407976

R

Growth Rate of Giant Clam Tridacna gigas at Bikini Atoll as Revealed by Radioautography

Kelshaw Bonham

DDC AD

Reprinted from Science, July 16, 1965, Vol. 149, No. 3681, pages 300-302

nature. One annulus precedes the 1956 layer of radioactivity, two intervene in 1958, and six follow to the time of collection, so that this clam (length, 52 centimeters) was in its 9th year of life.

Written records of the giant clam *Tridacna gigas* Linné have existed for centuries. Considered remarkable at first simply because of its large size (2 m in greatest length and several hundred kilograms in weight), the clam was later (*1*) found to contain symbiotic algae within its tissues. Yonge proposed that the clam attained such size by "farming" the zooxanthellae within the greatly expanded tissues of the siphons, and by utilizing the photosynthetic products in nutrition (*2–4*). However, in spite of an almost universal curiosity about the age of these giants of the conspicuous alternating dark, relatively opaque, layers, as contrasted with the lighter, more translucent bands, clearly indicating apparent years of age. Up to the 1956 line the clam was in its first year of life. Two years intervene between the two stippled lines, to 1958, and then six more years to the inner surface of the shell representing 1964, so that the clam was in its 9th year. The 1956 line corresponds to a shell length of about 10 cm, and the 1958 line, to about 24 cm.

It is of special interest that a tropical organism living in water with a mean monthly temperature varying less than 3°C (*8*) throughout the year should display distinct annulations. Seasonally varying environmental factors other than temperature, such as winds, currents, weather, light, and the abundance polaroid discs of a thin (15 to 20 μ) shell section at the position indicated by the dashed lines of Fig. 1 (top). Although Fig. 3 shows the outer border of the shell at the upper left, it does not extend to the inner border. The prismatic outer layer occupies the first and most of the second column of photographs down to the sloping light area which is the pallial layer marked *P*, while the rest of column 2 and all of columns 3 and 4 consist of nacre. The prismatic layer is composed of vertical columns about 45 μ in thickness disposed normally to the outer surface of the shell. The nacreous layers below are more irregular, with only slight or localized indications of vertical striae, but with both primary, coarse layering and fine striations oriented approximately parallel to the inner shell

have been deposited in 1956 and 1958, respectively. Radioactivity is also evident in the umbonal cleft and elsewhere on the outer surface as well as in the eroded spaces. The white spot left of center resulted from Ca^{45} mixed with the ink used to label the section *5b* (see Fig. 1).

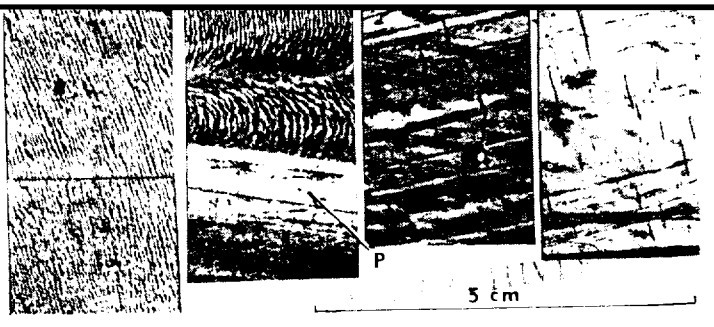

Fig. 3 (right). Composite photomicrograph of thin transverse section ground to a thickness of 15 to 20 μ. Removed from the position indicated by dashes on the right side of Fig 1, (top). Length and width of section, 41 by 2 mm. The continuous strip is divided for convenience into four columns starting with the outside of the shell at the upper left (*P* indicates the pallial mark).

Laboratory of Radiation Biology, University of Washington, Seattle 5

References and Notes

1. J. Brock, *Z. Wiss. Zool.* **46**, 270 (1888), and English translation by W. S. Dallas, *Ann. Mag. Nat. Hist. Ser. 6* **2**, 435 (1888).
2. C. M. Yonge, in *Great Barrier Reef Expedition 1928–29, Scientific Reports* [British Museum (Natural History), London, 1936], vol. 1, p. 283.
3. ———, *Proc. Zool. Soc. London* **123**, 551 (1953).
11. K. M. Wilbur and L. H. Jodrey, *Biol. Bull.* **103**, 269 (1952).
12. Dr. A. D. Welander found specimen 128 about 11 a.m. on 12 August 1964 in water less than 1 m deep within 20 m of the north shore of Engebi Island, Eniwetok Atoll.
13. Work done under contract AT(45-1)1385 with the AEC. . thank also Mr. Egil Oas for preparing the thick and thin sections of the shell, Miss Lorna Matson for the radioautographs, and Dr. Grant Gross for identification by x-ray diffraction of aragonite in the shell.

7 June 1965