Procladius sp.	2	3.6	—	—	—	—	30	0.05	—	—	—	—	—	—	—	—
Spaniotoma akamusii (Tokunaga)	11	232.2	15	279.4	14	264.2	591	11.5	2	53.2	3	61.8	3	70.6	120	2.7
Chironomus plumosus (Meigen)	—	—	—	—	2	96.2	30	1.4	—	—	—	—	—	—	—	—
Einfeldia sp.	4	8.5	2	5.2	—	—	89	0.2	—	—	—	—	4	15.6	60	0.23
Gastropoda																
Semisulcospira decipiens (Westerlund)	—	—	—	—	—	—	—	—	1	910	—	—	—	—	15	13.5

Pelecypoda																
Sphaerium japonicum biwaense Mori	—	—	1	20	—	—	15	0.3	1	20	—	—	—	—	15	0.3

Date	May 14, 1973								June 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	14	175.4	7	29.0	10	231.0	457	6.4	6	67.2	13	139.9	7	92.5	386	4.44
Oligochaeta cacoon	—	—	—	—	—	—	—	—	—	—	1	6.4	1	5.4	31	0.17
Chironimidae larvae																
Procladius sp.	2	3.8	—	—	2	5.7	58	0.14	—	—	—	—	—	—	—	—
Clinotanypus sp.	—	—	—	—	—	—	—	—	1	5.2	1	6.2	1	8.9	44	0.30
Spaniotoma akamusii (Tokunaga)	1	7.0	—	—	—	—	15	0.10	—	—	—	—	—	—	—	—
Spaniotoma sp. A	1	0.2	1	0.2	3	0.7	75	0.02	—	—	—	—	—	—	—	—
Chironomus plumosus (Meigen)	23	93.3	16	63.7	25	118.7	946	4.08	8	156.5	16	218.5	19	348.5	635	10.71
Einfeldia sp.	1	4.3	1	4.8	1	3.2	44	0.18	—	—	—	—	—	—	—	—
Unidentified	—	—	—	—	—	—	—	—	2	1.7	—	—	—	—	30	0.03
Gastropoda																
Semisulcospira decipience (Westerlund)	—	—	1	1020	—	—	15	15.1	—	—	—	—	—	—	—	—
Pelecypoda																
Corbicula (*Corbiculina*) *leana* prime	—	—	—	—	—	—	—	—	—	—	—	—	1	20	15	0.3
Pisidium japonicum Pilsbry et Hirase	—	—	—	—	1	40	15	0.59	—	—	—	—	—	—	—	—
Sphaerium japonicum biwaense Mori	—	—	1	80	1	120	30	2.96	—	—	—	—	—	—	—	—
Teleostomi																
Rhinogobius similis (Gill)	—	—	—	—	—	—	—	—	—	—	1	2.3	—	—	15	0.04

Date	July 16, 1973								August 9, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	6+1	109.0	14	126.2	12	136.0	488	5.49	6	47.0	7	190.2	4	97.9	253	5
Hirudinea	4	22.0	1	1.7	2	4.4	102	0.42	—	—	—	—	—	—	—	—
Chironomidae larvae																
Procladius sp.	1	1.0	—	—	—	—	15	0.01	—	—	—	—	—	—	—	—
Chiromomus plumosus (Meigen)	2	34.3	10	218.6	21	404.9	488	9.74	7	175.0	6	112.3	1	0.4	209	4.26

Pelecypoda *Corbicula* (*Corbiculina*) *leana* prime	—	—	—	—	1	300	15	4.44	—	—	—	—	—	—	—	—

Date	September 11, 1973								October 15, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	20	348.3	16	131.8	7	76.5	635	8.24	6+1	62.6	22	134.4	12	63.0	608	3.85
Hirudinea	—	—	—	—	—	—	—	—	—	—	—	—	1	2.2	15	0.03
Chironomidae larvae																
Clinotonypus sp.	—	—	—	—	—	—	—	—	1	0.9	—	—	—	—	15	0.01
Chironomus plumosus (Meigen)	1	12.3	1	20.5	4	103.5	89	2.02	1	0.2	—	—	1	35.8	31	0.53
Gastropoda *Valvata* (*Cincinna*) *japonica* v. Martens	—	—	—	—	—	—	—	—	1	1	—	—	—	—	15	0.01
pelecypoda *Sphaerium japonicum biwaense* Mori	—	—	1	70	—	—	15	1.04	—	—	—	—	—	—	—	—

