

Sixth Report of the Regular Limnological  
Survey of Lake Biwa (1972)  
II. Benthos<sup>1)2)</sup>

By  
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(Received November 28, 1973)

The regular limnological survey on benthos at four stations in Lake Biwa has been carrying on as a part of the routine work of the Otsu Hydrobiological Station. The aim of the research is to detect quantitative as well as qualitative changes in benthic communities extending over a long period (Mori et al. 1967) and also to offer basic data to IBP studies executing in this lake.

The sampling stations with conditions, the methods for collection and the results obtained during past six years have been reported in the previous papers (Mori et al. 1967; Mori 1970, 1971, 1972; Suzumi and Mori 1967, 1968).

The number of individual and fresh weight of three samples per  $15 \times 15$  cm 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.

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 Otsu Hydrobiological Station have assisted in many ways.

*A. Benthic community at Station Ie-1*

Station Ie-1 has a representative character of the oligotrophic northern part of the lake or main basin, where the depth is about 74 m and the bottom substratum is muddy.

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1) Contribution from the Otsu Hydrobiological Station, Kyoto University, No. 254.

2) JIBP-PF Publication No. 176.

Table 1. Benthic faunal composition and its abundance at St. Ic-1  
January 12, 1972 February 16, 1972

| Date                       | January 12, 1972 |        |        |                                     | February 16, 1972 |        |        |                                     |
|----------------------------|------------------|--------|--------|-------------------------------------|-------------------|--------|--------|-------------------------------------|
|                            | 1                | 2      | 3      | Average                             | 1                 | 2      | 3      | Average                             |
| Sampling No.               | No. mg           | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg            | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |
| Oligochaeta                | 10 156           | 16 546 | 17 391 | 635 16.2                            | 20 461            | 24 261 | 28 707 | 1066 21.1                           |
| Amphipoda                  |                  |        |        |                                     |                   |        |        |                                     |
| <i>Anisogammarus</i>       | 4 41             | 2 17   | —      | 89 0.9                              | —                 | —      | —      | —                                   |
| <i>annandalei</i>          |                  |        |        |                                     |                   |        |        |                                     |
| (Tattersall)               |                  |        |        |                                     |                   |        |        |                                     |
| Chironomidae larvae        |                  |        |        |                                     |                   |        |        |                                     |
| <i>Spatiotoma akamushi</i> | —                | —      | —      | —                                   | —                 | 1 1    | —      | 15 0.01                             |
| Tokunaga                   |                  |        |        |                                     |                   |        |        |                                     |

| Date         | March 16, 1972 |        |        |                                     | April 14, 1972 |        |         |                                     |
|--------------|----------------|--------|--------|-------------------------------------|----------------|--------|---------|-------------------------------------|
|              | 1              | 2      | 3      | Average                             | 1              | 2      | 3       | Average                             |
| Sampling No. | No. mg         | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg         | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> |
| Oligochaeta  | 17 704         | 25 719 | 15 238 | 844 24.6                            | 16 377         | 16 746 | 37 1090 | 1021 32.6                           |

| Date                 | May 15, 1972 |        |        |                                     | June 16, 1972 |        |         |                                     |
|----------------------|--------------|--------|--------|-------------------------------------|---------------|--------|---------|-------------------------------------|
|                      | 1            | 2      | 3      | Average                             | 1             | 2      | 3       | Average                             |
| Sampling No.         | No. mg       | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg        | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> |
| Oligochaeta          | 28 825       | 21 708 | 24 433 | 1079 29.1                           | 27 793        | 26 844 | 29 1076 | 1212 40.1                           |
| Amphipoda            |              |        |        |                                     |               |        |         |                                     |
| <i>Anisogammarus</i> | —            | —      | —      | —                                   | —             | 1 13   | —       | 15 0.2                              |
| <i>annandalei</i>    |              |        |        |                                     |               |        |         |                                     |
| (Tattersall)         |              |        |        |                                     |               |        |         |                                     |

| Date                           |  | July 10, 1972 |        |        |        |        |        |                                     | August 15, 1972 |        |        |        |        |        |                                     |
|--------------------------------|--|---------------|--------|--------|--------|--------|--------|-------------------------------------|-----------------|--------|--------|--------|--------|--------|-------------------------------------|
| Sampling No.                   |  | 1             |        | 2      |        | 3      |        | Average                             | 1               |        | 2      |        | 3      |        | Average                             |
|                                |  | No. mg        | No. mg | No. mg | No. mg | No. mg | No. mg |                                     | No. mg          | No. mg | No. mg | No. mg | No. mg | No. mg |                                     |
| Oligochaeta                    |  | 23            | 827    | 31     | 828    | 52     | 788    | No./m <sup>2</sup> g/m <sup>2</sup> | 22              | 889    | 26     | 688    | 19     | 449    | No./m <sup>2</sup> g/m <sup>2</sup> |
| Amphipoda                      |  |               |        |        |        |        |        | 1567                                |                 |        |        |        |        |        | 990                                 |
| <i>Anisogammarus amandalei</i> |  | —             | —      | —      | —      | —      | —      | —                                   | 1               | 5      | —      | —      | —      | —      | 15                                  |
| (Tattersall)                   |  |               |        |        |        |        |        |                                     |                 |        |        |        |        |        | 0.1                                 |

