

On the Effect of Long Continued Additions of Lime to Aquarium Sea-water.

By

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THE contention of Breder and Howley (1931), and Breder and Smith (1932) that liming may lead to an increase in calcium in aquarium water is correct. In January, 1932, when the salinity of the Plymouth tank water was 38.0‰ the calcium content was about 0.62 g. per litre compared with about 0.39 g. found in the sea-water off Plymouth by the permanganate method. Thus compared with the normal calcium content of water of 38‰ salinity a 46‰ excess was present. One liming did not increase the calcium content appreciably, which suggests that the water is at the present time (Jan., 1932) saturated with respect to calcium. Other indirect evidence lends some support to this statement.

Excess base determined by Wattenberg's method (1930) (which only determines base in combination with carbonic or other volatile acid) was 4.2 milliequivalents per litre compared with 2.35–2.4 milliequivalents in the water of the English Channel, whilst the pH was 7.9 compared with 8.0–8.3. The fish are therefore likely to have no difficulty in maintaining their internal alkaline reserve.

Any considerable increase in sulphate should be remedied by precipitation of calcium sulphate since it seems probable that sea-water is nearly saturated with respect to this salt.

Although there is certainly a definite increase in calcium due to regular liming of the aquarium water, the excellent condition of the fish and delicate invertebrates such as the echinoderms shows that it is of little consequence. Since the most important factors appear to be control of pH and adequate aeration there appears to be no sufficient reason to change the current Plymouth practice, which has been carried out without any untoward effects for eight years.

REFERENCES.

- BREDER, C. M., JR., and HOWLEY, T. H. 1931. The Chemical Control of Closed Circulating Systems of Sea-Water in Aquaria for Tropical Marine Fishes. *Zoologica*, IX, No. 11, pp. 403–442.

BREDER, C. M., JR., and SMITH, H. W. 1932. On the Use of Sodium Bicarbonate and Calcium in the Rectification of Sea-Water in Aquaria. *Journ. Mar. Biol. Assoc., N.S.*, Vol. XVIII, No. 1, pp. 199-200.

WATTENBERG, H. 1930. Über die Bestimmung der Alkalinität des Meerwassers. *Ann. d. Hydr. usw.*, **58**, p. 277.

[It is obvious that Messrs. Breder and Howley are correct in their suggestion that the addition of lime to sea-water, in an aquarium, may raise its calcium content. This has been established by the analyses carried out by L. H. N. Cooper at my request. The increase in calcium, however, appears to be without any observed injurious effect. W. R. G. A.]