Date	November 14, 1973								December 12, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	22+2	198.3	32+4	118.7	20	138.0	1185	6.74	44+1	293.9	30	196.4	29	239.2	1541	10.8
Hirudinea	6	20.7	1	5.4	3	13.0	147	0.58	—	—	1	10.2	2	22.2	44	0.5
Chironomidae larvae																
Clinotanypus sp.	—	—	—	—	—	—	—	—	—	—	1	0.4	—	—	15	0.004
Spaniotoma akamusii (Tokunaga)	1	15.0	—	—	5	111.2	89	1.87	18	285.7	12	83.3	11	163.9	608	7.9
Spaniotoma akamusii *pupae*	1	17.7	—	—	—	—	15	0.26	—	—	—	—	—	—	—	—
Chironomus plumosus (Meigen)	2	24.2	4	99.8	4	8.9	147	1.97	6	75.5	1	47.7	6	60.8	191	2.7
Gastropoda *Valvata* (*Cincinna*) *japonica* v. Martens	—	—	—	—	—	—	—	—	—	—	1	1	—	—	15	0.01
Pelecypoda *Alnodonta calipygos* Kobelt	—	—	—	—	1	8100	5	119.9	—	—	—	—	—	—	—	—

Table 4. Composition and abundance of benthic animal community at St. Na-3.

Date	January 17, 1973								February 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	24	206.9	17	146.5	28	90.5	1021	6.6	56	412.2	21	205.6	29	181.1	1567	11.8
Decapoda																
Macrobrachium nipponensis (De Haan)	—	—	—	—	1	10.8	15	0.2	—	—	—	—	—	—	—	—
Chironomidae larvae																
Spanioloma akamusii (Tokunaga)	—	—	3	71.7	1	25.8	58	1.5	18	23.8	1	1.7	5	37.9	355.2	0.94
Spanioloma sp. A	2	1.9	—	—	—	—	30	0.02	—	—	14	26.7	7	11.1	311	0.6
Einfeldia sp.	1	1.8	—	—	—	—	15	0.02	—	—	—	—	—	—	—	—
Chirnomid pupae	—	—	—	—	—	—	—	—	—	—	—	—	2	5.0	30	0.08
Unidentified	1	0.4	1	1.6	—	—	31	0.03	—	—	—	—	—	—	—	—
Gastropoda																
Semisulcospira decipiens (Westerlund)	6	1560	2	1080	1	1300	133	58.3	3	690	5	1540	3	1040	164	48.4
Semisulcospira decipiens reticulata Kajiyama et Habe	1	580	—	—	—	—	15	8.58	—	—	—	—	—	—	—	—
Radix (Biwakoia) onychia (Westerlund)	—	—	—	—	—	—	—	—	—	—	1	1	—	—	15	0.01
Gyraulus biwaensis (Preston)	—	—	—	—	—	—	—	—	—	—	—	—	1	10	15	0.15
Pelecypoda																
Unio biwae Kobetl	—	—	—	—	—	—	—	—	—	—	—	—	1	2020	15	29.9

Date	March 17, 1973								April 17, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No. m²	g/m²
Oligochaeta	11	27.0	38	882.1	28+1	281.0	1154	17.6	8+1	31.7	11	97.6	15	107.8	519	3.5
Oligochaeta cacoon	—	—	—	—	—	—	—	—	—	—	—	—	1	12.0	15	0.2
Chironomidae larvae																
Procladius sp.	1	1.0	—	—	—	—	15	0.01	—	—	—	—	1	2.0	15	0.03
Clinolanypus sp.	1	1.3	—	—	—	—	15	0.01	—	—	1	5.3	—	—	15	0.1
Spaniotoma akamusii (Tokunaga)	—	—	7	51.5	2	6.5	133	0.86	—	—	—	—	—	—	—	—