| Date                           |  | September 14, 1972 |        |        |        |        |        |                                     | October 16, 1972 |        |        |        |        |        |                                     |
|--------------------------------|--|--------------------|--------|--------|--------|--------|--------|-------------------------------------|------------------|--------|--------|--------|--------|--------|-------------------------------------|
| Sampling No.                   |  | 1                  |        | 2      |        | 3      |        | Average                             | 1                |        | 2      |        | 3      |        | Average                             |
|                                |  | No. mg             | No. mg | No. mg | No. mg | No. mg | No. mg |                                     | No. mg           | No. mg | No. mg | No. mg | No. mg | No. mg |                                     |
| Oligochaeta                    |  | 10                 | 326    | 14     | 326    | 5      | 79     | No./m <sup>2</sup> g/m <sup>2</sup> | 13               | 703    | 18     | 352    | 20     | 525    | No./m <sup>2</sup> g/m <sup>2</sup> |
| Amphipoda                      |  |                    |        |        |        |        |        | 431                                 |                  |        |        |        |        |        | 755                                 |
| <i>Anisogammarus amandalei</i> |  | 2                  | 7      | —      | —      | —      | —      | 30                                  | 1                | 12     | 2      | 15     | 8      | 125    | 164                                 |
| (Tattersall)                   |  |                    |        |        |        |        |        | 0.1                                 |                  |        |        |        |        |        | 2.2                                 |

| Date                           |  | November 15, 1972 |        |        |        |        |        |                                     | December 15, 1972 |        |        |        |        |        |                                     |
|--------------------------------|--|-------------------|--------|--------|--------|--------|--------|-------------------------------------|-------------------|--------|--------|--------|--------|--------|-------------------------------------|
| Sampling No.                   |  | 1                 |        | 2      |        | 3      |        | Average                             | 1                 |        | 2      |        | 3      |        | Average                             |
|                                |  | No. mg            | No. mg | No. mg | No. mg | No. mg | No. mg |                                     | No. mg            | No. mg | No. mg | No. mg | No. mg | No. mg |                                     |
| Oligochaeta                    |  | 8                 | 357    | 28     | 564    | 14     | 336    | No./m <sup>2</sup> g/m <sup>2</sup> | 13                | 677    | 26     | 1024   | 14     | 341    | No./m <sup>2</sup> g/m <sup>2</sup> |
| Amphipoda                      |  |                   |        |        |        |        |        | 741                                 |                   |        |        |        |        |        | 786                                 |
| <i>Anisogammarus amandalei</i> |  | —                 | —      | 2      | 15     | 3      | 32     | 75                                  | —                 | —      | —      | —      | —      | —      | —                                   |
| (Tattersall)                   |  |                   |        |        |        |        |        | 0.7                                 |                   |        |        |        |        |        | —                                   |

Result is shown in Table 1. Oligochaeta was most predominant and found everytime. The trend of increase of this animal still continued in this year. *Anisogammarus* was collected sometimes and Chironomidae larva (*Spaniotoma*) was found only in February.

*B. Benthic communities at Stations Nb-2, Nb-5 and Na-3*

Stations Nb-2, Nb-5 and Na-3 have a representative character of the mesotrophic southern part of the lake or sub-basin. Nb-2 (sand or sandy mud substratum) and Na-3 (muddy 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 (muddy substratum) is in the contral part of the lake and about 4.5 m in depth.

Results are shown in Tables 2, 3 and 4. Animals found were Oligochaeta, Crustacea (5 species), Gastropoda (3 species), Pelecypoda (6 species) and Pisces (1 species).

The increasing trend of Oligochaeta at Station Nb-5, which had been lasted several years, disappeared in this year and the biomass was maintained nearly at the same level of the previous year, as in the cases of Stations Na-3 and Nb-2. The decreasing trend of *Unio biwae* still continued in this year. Also *Sphaerium japonicum biwaense*, which showed a conspicuous outbreak in 1971, decreased to some extent at all stations.

Table 2. Benthic faunal composition and its abundance at St. Nb-2  
January 12, 1972 February 15, 1972

