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Wall Structure of the agglutinated foraminifera *Eggerella bradyi* (Cushman) and *Karreriella bradyi* (Cushman)

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ABSTRACT—Specimens of the agglutinated foraminifera *Eggerella bradyi* (Cushman) and *Karreriella bradyi* (Cushman) have been sectioned to study their wall structure. Specimens of both species from the continental slopes off Britain have test walls composed of quartz, calcite and dolomite grains in an excess of calcareous cement. One specimen of *E. bradyi* examined came from below the C.C.D. and, in this case, the test wall is composed of quartz and feldspar grains with very little intergranular calcareous cement. This suggests one way in which a eurytopic, calcareous agglutinated species may adapt to living below the C.C.D.

INTRODUCTION

Karreriella bradyi (Cushman) and *Eggerella bradyi* (Cushman) are calcareous agglutinated foraminifera belonging to the family Ataxophragmiidae (Loeblich & Tappan, 1964, 1974) or Eggerellidae (Haynes, 1981). These species are similar in most respects except that *Eggerella bradyi* has a triserial pattern of chamber arrangement throughout (Pl. 1, fig. 2) and *Karreriella bradyi* rapidly becomes biserial (Pl. 1, fig. 1).

Specimens of *Eggerella bradyi* (Pl. 1, fig. 3) and *Karreriella bradyi* (Pl. 1, fig. 4) were sectioned to study their wall structure. The method used is given below and is based on that of Hansen *et al.* (1969). The specimen is mounted in Lakeside 70 resin directly onto a Scanning Electron Microscope (S.E.M.) stub. It is manoeuvred into the required orientation using a heated needle and the Lakeside 70 is allowed to cool. The resin is scraped away until the surface of the test is reached. The test itself is then ground away slightly, using ground glass slides of 120–400 grade lubricated with distilled water, until the chambers of the test are opened to the surface. A little more Lakeside 70 is melted onto the specimen to fill the chambers and remove the air from them and then the specimen is reground to the required sectioning level. It is washed with distilled water and etched using a saturated solution of E.D.T.A. for 3–5 minutes (4 minutes was found to be the optimum time). The specimens are coated with gold and observed under the S.E.M. A 'Link System Energy Dispersive Analyser' attached to the S.E.M. is used to indicate the constituent elements of the grains and cement making up the test walls which can then be used to suggest the type of mineral grains used by the foraminifera.

RESULTS

The specimens illustrated in Pl. 1, figs. 3, 4, 5 and 6 are taken from 1710–1920 m (*K. bradyi*) and 2668 m (*E. bradyi*) on the European Continental Margin off Britain. All specimens sectioned were dead, but are taken from samples where downslope transport of the $> 125\,\mu$m fraction is minimal ($< 1\%$) (Murray *et al.*, 1982). The outer surface of the test wall at these depths is generally cream-coloured and smooth. The wall structure of such specimens of both species is very similar. Grains in the walls of both species include quartz, calcite and dolomite in an excess of calcareous cement. Among the specimens examined, both species show variations in the amount of each mineral so that the foraminifera are probably unselective, with the grain type dependent on availability within the area. However, all grains measure $< 10\,\mu$m. Both the sections illustrated in Pl. 1, figs. 3 and 4 measure 0.4 mm in length.

Pl. 1, fig. 7 shows a section through the wall of another specimen of *E. bradyi*. This comes from below the Calcite Compensation Depth (C.C.D.), from 5296 m on the southern Cape Verde – Madeira Abyssal Plain. The test walls of such deep-water specimens are more grey in colour than those from shallower water above the C.C.D., and they are often speckled. In section, they are composed predominantly of quartz and feldspar grains with very little intergranular calcareous cement. Again, all grains measure $< 10\,\mu$m. Such tests of *E. bradyi* from the abyssal plains are no more fragile than those from above the C.C.D. and, despite the paucity of intergranular cement, the grains do not suffer any lack of cohesion. If the wall structure shown in fig. 7 were due to dissolution of the intergranular cement after death of the organism, it is probable that the tests would become fragile and readily disaggregate. This adaptability in wall construction suggests one way in which a eurytopic, calcareous agglutinated species may adapt to living below the C.C.D.

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Explanation of Plate 1

Fig. 1. *Karreriella bradyi* (Cushman) (× 135).

Fig. 2. *Eggerella bradyi* (Cushman) (× 336).