Spaniotoma sp. C	1	0.7	—	—	9	12.4	147	0.2	—	—	—	—	—	—	—	—
Chironomus halophilus (Kieffer)	—	—	1	2.9	—	—	15	0.04	—	—	—	—	—	—	—	—
Unidentified	2	2.3	—	—	—	—	30	0.04	—	—	—	—	—	—	—	—
Gastropoda																
Semisulcospira decipiens (Westerlund)	8	2691	1	420	—	—	133	48.7	—	—	4	1810	1	60	75.5	27.7
Semisulcospira decipiens reticulata Kajiyama et Habe	1	1920	—	—	—	—	15	28.4	—	—	—	—	—	—	—	—
Radix (Biwakoia) Onychia (Westerlund)	—	—	—	—	1	120	15	1.7	—	—	—	—	—	—	—	—
Gyraulus biwaensis (Preston)	1	1	—	—	—	—	15	0.01	1	10	2	20	—	—	44	0.4
Pettancylus nipponica (Kuroda)	1	1	—	—	—	—	15	0.01	—	—	—	—	—	—	—	—
Pelecypoda																
Unio biwae Kobelt	1	320	—	—	—	—	15	4.7	—	—	—	—	1	4200	15	62.2

Date	May 14, 1973								June 14, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	12+6	—	11	47.0	16	53.0	666	2.2	13+1	63.0	10	74.9	9	64.5	488	3.5
Amphipoda																
Anisogammarus annandalei (Tattersal)	—	—	—	—	—	—	—	—	—	—	1	3.8	—	—	15	0.1
Chironomidae larvae																
Procladius sp.	—	—	—	—	—	—	—	—	1	0.9	—	—	—	—	15	0.01
Cryptochirnomus sp.	—	—	1	0.5	—	—	15	0.01	—	—	—	—	—	—	—	—
Chironomus plumosos (Meigen)	—	—	3	10.6	2	4.9	75.5	0.23	—	—	—	—	—	—	—	—
Gastropoda																
Semisulcospira decipiens (Westerlund)	6	2580	—	—	4	1660	148	62.8	—	—	2	21	—	—	30	0.3
Radix japonica (Jay)	1	10	—	—	—	—	15	0.15	1	1	—	—	1	1	30	0.03
Gyraulus biwaensis (Preston)	1	10	—	—	—	—	15	0.15	—	—	—	—	—	—	—	—

Pelecypoda																
Sphaerium japonicum biwaense Mori (1)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Date	July 16, 1973								August 9, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	4+1	7.3	3	1.7	1	5.9	133	0.22	4	3.0	5+1	40.2	2	23.0	178	0.98
Decapoda																
Paralya compressa (De Haan)	—	—	—	—	1	8.3	15	0.12	—	—	—	—	—	—	—	—
Chrionomidae larvae																
Chironomus plumosus (Meigen)	—	—	—	—	—	—	—	—	—	—	3	4.7	—	—	44	0.07
Unidentified	—	—	1	0.7	—	—	15	0.01	—	—	—	—	—	—	—	—
Gastropoda																
Semisulcospira decipiens (Westerlund)	—	—	2	460	—	—	30	6.8	—	—	—	—	—	—	—	—
Radix (Biwakoia) onychia (Westerlund)	1	1	—	—	—	—	15	0.01	—	—	—	—	—	—	—	—

Date	September 11, 1973								October 15, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m²
Oligochaeta	5	31.8	9	4.3	3	9.2	253	0.67	5	61.0	—	—	7	106.6	178	2.48
Odonata																
Cercion hieroglyphicus	—	—	—	—	1	5.4	15	0.08	—	—	—	—	—	—	—	—
Chironomidae larvae																
Chironomus plumosus (Meigen)	—	—	—	—	—	—	—	—	5	11.3	2	7.4	2	1.3	133	0.3
Einfeldia sp.	—	—	—	—	—	—	—	—	—	—	—	—	1	0.1	15	0.01
Gastropoda																
Parafossarulus manchuricus japonicus (Pilsbry)	—	—	1	30	1	70	30	1.48	—	—	—	—	—	—	—	—