| Date                | Sampling No.                               | January 12, 1972 |      |     |     |     | February 15, 1972 |      |      |    |     | Average                             |                  |
|---------------------|--------------------------------------------|------------------|------|-----|-----|-----|-------------------|------|------|----|-----|-------------------------------------|------------------|
|                     |                                            | No.              | mg   | No. | mg  | No. | No.               | mg   | No.  | mg | No. | No./m <sup>2</sup> g/m <sup>2</sup> | g/m <sup>2</sup> |
| Oligochaeta         |                                            | 1                | 6    | 2   | 15  | 2   | 2                 | 5    | 4    | 22 | 3   | 29                                  | 133 0.8          |
|                     |                                            | 2                | 6    | 2   | 15  | 2   | 6                 | 6    | 6    | 22 | 3   | 29                                  | 133 0.8          |
| Amphipoda           | <i>Anisogammarus amandaei</i> (Tattersall) | —                | —    | —   | —   | —   | —                 | —    | —    | —  | 1   | 3                                   | 15 0.04          |
|                     |                                            | —                | —    | —   | —   | —   | —                 | —    | —    | —  | —   | —                                   | —                |
| Chironomidae larvae | <i>Spautotoma akanusii</i> Tokunaga        | —                | —    | —   | —   | —   | —                 | —    | 1    | 11 | 1   | 6                                   | 31 0.3           |
|                     |                                            | —                | —    | —   | —   | —   | —                 | —    | —    | —  | —   | —                                   | —                |
| Pelecypoda          | <i>Corbicula sandai</i> Reinhardt          | —                | —    | 2   | 420 | 1   | 720               | 44   | 17   | —  | 1   | 620                                 | 15 9.3           |
|                     |                                            | —                | —    | 1   | 10  | —   | —                 | 15   | 0.1  | —  | —   | —                                   | —                |
|                     | <i>Sphaerium japonicum</i> biwaense Mori   | —                | —    | —   | —   | —   | —                 | —    | —    | 3  | 40  | 8                                   | 58 2.0           |
|                     |                                            | —                | —    | —   | —   | —   | —                 | —    | —    | —  | —   | —                                   | —                |
| Date                | Sampling No.                               | March 15, 1972   |      |     |     |     | April 14, 1972    |      |      |    |     | Average                             |                  |
|                     |                                            | No.              | mg   | No. | mg  | No. | No.               | mg   | No.  | mg | No. | No./m <sup>2</sup> g/m <sup>2</sup> | g/m <sup>2</sup> |
| Oligochaeta         |                                            | 1                | 6    | 1   | 13  | 5   | 15                | 1012 | 0.5  | 3  | 5   | 2                                   | 6 1 3 89 0.2     |
|                     |                                            | —                | —    | —   | —   | 1   | 9                 | 15   | 0.1  | —  | —   | —                                   | —                |
| Chironomidae larvae | <i>Tendipes plumosus</i> (Meigen)          | 1                | 23   | —   | —   | —   | —                 | 15   | 0.3  | —  | —   | —                                   | —                |
|                     |                                            | —                | —    | —   | —   | 1   | 18                | 15   | 0.3  | —  | —   | —                                   | —                |
| Ephemeroptera       | <i>Ephemerella longicaudata</i> Uéno       | —                | —    | —   | —   | —   | —                 | —    | —    | —  | —   | —                                   | —                |
|                     |                                            | 1                | 59   | —   | —   | —   | —                 | 15   | 0.9  | —  | —   | —                                   | —                |
| Gastropoda          | <i>Semiatospira decipiens</i> (Westerlund) | —                | —    | —   | —   | 1   | 630               | 15   | 9.3  | —  | 1   | 860                                 | 1 720 30 23.5    |
|                     |                                            | 2                | 1490 | —   | —   | —   | —                 | 30   | 22.2 | —  | —   | —                                   | —                |



| Date                          | July 18, 1972      |        |        |        |                                     |  | August 15, 1972  |        |        |                                     |  |  |
|-------------------------------|--------------------|--------|--------|--------|-------------------------------------|--|------------------|--------|--------|-------------------------------------|--|--|
|                               | Sampling No.       | 1      | 2      | 3      | Average                             |  | 1                | 2      | 3      | Average                             |  |  |
|                               |                    | No. mg | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  | No. mg           | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |
| Oligochaeta                   |                    | 10 9   | 4 3    | 1 1    | 222 0.2                             |  | 17 28            | 15 27  | 3 2    | 519 0.9                             |  |  |
| Chironomidae larvae           |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Einfeldia</i> sp. A        |                    | 1 0.1  | 1 1    | 3 2    | 75 0.05                             |  | 2 1              | —      | —      | 30 0.01                             |  |  |
| <i>Clinotanytus</i> sp.       |                    | —      | —      | —      | —                                   |  | 1 6              | —      | —      | 15 0.1                              |  |  |
| <i>Spaniotoma akanusii</i>    |                    | —      | —      | —      | —                                   |  | 1 22             | —      | —      | 15 0.3                              |  |  |
| Tokunaga                      |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| unidentified                  |                    | —      | —      | —      | —                                   |  | —                | 1 0.2  | —      | 15 0.004                            |  |  |
| chironomid pupae              |                    | —      | —      | —      | —                                   |  | 1 1              | —      | —      | 15 0.01                             |  |  |
| Gastropoda                    |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Semisulcospira</i>         |                    | —      | —      | —      | —                                   |  | 1 1100           | —      | —      | 15 16.3                             |  |  |
| <i>decepiens</i> (Westerlund) |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| <i>Sinotata histrica</i>      |                    | —      | —      | 2 130  | 30 1.9                              |  | 2 940            | 3 320  | 1 70   | 89 19.7                             |  |  |
| (Gould)                       |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| Pelecypoda                    |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Corbicula sandai</i>       |                    | 2 250  | 2 340  | 4 6790 | 119 109.2                           |  | 2 860            | 3 650  | —      | 74 22.2                             |  |  |
| Reinhardt                     |                    | —      | —      | —      | —                                   |  | 1 420            | —      | —      | 15 6.2                              |  |  |
| <i>Unio biwaensis</i> Kobelt  |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| <i>Sphaerium japonicum</i>    |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| <i>biwaensis</i> Mori         |                    | —      | —      | —      | —                                   |  | 2 1              | —      | —      | 30 0.01                             |  |  |
|                               |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| Date                          | September 18, 1972 |        |        |        |                                     |  | October 18, 1972 |        |        |                                     |  |  |
|                               | Sampling No.       | 1      | 2      | 3      | Average                             |  | 1                | 2      | 3      | Average                             |  |  |
|                               |                    | No. mg | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  | No. mg           | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |
| Oligochaeta                   |                    | 3 1    | —      | —      | 44 0.01                             |  | 3 1              | 1 1    | 1 0.4  | 75 0.02                             |  |  |
| Chironomidae larvae           |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Einfeldia</i> sp. A        |                    | 1 1    | —      | —      | 15 0.01                             |  | —                | —      | —      | —                                   |  |  |
| Gastropoda                    |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Sinotata histrica</i>      |                    | 3 6480 | —      | —      | 44 95.9                             |  | —                | —      | —      | —                                   |  |  |
| (Gould)                       |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| Pelecypoda                    |                    |        |        |        |                                     |  |                  |        |        |                                     |  |  |
| <i>Corbicula sandai</i>       |                    | 4 7540 | —      | 1 350  | 74 116.8                            |  | —                | —      | —      | —                                   |  |  |
| Reinhardt                     |                    | —      | —      | —      | —                                   |  | 1 1050           | —      | —      | 15 15.5                             |  |  |
| <i>Unio biwaensis</i> Kobelt  |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |
| <i>Anodonta chiyogis</i>      |                    | 1 420  | —      | —      | 15 6.2                              |  | —                | —      | —      | —                                   |  |  |
| Kobelt                        |                    | —      | —      | —      | —                                   |  | —                | —      | —      | —                                   |  |  |

