

1. *Planorbis companulatus* Say

|                              | H.    | W.    | A.H.  | A.W.* |
|------------------------------|-------|-------|-------|-------|
| a. Marl from                 |       |       |       |       |
| MacKay Lake...               | 5.18  | 9.2   | 4.56  | 3.69  |
| b. Living form,              |       |       |       |       |
| MacKay Lake...               | 6.27  | 11.4  | 5.5   | 4.56  |
| c. Form in                   |       |       |       |       |
| Chicago area...              | 6.63  | 12.75 | 5.19  | 4.69  |
| Ratio b:a .....              | 1.211 | 1.245 | 1.226 | 1.238 |
| or an average ratio of 1.23. |       |       |       |       |

In the case of *Planorbis companulatus* we have thus conclusive evidence that the present form is considerably larger (23%) and that the environment of the fossil species was not very suitable to it. But apart from the size the species has not changed at all. The ratios of the four standard measurements are nearly equal showing that the proportions of the shell have remained practically the same. The shell ornamentation remains unchanged also.

2. *Planorbis bicarinatus* Say

|                         | H.    | W.    | A.H.  | A.W.  |
|-------------------------|-------|-------|-------|-------|
| a. Marl form,           |       |       |       |       |
| MacKay Lake...          | 4.94  | 8.75  | 4.15  | 3.5   |
| b. Living form,         |       |       |       |       |
| MacKay Lake...          | 4.75  | 7.83  | 4.17  | 2.917 |
| c. Chicago form...      | 5.75  | 10.63 | 5.13  | 3.88  |
| d. Form from Presqu'île |       |       |       |       |
| Bay, L. Ontario...      | 6.08  | 11.33 | 5.25  | 4.16  |
| Ratio c:a .....         | 1.164 | 1.215 | 1.231 | 1.09  |

Analysis of the above figures shows that in this case the fossil specimens are slightly larger than the living forms, a conclusion not in harmony with the previous result and, as we shall see, also differing from that reached for the majority of the species. Apparently the quiet water of Mackay lake is not well suited to *Planorbis bicarinatus*. The two broadly funnel-shaped depressions in both sides of the shell expose a very large area to erosion by carbon dioxide, which the water contains in considerable amount. Such erosion is a constant drain on the vitality of the animal, as the lime of the shell must be constantly renewed. We have also abundant evidence that the marl forms themselves were not well adapted to their environment. They show an extreme variation in the shell:—the aperture varies from sub-trigonal to sub-ovate; many specimens show traces of former apertures, as evinced by transverse thickening of the shell at one or more places in the body whorl accompanied by a change in direction in the latter; fully fifty per cent. of the specimens examined show distinct minute revolving lines occurring irregularly over the shell; the shell

is also thickened unevenly about the aperture. Specimens from Presqu'île bay, Lake Ontario, do not show any such irregularities. That the slight diminution in size of the specimens found in the lake as compared with those from the marl is local and is not a constant feature, is indicated by the measurements from the Lake Ontario and Chicago specimens. That the marly bottom of the ancient lake was not very suitable to this form, is evident from the presence of so many abnormalities in the individuals, but it was a little more suitable than the present lake.

3. *Planorbis parvus* Say. The fossil form is variable in size. It is impossible to give an exact series of measurements but the average is lower than those of the living forms to-day. This species is found in considerable numbers in the marl bed but is not nearly so abundant as *Valvata tricarinata* and *Amnicola porata*.

4. *Physa heterostropha* Say.

|                    | H.    | W.    | A.H.  | A.W.  |
|--------------------|-------|-------|-------|-------|
| a. Marl form,      |       |       |       |       |
| MacKay Lake...     | 11.38 | 7.38  | 8.69  | 4.08  |
| b. Living form,    |       |       |       |       |
| MacKay Lake...     | 12.88 | 8.13  | 9.75  | 4.61  |
| c. Chicago form... | 13.50 | 8.67  | 10.17 | 4.33  |
| Ratio b:a .....    | 1.132 | 1.102 | 1.122 | 1.111 |

In the case of this species the living form is somewhat larger than the fossils. The ratio agree closely. *Physa heterostropha* shows with the other species the adverse influence of the marly bottom. The fossil form retains some of the original coloring matter in a red band inside the callus at the aperture.

5. *Valvata tricarinata* Say.

|                    | H.   | W.   | A.H. | A.W. |
|--------------------|------|------|------|------|
| a. Marl form,      |      |      |      |      |
| MacKay Lake...     | 2.7  | 3.9  | 1.8  | 1.65 |
| b. Living form,    |      |      |      |      |
| MacKay Lake...     | 4.41 | 5.47 | 2.67 | 2.28 |
| c. Chicago form... | 4.00 | 4.00 | 2.00 | 2.00 |
| One specimen only. |      |      |      |      |
| Ratio b:a .....    | 1.65 | 1.40 | 1.48 | 1.39 |

Of all the species discussed in this paper *Valvata tricarinata* shows the greatest difference in size between the present and fossil specimens. The linear measurements show that the bulk of the living animal is more than twice the size of the fossil form. This species occurs in great abundance in the marl beds and is uniformly small. The marl specimens might be considered a dwarf variety of the species which adapted itself to an unsuitable bottom environment. Many of the shells are slightly green in colour.

\*H.—height of shell in millimeters.

W.—width.

A.H.—aperture height.

A.W.—aperture width.