SOME OBSERVATIONS ON THE GROWTH OF *Kidderia bicolor* (Martens) (MOLLUSCA : LAMELLIBRANCHIATA) AT SOUTH GEORGIA

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ABSTRACT. Growth of the South Georgian lamellibranch *Kidderia bicolor* (Martens) has been investigated by examination of growth rings on the shell. A uniform rate of growth was found for the five youngest age classes. The number of young brooded in the mantle cavity of the females varied from six to 60. No correlation was found between the number of young brooded and the size or age of the animal.

THERE are considerable difficulties in measuring the growth rates of Antarctic molluscs. Few opportunities present themselves for repeated regular sampling of deep-water populations. The only species that may be collected regularly are intertidal forms or species living in shallow water near shore bases where regular collections may be made by skin-divers. Because of seasonal ice-scouring there are very few species of intertidal Antarctic molluscs. An example is the lamellibranch *Kidderia bicolor* (Martens) of the family Gaimardiidae which is common in South Georgia (Dell, 1964). In early April 1967, we were able to collect several hundred specimens from rocks and boulders on the shore of Husvik Bay. This collection has been examined to provide information on the growth rate and reproduction of this animal.

METHODS

When repeated sampling of a population is not possible, growth data can be obtained if a large number of animals of different ages is collected and if some way can be found of determining their age. This is easier in lamellibranchs than in other animals because variations in the growth rate often result in the formation of rings on the shell. Some other evidence must be available to confirm that the rings are formed annually because there are many factors that can produce a growth ring, e.g. physical disturbance (Wilbur and Owen, 1964). There are clear growth rings on the shell of *Kidderia* and it will be shown later that they can be used as a measure of age. Shell length has been used as a measure of growth; the specimens were measured to the nearest 0·1 mm. using a binocular microscope with a micrometer eyepiece.

RESULTS

Fig. 1 presents shell length–frequency histograms with groups of animals separated on the basis of the number of obvious growth rings. Fig. 2 illustrates the mean length of animals in each group plotted against the number of growth rings in each group. Not represented in either diagram is one individual, length 5·8 mm., with six rings. It is to be expected that the extreme seasonality of the Antarctic climate is likely to produce clear annual growth rings, especially in shallow-water molluscs. The size distribution in Fig. 1 suggests that the *Kidderia* growth rings are annual rings. Table I gives the data from Fig. 2 numerically with the calculated mean increase in growth each year.

The animals were dissected to count the number of young in the mantle cavity of the females. The number of young varied from six to 60 but it was usually between 20 and 40. There was no correlation between the number of young and the size or age of the animal. No 2 yr. old animals were carrying young and it would seem that breeding does not begin until the animals are 3 yr. old. 40 young animals were measured and they had a mean length of $0 \cdot 8 \pm 0 \cdot 19$ mm. Not too much significance can be attached to this measurement because, although the collection was made in early April near the end of the southern summer, release of the young might not take place for another few weeks. There is even the possibility that the young spend their first winter in the mantle cavity before release.

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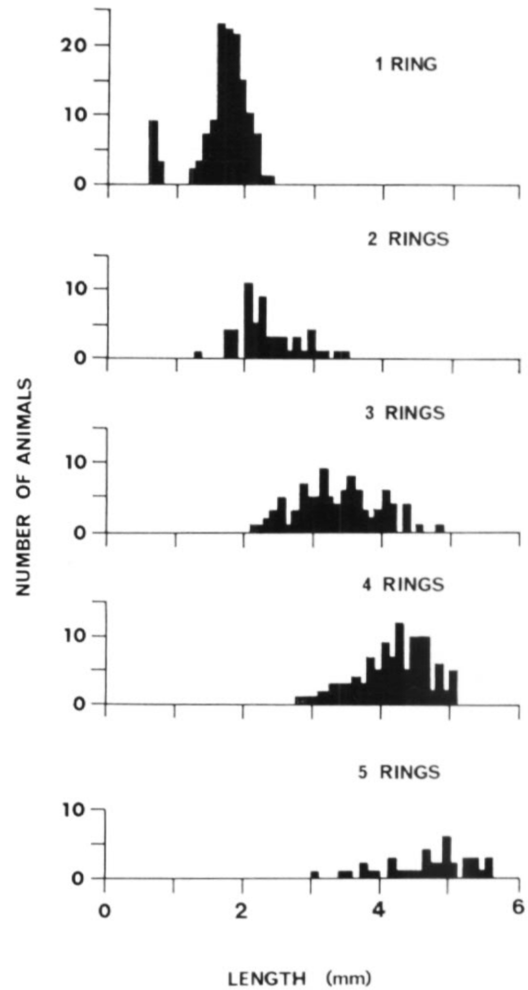

Fig. 1. Length—frequency histograms of the collection of *Kidderia*. The animals have been separated i groups on the basis of the number of shell growth rings.