| Date                                         | November 15, 1972 |        |        |        |                                     |  | December 15, 1972 |        |        |                                     |  |  |
|----------------------------------------------|-------------------|--------|--------|--------|-------------------------------------|--|-------------------|--------|--------|-------------------------------------|--|--|
|                                              | Sampling No.      | 1      | 2      | 3      | Average                             |  | 1                 | 2      | 3      | Average                             |  |  |
|                                              | No. mg            | No. mg | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  | No. mg            | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |
| Oligochaeta                                  |                   | 11 13  | 14 13  | 7 49   | 475 1.1                             |  | 17 66             | 13 69  | 29 104 | 888 3.5                             |  |  |
| Amphipoda                                    |                   | —      | —      | —      | —                                   |  | —                 | —      | —      | —                                   |  |  |
| <i>Anisogammarus amandalei</i> (Tattersal)   |                   | —      | —      | —      | —                                   |  | 1 0.3             | —      | —      | 15 0.004                            |  |  |
| Chironomidae larvae                          |                   | —      | —      | —      | —                                   |  | —                 | —      | —      | —                                   |  |  |
| <i>Tendipes plumosus</i> (Meigen)            |                   | —      | 1 3    | —      | 15 0.04                             |  | 7 75              | 6 18   | 1 3    | 209 1.4                             |  |  |
| <i>Spaniotoma akamushi</i> Tokunaga          |                   | —      | —      | 1 29   | 15 4.2                              |  | —                 | —      | —      | —                                   |  |  |
| <i>Spaniotoma</i> sp. A                      |                   | —      | —      | —      | —                                   |  | 1 2               | —      | —      | 15 0.02                             |  |  |
| <i>Einfeldia</i> sp. A                       |                   | —      | —      | —      | —                                   |  | —                 | —      | 3 3    | 44 0.05                             |  |  |
| Gastropoda                                   |                   | —      | —      | —      | —                                   |  | —                 | —      | —      | —                                   |  |  |
| <i>Semistulospira decipiens</i> (Westerlund) |                   | 2 590  | —      | —      | 30 8.7                              |  | —                 | —      | —      | —                                   |  |  |
| <i>Sinotata histrica</i> (Gould)             |                   | —      | —      | 2 2880 | 30 42.6                             |  | —                 | —      | —      | —                                   |  |  |
| Pelecypoda                                   |                   | —      | —      | —      | —                                   |  | —                 | —      | —      | —                                   |  |  |
| <i>Corbicula sandai</i> Reinhardt            |                   | —      | —      | 1 1110 | 15 16.4                             |  | —                 | —      | —      | —                                   |  |  |
| <i>Unio biwaensis</i> Kobelt                 |                   | 1 420  | —      | —      | 15 6.2                              |  | —                 | —      | —      | —                                   |  |  |