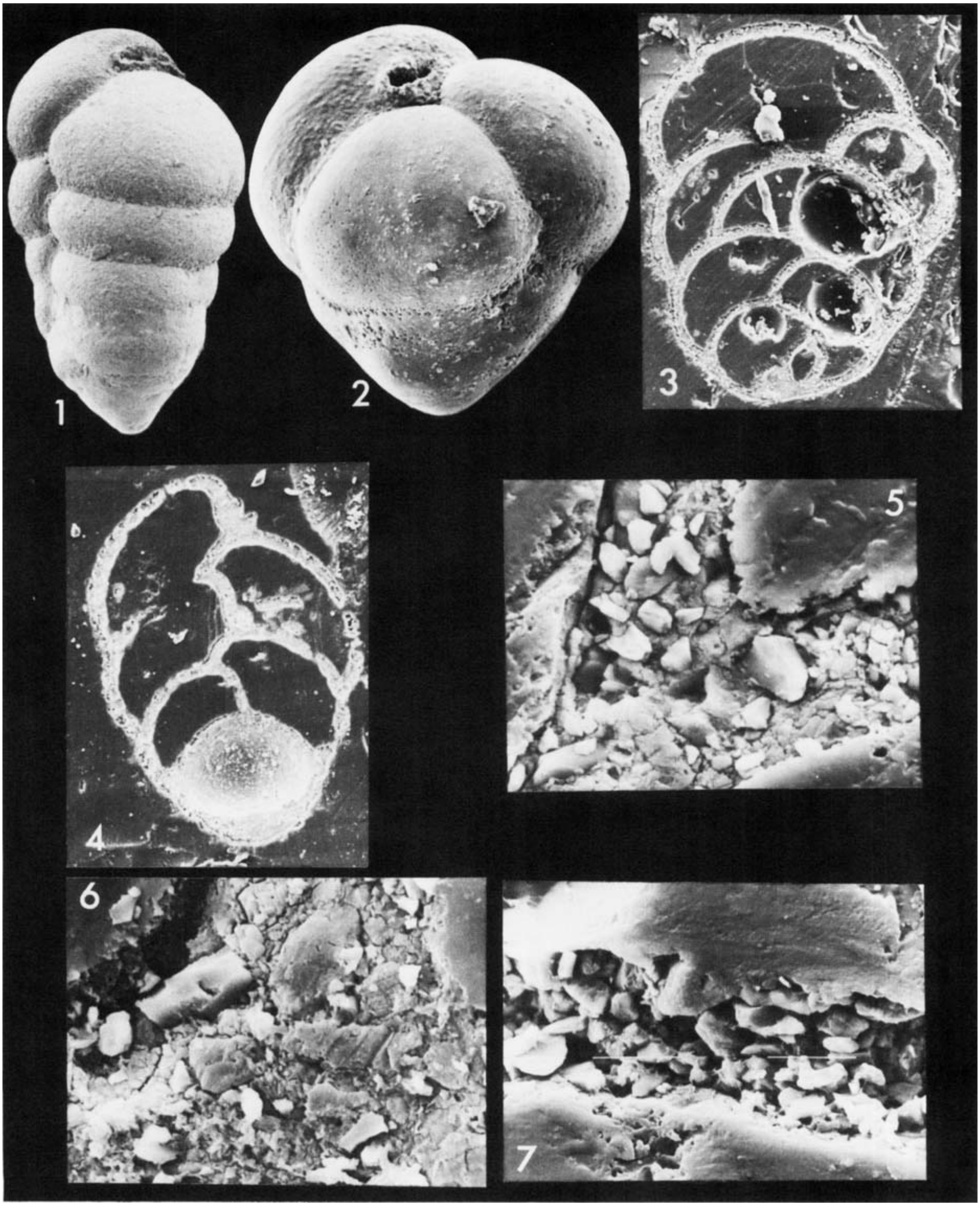
Fig. 3. Longitudinal section through the test of *E. bradyi*. Specimen taken from 2668 m in the eastern Rockall Trough. (× 180).

Fig. 4. Longitudinal section through the test of *K. bradyi*. Specimen taken from 1710–1920 m off the Western Approaches to the English Channel. (× 190).

Fig. 5. Section of the wall of the *E. bradyi* test. Grains in wall mainly quartz and calcite in an excess of calcareous cement. Width of field of view represents 35 μm.

Fig. 6. Section of the wall of the *K. bradyi* test, composition as for fig. 5. Width of field of view represents 25 μm.

Fig. 7. Section of the wall of *E. bradyi* test from 5296 m on the Cape Verde – Madeira Abyssal Plain. Wall composed of quartz and feldspar grains with little intergranular calcareous cement. Scale bar represents 10 μm.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