TABLE I

Number of growth rings	*Mean length with standard deviation and sample number*	*Increase in size each year* (mm.)	(per cent)
1	1·63±0·38 (133)		
2	2·27±0·43 (56)	0·64	39·2
3	3·26±0·58 (95)	0·99	43·6
4	4·14±0·73 (113)	0·88	26·9
5	4·62±0·63 (40)	0·48	11·0
6	5·8 (1)	1·18	25·5

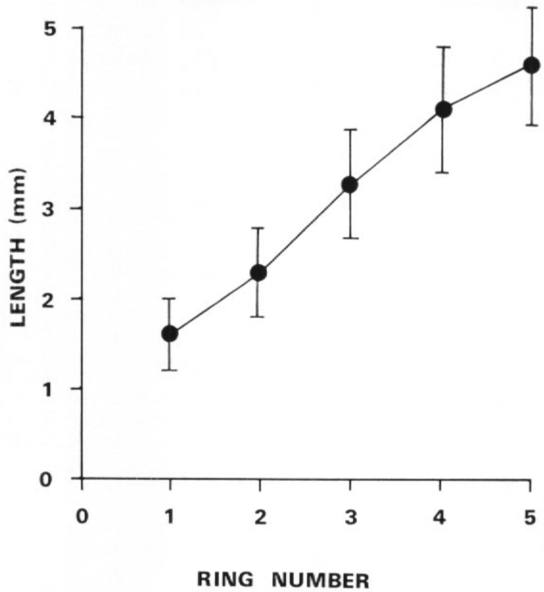

Fig. 2. Mean length with standard deviation plotted against ring number (age).

Discussion

It is clear that *Kidderia* is a small lamellibranch and probably the 6 yr. old animal, length 5·8 mm., is close to the maximum age and size for the species. Of course there are lamellibranchs as small as this in tropical and temperate regions but there is evidence that small size is one of a number of characteristics that cold-water lamellibranchs have in common. Nicol (1966) examined the shells of 36 shallow-water Antarctic species, a number that he considered must represent at least half of the total number of species present. 30 of them had a maximum size of less than 20·0 mm. and 24 were less than 10·0 mm. Other features that seem common to the Antarctic lamellibranchs are thin chalky shells, a lack of bright colours, colour patterns and spines (Nicol, 1964, 1967). In all these respects *Kidderia* is a typical Antarctic lamellibranch.

We have not been able to find any specific information on growth rates of other Antarctic lamellibranchs, although Nicol (1967) commented that the growth rings that have been observed on many species of Arctic and Antarctic lamellibranch suggest that growth proceeds slowly in these cold waters. A typical tropical or temperate lamellibranch growth curve shows fast growth in the young animals, the rate of growth slowing as the animals get older. For example, the scallop (*Pecten maximus*) increases in breadth by 200–300 per cent in its second year but slows to only 20 per cent in its fourth year (Gibson, 1956). This pattern of growth has also been shown by Orton (1926) in *Cardium*, Chamberlain (1930) in several species of fresh-water mussel, Quayle (1951) in *Venerupis*, and by many other authors. *Kidderia* is notable for its slow uniform rate of growth. It is not possible to comment on the growth in its first year of life, the fastest growth period in other lamellibranchs, because the release date of the young is not known. The rate of growth in succeeding years is very uniform compared with the large differences in growth rate seen in other lamellibranchs but more information is needed on other Antarctic species.

It is characteristic of most Arctic and Antarctic benthic invertebrates that they have a non-pelagic mode of reproduction and are either ovoviviparous or brood their young (Thorson, 1936; Soot-Ryen, 1951; Ockelmann, 1965). This habit and its possible ecological significance has been reviewed by Thorson (1950).

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