Table 3. Benthic faunal composition and its abundance at St. Nb-5

| Date                                | January 12, 1972 |        |        |        |                                     |  | February 16, 1972 |        |        |                                     |  |  |
|-------------------------------------|------------------|--------|--------|--------|-------------------------------------|--|-------------------|--------|--------|-------------------------------------|--|--|
|                                     | Sampling No.     | 1      | 2      | 3      | Average                             |  | 1                 | 2      | 3      | Average                             |  |  |
|                                     | No. mg           | No. mg | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  | No. mg            | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |
| Oligochaeta                         |                  | 8 149  | 41 466 | 10 180 | 875 11.8                            |  | 10 156            | 13 285 | 6 65   | 431 7.5                             |  |  |
| Hirudinea                           |                  | 1 11   | 1 8    | 1 3    | 44 0.3                              |  | —                 | —      | —      | —                                   |  |  |
| Chironomidae larvae                 |                  | —      | —      | —      | —                                   |  | —                 | —      | —      | —                                   |  |  |
| <i>Tendipes plumosus</i> (Meigen)   |                  | —      | 1 25   | —      | 15 0.4                              |  | 1 33              | —      | —      | 15 0.5                              |  |  |
| <i>Spaniotoma akamushi</i> Tokunaga |                  | 2 36   | 7 60   | 4 98   | 192 28.6                            |  | 2 22              | 2 51   | 2 23   | 89 1.4                              |  |  |
| <i>Procladius</i> sp. C             |                  | 1 2    | —      | —      | 15 0.02                             |  | —                 | —      | —      | —                                   |  |  |
| <i>Einfeldia</i> sp. A              |                  | —      | 1 1    | —      | 15 0.01                             |  | —                 | —      | —      | —                                   |  |  |
| <i>Clinotanyphus</i> sp. A          |                  | —      | —      | —      | —                                   |  | —                 | 1 5    | —      | 15 0.08                             |  |  |

| Date                                         | March 16, 1972 |        |        |                                     |        |        | April 14, 1972 |                                     |  |  |  |  |
|----------------------------------------------|----------------|--------|--------|-------------------------------------|--------|--------|----------------|-------------------------------------|--|--|--|--|
| Sampling No.                                 | 1              | 2      | 3      | Average                             | 1      | 2      | 3              | Average                             |  |  |  |  |
| Oligochaeta                                  | No. mg         | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg         | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |  |  |
| Amphipoda                                    | 8 144          | 12 148 | 19 222 | 577 7.6                             | 13 150 | 4 98   | 14 41          | 457 4.3                             |  |  |  |  |
| <i>Anisogammarus amandalei</i> (Tattersall)  | —              | —      | —      | —                                   | —      | 1 6    | 2 9            | 44 0.2                              |  |  |  |  |
| Chironomidae larvae                          | 2 9            | —      | 4 38   | 133 0.7                             | 2 34   | 1 21   | —              | 44 0.8                              |  |  |  |  |
| <i>Spaniotoma akanusii</i>                   | 1 0.4          | —      | —      | 15 0.004                            | 1 1    | —      | 8 11           | 133 0.2                             |  |  |  |  |
| <i>Procladius</i> sp. C                      | —              | —      | —      | —                                   | —      | —      | 1 0.3          | 15 0.004                            |  |  |  |  |
| <i>Tendipes salinaris</i>                    | —              | —      | —      | —                                   | 1 2    | —      | —              | 15 0.03                             |  |  |  |  |
| Kieffer                                      | —              | —      | —      | —                                   | —      | —      | —              | —                                   |  |  |  |  |
| <i>Einfeldia</i> sp.                         | —              | —      | —      | —                                   | —      | —      | —              | —                                   |  |  |  |  |
| Gastropoda                                   | —              | —      | —      | —                                   | —      | —      | —              | —                                   |  |  |  |  |
| <i>Semisulcospira decipiens</i> (Westerlund) | —              | —      | —      | —                                   | —      | —      | 1 480          | 15 7.1                              |  |  |  |  |
| Pelecypoda                                   | —              | —      | —      | —                                   | —      | —      | 1 110          | 15 1.6                              |  |  |  |  |
| <i>Sphaerium japonicum biwaense</i> Mori     | —              | —      | —      | —                                   | —      | —      | —              | —                                   |  |  |  |  |

| Date                                     | May 15, 1972 |        |        |                                     |        |        | June 16, 1972 |                                     |  |  |  |  |
|------------------------------------------|--------------|--------|--------|-------------------------------------|--------|--------|---------------|-------------------------------------|--|--|--|--|
| Sampling No.                             | 1            | 2      | 3      | Average                             | 1      | 2      | 3             | Average                             |  |  |  |  |
| Oligochaeta                              | No. mg       | No. mg | No. mg | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg        | No./m <sup>2</sup> g/m <sup>2</sup> |  |  |  |  |
| Chironomidae larvae                      | 8 12         | 11 225 | 8 186  | 400 6.3                             | 11 38  | 5 69   | 6 55          | 324 23.8                            |  |  |  |  |
| <i>Spaniotoma akanusii</i>               | 1 3          | —      | —      | 15 0.04                             | —      | —      | —             | —                                   |  |  |  |  |
| Tokunaga                                 | —            | —      | —      | —                                   | —      | —      | —             | —                                   |  |  |  |  |
| <i>Tendipes salinaris</i>                | —            | —      | 2 1    | 30 0.01                             | —      | —      | —             | —                                   |  |  |  |  |
| Kieffer                                  | 3 4          | 2 3    | —      | 75 0.1                              | —      | 1 2    | —             | 15 0.03                             |  |  |  |  |
| <i>Chironotanytus</i> sp.                | 2 0.3        | 1 0.2  | —      | 44 0.01                             | —      | —      | —             | —                                   |  |  |  |  |
| <i>Calopspectra</i> sp. J                | —            | —      | —      | —                                   | —      | —      | —             | —                                   |  |  |  |  |
| Pelecypoda                               | —            | —      | —      | —                                   | —      | —      | —             | —                                   |  |  |  |  |
| <i>Sphaerium japonicum biwaense</i> Mori | —            | 1 170  | —      | 15 2.5                              | —      | —      | —             | —                                   |  |  |  |  |