Date	November 14, 1973								December 12, 1973							
Sampling No.	1		2		3		Average		1		2		3		Average	
	No.	mg	No.	mg	No.	mg	No./m²	g/m²	No.	mg	No.	mg	No.	mg	No./m²	g/m
Oligochaeta	3	5.5	11+1	25.3	2+1	2.8	266	0.5	27	56.7	29+1	206.0	10+4	41.8	1039	4.5
Decapoda																
Macrobrachium nipponensis (De Haan)	—	—	—	—	—	—	—	—	1	158.2	—	—	—	—	15	2.3
Paratya compressa (De Haan)	1	86.7	—	—	—	—	15	1.3	1	48.3	—	—	—	—	15	0.7
Odonata																
Cercion hieroglyphicum Brauer	—	—	—	—	—	—	—	—	—	—	—	—	1	6.1	15	0.1
Chironomidae larvae																
Spaniotoma akamusii (Tokunaga)	—	—	1	27.3	—	—	15	0.4	1	13.0	—	—	—	—	15	0.2
Spaniotoma akamusii Pupae	—	—	—	—	1	9.8	15	0.1	—	—	—	—	—	—	—	—
Chironomus plumosus (Meigen)	2	26.6	8	78.9	6	50.0	235	2.3	2	11.6	4	45.5	2	14.0	120	1.1
Einfeldia sp.	—	—	—	—	—	—	—	—	1	1.8	—	—	—	—	15	0.03
Zygoptela larvae	—	—	—	—	—	—	—	—	1	1.2	—	—	—	—	15	0.02
Gastropoda																
Parafossarulus manchuricus japonicus (Pilsbry)	—	—	1	70	—	—	15	1.0	—	—	1	50	—	—	15	0.74
Semisulcospira decipiens (Westerlund)	—	—	1	310	—	—	15	4.6	3	550	4	2620	—	—	104	46.9
Radix (Biwakoia) onychia (Westerlund)	4	4	—	—	—	—	58	0.06	1	10	—	—	2	80	44	1.3
Gyraulus biwaensis (Preston)	—	—	—	—	—	—	—	—	2	2	—	—	7	43	133	0.67
Teleostomi																
Rhinogobius similis (Gill)	—	—	—	—	—	—	—	—	—	—	1	195.0	—	—	15	2.9

C. On some remarkable points in the changes of biomasses of benthic animals

1. Oligochaeta

Biomass change of Oligochaeta from 1966 through 1975 at each station is illustrated in Fig. 1. There is a noticeable feature that an increasing trend, which had been lasted during past several years, stoped or even a decreasing tendency appeared in this year. It is clearly shown at Ie-1 and Na-3, and at Nb-5 the same level is maintained during these three years. The cause of this phenomenon should be carefully examined, whether it is a sign of suspension of eutrophication or it is in-

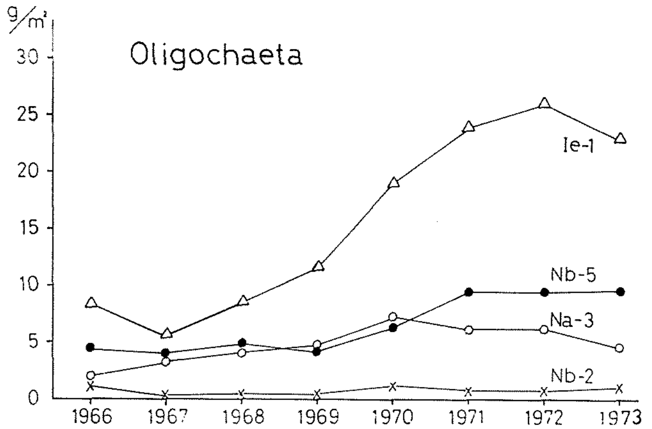

Fig. 1. Change of average biomass of oligochaete worms from 1966 through 1973.

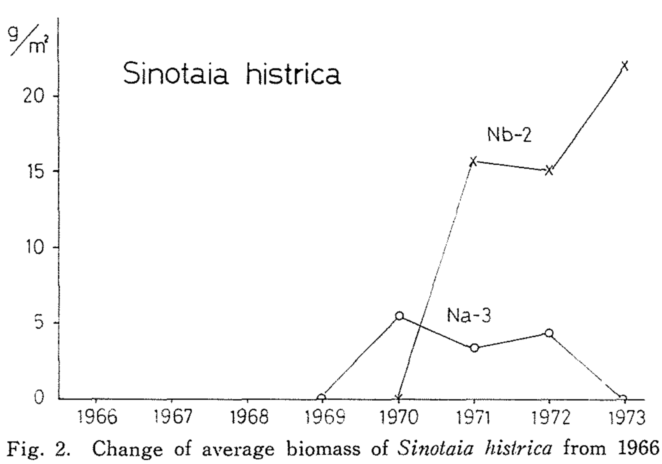

Fig. 2. Change of average biomass of *Sinotaia histrica* from 1966 through 1973.

duced by some other reasons.

