AN OCCURRENCE OF THE PRODUCTID BRACHIOPOD STRIATIFERA STRIATA (FISCHER) IN THE CARBONIFEROUS LIMESTONE OF NORTH STAFFORDSHIRE

by

Paul G. Morris

Summary

A cluster of the productid Striatifera striata (Fischer) is described and the palaeoecological significance of the specimen is discussed.

In the vicinity of Waterhouses, near Leek in north Staffordshire, are a series of old quarries which usually yield large numbers of fossils. In particular, the quarry immediately west of Lee House (SK 08635030) yields many fossils, including masses of the Rugose coral Lithostrotion spp., occasional specimens of the brachiopod Spirifer bisulcatus J. de C. Sowerby and many productids, especially from the weathered debris at the foot of the old quarry face.

The strata of the Lee House quarry have been referred to as the Waterhouses Limestones by Prentice (1951, p. 186) and Ludford (1951, p. 222). Prentice (op.cit., p. 182) regarded these beds as belonging to the Lower Dibunophyllum (D_1) Zone of the Lower Carboniferous. Ludford (op. cit., p. 221) observes that the top fifty feet of the Waterhouses Limestone are of D_2 age and then (p. 222) comments that the top 50 - 100 feet of these limestones are well exposed in the quarries west of Lee House. Parkinson and Ludford (1964, p. 171) refer the Waterhouses Limestones to the D_1 zone. These authors also refer (op.cit., p. 172) to abundant Striatifera striata in limestones on Cauldon Low but make no reference to their mode of occurrence.

The species Striatifera striata is not uncommon among the productid fauna of the Lee House quarry. Specimens are generally to be found lying haphazardly in the limestone, with little or no evidence of their mode of life; they are apparently non-gregarious in habit. However, a specimen collected from the limestone debris in the quarry shows that, at least occasionally, the species is gregarious. Muir-Wood and Cooper (1960, p. 41) wrote of Striatifera that "the animals lived in clusters and banks very much like oysters, the shells cemented to one another by their spines. The narrowly beaked and often distorted forms resulting from the close-crowding of individuals". So far as I can ascertain, clusters of Striatifera striata have not been figured. I am indebted to Mr. A. Ludford for the information (verbal communication) that he has not observed this gregarious habit amongst specimens collected by him from Cauldon Low. He has, however, collected a specimen in which two individuals grew in close proximity to one another.

The specimen figured (Plate 11) consists of at least seven (and possibly eight) individuals of varying size, growing on the surface of a large brachiopod valve. The host valve may be another Striatifera striata but is only partly preserved and it is probably not specifically determinable. The members of the group show a considerable amount of distortion suffered during the growth of

the individuals and presumably caused by restricted space. The shells are aligned along a gentle arc running across the host valve. The largest individuals are centrally placed on the host valve and are much elongated, with a length in excess of three inches (the anterior part of the shells of these animals is damaged and incomplete). The umbonal region of all individuals, except those at either end of the row, is narrowly pointed. The marginal individuals have a more normal rounded outline, presumably because of the much less restricted environment. Preservation of the shells is poor. Traces of shell ornament can be seen on most individuals, but the larger specimens are represented by smooth internal casts. Where ornament is seen on the larger shells it consists of very fine radial striae. On the smaller specimens, particularly those at either end of the group, a fine radial ornament is accompanied by the development of more widely spaced, coarser, concentric wrinkles.

The alignment of the individuals of S. striata is of interest in that it gives a possible clue to their orientation during life. The development of the group along an arcuate line suggests that the host valve was partially embedded at an angle in a calcareous ooze. Brachiopod larvae, on sinking to the sea-bed after their planktonic phase, settled on to the host valve. It is puzzling that colonisation should have occurred only along a single line and not haphazardly over the whole shell surface. Possible explanations are either that bottom currents were sufficiently strong to sweep the main part of the host valve clear of larvae, or that the angle at which the valve was embedded was too great to allow colonisation. The settling larvae may therefore have been carried down to sediment level before being able to attach themselves. The mode of attachment to the host valve is not seen clearly; but what may be attachment spines can be seen close to the umbo of one of the largest individuals. Attachment in the genus Striatifera normally occurred by means of spines on the posterior part of the pedicle valve (Muir-Wood & Cooper, 1960, p. 41).

Members of the group figured overlap one another to a varying extent, posing a question as to the attitude of the two valves during the life-time of the individual animals. If each individual was rigidly fixed in position by attachment spines around the umbo, then the effect of crowding and overlapping would have been to prevent normal opening and closing of the valves. It might therefore be assumed that, if the animals were to live for any length of time, the two valves would have to enlarge with a permanent, though slight, gape along the anterior margin. Since each individual is incomplete in the anterior region, the presence of such a gape cannot be determined. The development of a permanent gape in the productids appears to have been accompanied by the development of endospines around the anterior margin. These presumably served to strain water passing inwards and also to prevent access by predators to the interior of the shell. Because of incomplete preservation, the presence or absence of endospines cannot be determined. Chao (1927, pp. 94-97) and Muir-Wood and Cooper (1960) do not refer to the development of endospines in the genus Striatifera. It must be assumed, therefore, that crowding was not so great as to prevent normal opening and closure of the valves.

The development of an elongated shell in productids such as S. striata, which may assume a gregarious mode of life, is parallelled by a similar type of shell growth in such lamellibranchs as the oysters. Hayasaka (1960, p. 366) cites the species Crassostraea virginica (Gmelin) as becoming abnormally elongated through growing on crowded banks, a phenomenon also recognised by Ryder (1884). Similarly, a marked elongation occurs in the British oyster Liostrea hebridica var. elongata, from the Middle Jurassic (Bathonian) of Dorset.

Distortion of the shells of brachiopods is also not unusual. Ager and Riggs (1964, pp. 758-759) refer to the development of distorted forms of Spinocyrtia iowensis (Owen) in the Devonian and suggest that this asymmetry is due to restriction of the environment. Similarly Cooper (1957) notes that specimens of Mucrospirifer are frequently deformed and he attributes this to crowding of specimens during growth. A specimen of the modern Pacific brachiopod species

Plate 11 A cluster of the productid Striatifera striata (Fischer) from the Lower Carboniferous. Specimen NS.929 Magnification x 1.

Terebratella transversa, in the collection of the Department of Geology, Chelsea College of Science and Technology, also shows a marked asymmetry. The provenance of this specimen is unknown, so that its asymmetry cannot be ascribed definitely to restriction of environment. Other possible causes of asymmetry may be damage during growth or the influence of parasites (Ager and Riggs 1964, p.759). Since modern terebratellids are forms which attach themselves to a rocky substratum as isolated individuals, it seems probable that asymmetry in T. transversa is pathological.

The specimen described in this note is housed in the author's personal collection (Catalogue No. NS.929) in the Department of Geology, Chelsea College of Schience and Technology.

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P.G. Morris, B.Sc., Ph.D.,
Department of Geology,
Chelsea College of Science and Technology,
Manresa Road,
London, S.W.3.

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