| Date                                                                 |                    | August 15, 1972 |     |     |     |         |                                     |     |     |                                     |         |
|----------------------------------------------------------------------|--------------------|-----------------|-----|-----|-----|---------|-------------------------------------|-----|-----|-------------------------------------|---------|
| Sampling No.                                                         | July 10, 1972      |                 |     |     |     | Average |                                     |     |     |                                     | Average |
|                                                                      | No.                | mg              | No. | mg  | No. | No.     | mg                                  | No. | mg  | No./m <sup>2</sup> g/m <sup>2</sup> |         |
| Oligochaeta                                                          | 5                  | 61              | 6   | 43  | 10  | 99      | 311                                 | 3   | 45  | 21                                  | 382     |
| Chironomidae larvae<br><i>Tendipes plumosus</i><br>(Meigen)          | —                  | —               | —   | —   | —   | —       | —                                   | —   | —   | —                                   | —       |
| <i>Procladius</i> sp. C                                              | 1                  | 1               | —   | —   | —   | —       | 15                                  | —   | 1   | —                                   | —       |
| <i>Einfeldia</i> sp. A                                               | 1                  | 2               | —   | —   | 1   | 1       | 30                                  | —   | 2   | —                                   | —       |
| Gastropoda<br><i>Senisulcospira</i><br><i>decipiens</i> (Westerlund) | —                  | —               | —   | —   | —   | —       | —                                   | 1   | 170 | 1                                   | 1680    |
| Pelecypoda<br><i>Anodonta calipygos</i><br>Kobelt                    | 1                  | 20440           | —   | —   | —   | —       | 15                                  | —   | —   | —                                   | —       |
| October 18, 1972                                                     |                    |                 |     |     |     |         |                                     |     |     |                                     |         |
| Sampling No.                                                         | September 18, 1972 |                 |     |     |     | Average |                                     |     |     |                                     | Average |
|                                                                      | No.                | mg              | No. | mg  | No. | mg      | No./m <sup>2</sup> g/m <sup>2</sup> | No. | mg  | No.                                 | mg      |
| Oligochaeta                                                          | 9                  | 142             | 5   | 106 | 8   | 151     | 324                                 | 8   | 239 | 5                                   | 175     |
| Gastropoda<br><i>Senisulcospira</i><br><i>decipiens</i> (Westerlund) | 1                  | 430             | —   | —   | —   | —       | 15                                  | 2   | 620 | —                                   | —       |
| December 15, 1972                                                    |                    |                 |     |     |     |         |                                     |     |     |                                     |         |
| Sampling No.                                                         | November 15, 1972  |                 |     |     |     | Average |                                     |     |     |                                     | Average |
|                                                                      | No.                | mg              | No. | mg  | No. | mg      | No./m <sup>2</sup> g/m <sup>2</sup> | No. | mg  | No.                                 | mg      |
| Oligochaeta                                                          | 21                 | 23              | 22  | 121 | 25  | 138     | 1008                                | 22  | 376 | 19                                  | 702     |
| Hirudinea                                                            | —                  | —               | —   | —   | —   | —       | —                                   | 1   | 8   | —                                   | —       |
| Chironomidae larvae<br><i>Tendipes plumosus</i><br>(Meigen)          | —                  | —               | 2   | 28  | 3   | 59      | 75                                  | 3   | 49  | —                                   | —       |
| <i>Spanioloma aknusi</i><br>Tokunaga                                 | —                  | —               | 3   | 80  | 1   | 22      | 58                                  | —   | 1   | 10                                  | —       |
| <i>Einfeldia</i> sp. A                                               | —                  | —               | 2   | 3   | 2   | 2       | 58                                  | —   | —   | —                                   | —       |
| <i>Clinotanytus</i> sp.                                              | 1                  | 1               | 1   | 18  | —   | —       | 30                                  | —   | —   | —                                   | —       |