2. Mollusca

i) Gastropod mollusc, *Sinotaia histrica*

This gastropod has been found predominantly at rather polluted areas, but now it is widely distributed all over the southern basin. There is an inconsistency in changing trend of biomass at Nb-2 and Na-3 (Fig. 2). The reason is unknown at present.

ii) Gastropod mollusc, *Semisulcospira decipiens*

A remarkable trend of decrease through successive years can be pointed out at Na-3 (Fig. 3). The cause of this change is not clear.

iii) Pelecypod mollusc, *Unio biwae*

The low level of biomass is still maintained in this year at every station (Fig. 4)

iv) Pelecypod molluscs, *Corbicula sandai* and *Corbicula leana*

There has been a misidentification among these two kinds of *Corbicula* species. *Corbicula sandai* is an endemic species to this lake and has been one of the most economically important mussel. This species is very fond of clear water area and sandy substratum, and a decreasing trend has been conspicuously observed as is illustrated in Fig 5 On the contrary, *Corbicula leana* is increasing steadily these several years. This mussel is widely distributed in Japan, living at small ponds or streams having muddy substratum, and in Lake Biwa it was used to be found only at the inland, eutrophicated bays. However, with a decrease of *Corbicula sandai*, *leana* species took the places once occupied by the former, and it seems to be a distinct evidence of a progress of eutrophication of this lake.

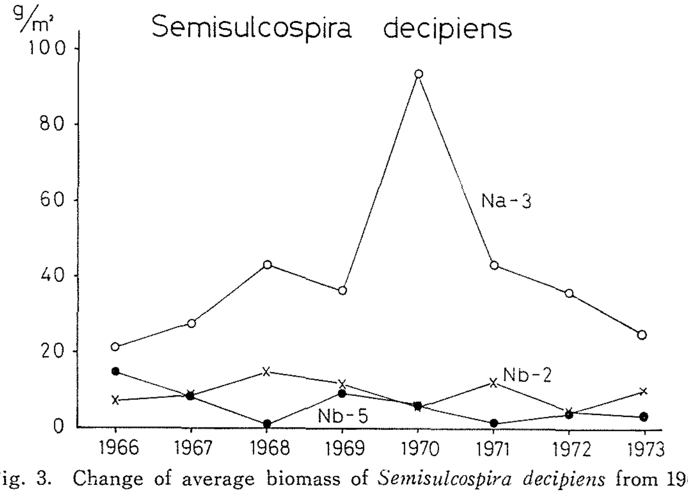

Fig. 3. Change of average biomass of *Semisulcospira decipiens* from 1966 through 1973.

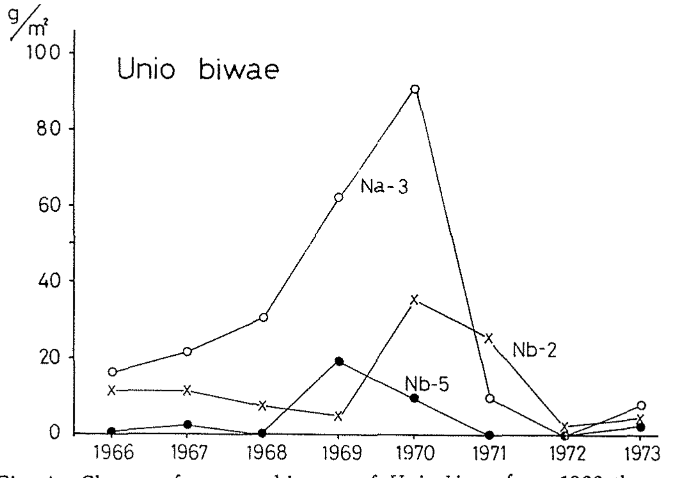

Fig. 4. Change of average biomass of *Unio biwae* from 1966 through 1973.