|                                                                     |        |        |        |         |                                     |        |        |        |         |                                     |        |        |        |         |                                     |      |
|---------------------------------------------------------------------|--------|--------|--------|---------|-------------------------------------|--------|--------|--------|---------|-------------------------------------|--------|--------|--------|---------|-------------------------------------|------|
| Gastropoda<br><i>Semilucospira</i><br><i>decipiens</i> (Westerlund) | 6      | 1370   | 1      | 1040    | —                                   | —      | 103    | 35.5   | 13      | 1880                                | 7      | 940    | 3      | 90      | 341                                 | 43.1 |
| Pelecypoda<br><i>Corbicula sandai</i><br>Reinhardt                  | —      | —      | —      | —       | 1                                   | 260    | 15     | 3.9    | —       | —                                   | —      | —      | —      | —       | —                                   | —    |
| October 18, 1972                                                    |        |        |        |         |                                     |        |        |        |         |                                     |        |        |        |         |                                     |      |
| Date                                                                |        |        |        |         |                                     |        |        |        |         |                                     |        |        |        |         |                                     |      |
| Sampling No.                                                        | 1      | 2      | 3      | Average |                                     | 1      | 2      | 3      | Average |                                     | 1      | 2      | 3      | Average |                                     |      |
|                                                                     | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> |      |
| Oligochaeta                                                         | 2      | 1      | 3      | 49      | 2                                   | 41     | 102    | 1.3    | 4       | 30                                  | 26     | 77     | 15     | 19      | 666                                 | 1.9  |
| Decapoda<br><i>Macrobrachium</i><br><i>nipponensis</i> (De Haan)    | 1      | 475    | —      | —       | —                                   | —      | 15     | 7.0    | —       | —                                   | —      | —      | —      | —       | —                                   | —    |
| Gastropoda<br><i>Semilucospira</i><br><i>decipiens</i> (Westerlund) | 7      | 260    | 5      | 110     | 3                                   | 210    | 222    | 8.4    | 4       | 1410                                | 8      | 1090   | 5      | 670     | 252                                 | 46.9 |
| <i>Sinotia histrica</i> (Gould)                                     | —      | —      | —      | —       | —                                   | —      | —      | —      | —       | —                                   | —      | —      | 1      | 260     | 15                                  | 3.9  |
| November 15, 1972                                                   |        |        |        |         |                                     |        |        |        |         |                                     |        |        |        |         |                                     |      |
| Date                                                                |        |        |        |         |                                     |        |        |        |         |                                     |        |        |        |         |                                     |      |
| Sampling No.                                                        | 1      | 2      | 3      | Average |                                     | 1      | 2      | 3      | Average |                                     | 1      | 2      | 3      | Average |                                     |      |
|                                                                     | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> | No. mg | No. mg | No. mg | No. mg  | No./m <sup>2</sup> g/m <sup>2</sup> |      |
| Oligochaeta                                                         | 51     | 227    | 34     | 99      | 30                                  | 53     | 1691   | 5.6    | 30      | 46                                  | 21     | 284    | 32     | 63      | 1230                                | 5.8  |
| Decapoda<br><i>Paratya compressa</i><br>(De Haan)                   | —      | —      | —      | —       | —                                   | —      | —      | —      | —       | —                                   | 1      | 15     | —      | —       | 15                                  | 0.2  |
| Chironomidae larvae<br><i>Shanitoloma akamusi</i><br>Tokunaga       | —      | —      | —      | —       | —                                   | —      | —      | —      | 2       | 32                                  | 1      | 9      | —      | —       | 44                                  | 0.6  |
| <i>Tendipes plumosus</i><br>(Meigen)                                | 1      | 4      | —      | —       | —                                   | —      | 15     | 0.2    | —       | —                                   | —      | —      | —      | —       | —                                   | —    |
| <i>Einfeldia</i> sp. A                                              | —      | —      | —      | —       | —                                   | —      | 15     | 0.1    | —       | —                                   | 1      | 2      | —      | —       | 15                                  | 0.03 |
| <i>Clinotanytus</i> sp.                                             | —      | —      | —      | —       | 1                                   | 3      | 15     | 0.1    | —       | —                                   | 1      | 3      | —      | —       | 15                                  | 0.04 |
| Gastropoda<br><i>Semilucospira</i><br><i>decipiens</i> (Westerlund) | 6      | 1500   | 6      | 2260    | 5                                   | 1400   | 252    | 76.4   | 3       | 970                                 | 7      | 4150   | 4      | 1610    | 207                                 | 99.6 |
| <i>Sinotia histrica</i> (Gould)                                     | —      | —      | —      | —       | —                                   | —      | —      | —      | 1       | 1430                                | —      | —      | —      | —       | 15                                  | 21   |
| <i>Heterogen longispira</i><br>(Smith)                              | 1      | 2820   | —      | —       | —                                   | —      | 15     | 41.7   | —       | —                                   | —      | —      | —      | —       | —                                   | —    |

C. On some remarkable changes in biomass of benthic animals

1. Oligochaeta

Biomass change of Oligochaeta from 1966 through 1972 at each station is illustrated in Fig. 1. A constant increase in the northern lake (Ie-1) is very remarkable, which seems to indicate a progress of eutrophication there. In the southern lake the biomass is maintained nearly at the same level since 1970.