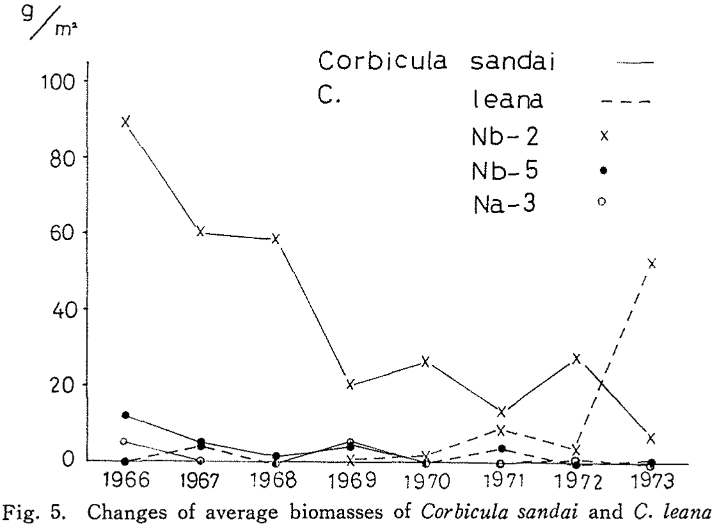

Fig. 5. Changes of average biomasses of *Corbicula sandai* and *C. leana* from 1966 through 1973.

v) Pelecypod mollusc, *Sphaerium japonicum biwaense*

This mussel lives in the muddy substratum, eutrophicated water areas. The tendency of decrease of this small mussel still continued in this year at Nb-2. At Nb-5 the same level of biomass is maintained through these three years (Fig. 6).

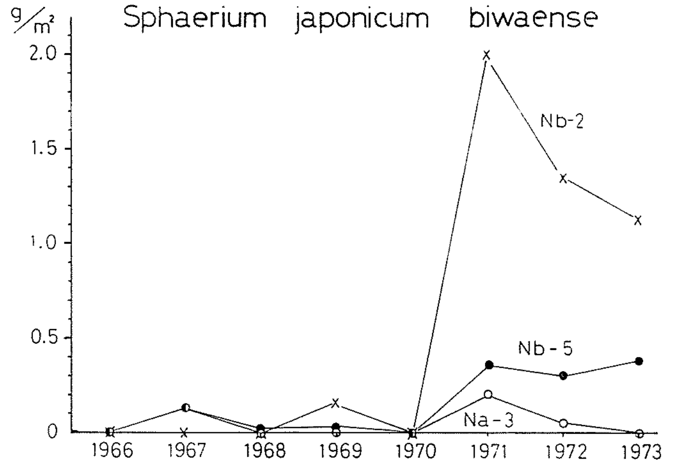

Fig. 6. Change of average biomass of *Sphaerium japonicum biwaense* from 1966 through 1973.

3. Chironomid larva, *Chironomus plumosus*

As is seen in Fig. 7 the biomass increased conspicuosly at Nb-5.

4. After all, a trend of eutrophication is still seen in some degree, as is shown in the change of corbiculan species, but there is a sign of suspension of eutrophication of lake water, as is seen in decreases of Oligochaeta and *Sphaerium*.

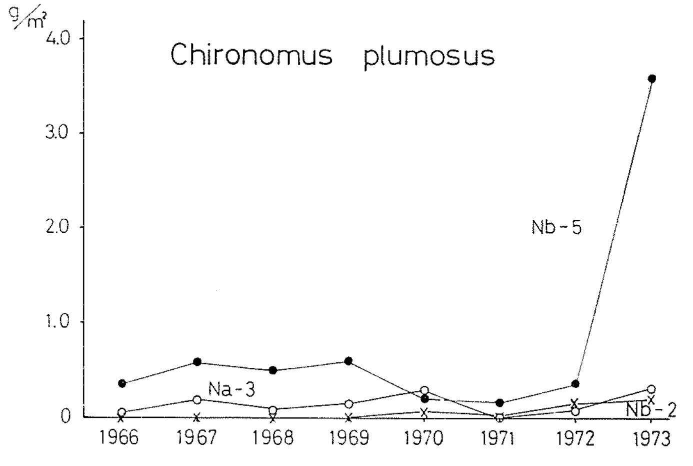

Fig. 7. Change of average biomass of *Chironomus plumosus* from 1966 through 1973.

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