2. Gastropod mollusc, *Sinotaia histrica* (Gould)

This is a small viviparous gastropod inhabiting predominantly at rather polluted water areas. Sudden appearance of this water snail since 1970 at St. Na-3 and since 1971 at St. Nb-2 (Fig. 2) should be considered as a result of a progress of eutrophication of the lake, especially at littoral zone.

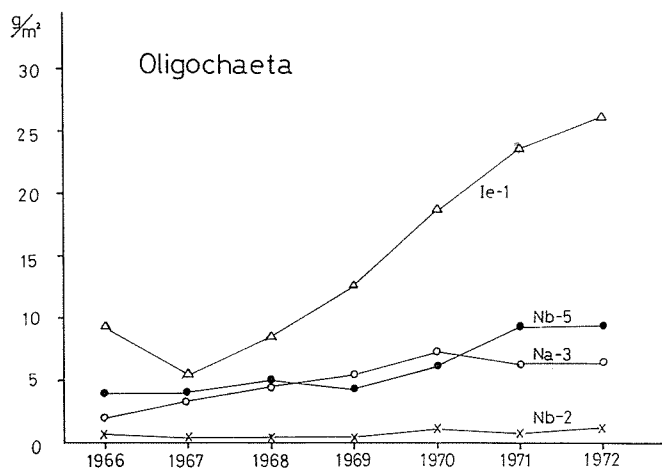


Fig. 1. Change of average biomass of oligochaete worms from 1966 through 1972.

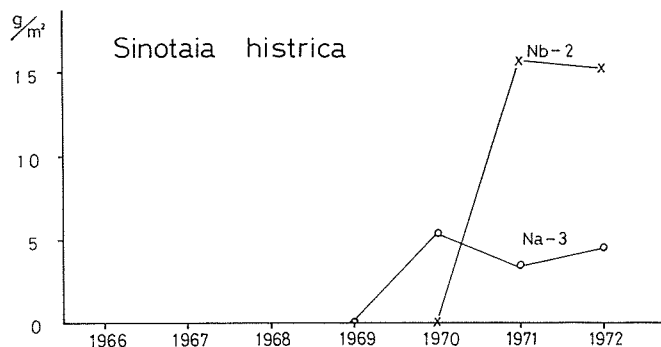


Fig. 2. Change of average biomass of *Sinotaia histrica* from 1966 through 1972.

3. Pelecypod mollusc, *Unio biwae* Kobelt

The decreasing tendency still continued in 1972 at every station (Fig. 3). The cause of this sudden decrease since 1971 is not clear at present.

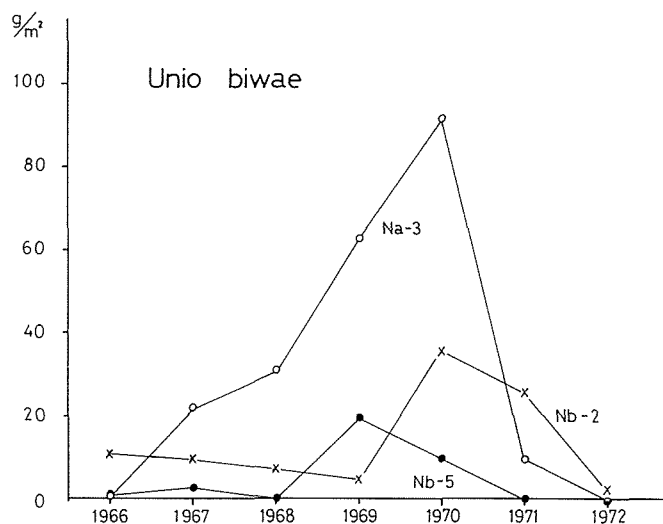


Fig. 3. Change of average biomass of *Unio biwae* from 1966 through 1972.

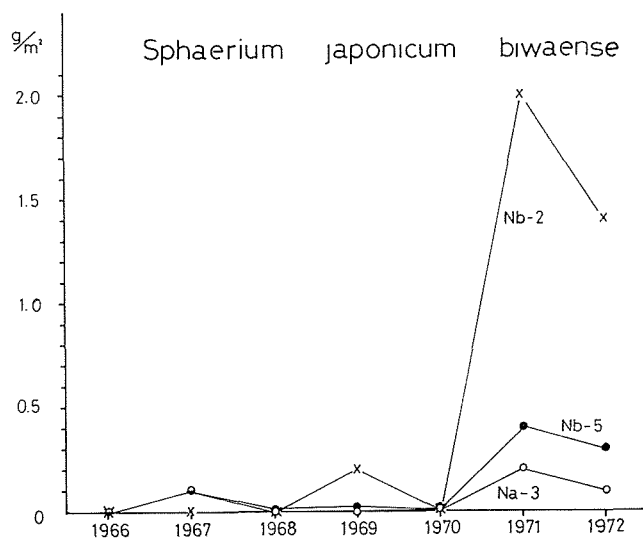


Fig. 4. Change of average biomass of *Sphaerium japonicum biwaense* from 1966 through 1972.

4. Pelecypod mollusc, *Sphaerium japonicum biwaense* Mori

The clear decrease was observed in this year following 1971's outbreak (Fig. 4). The cause of this decrease is not clear also at present.

### Literature

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