THE AFFINITIES OF TWO ENDEMIC SILURIAN BRACHIOPODS FROM THE DINGLE PENINSULA, IRELAND

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ABSTRACT. Two endemic brachiopods are described from the Wenlock of the Dingle Peninsula, south-western Ireland: *Rhipidium hibernicum* sp. nov. and *Spirifer bigugosus* M'Coy, 1846, the latter designated as the type species of a new genus *Holcospirifer* erected here and referred to the Kozlowskiellinae.

SOME reconstructions of the North Atlantic area in Wenlock times (e.g. Mitchell and McKerrow 1975) show what is now the Dingle Peninsula (County Kerry, south-western Ireland) on the northern side of the Proto-Atlantic Ocean; other interpretations (e.g. Holland 1969*b*) place it on the southern margin. Current progress in Irish Silurian research is not yet conclusive on this point. The Dingle Peninsula yields one of the few Wenlock shelly faunas from Ireland, including rich assemblages of brachiopods, together with less common corals, molluscs, trilobites, etc. The Proto-Atlantic appears to have been closing at this time, and, in general, the brachiopod faunas were similar on both its northern and southern margins during most of the Silurian. Thus it is important in progress towards palaeogeographical understanding to document the few occurrences of endemic faunas in the region.

Silurian brachiopods were first described from Dingle by M'Coy (1846), who reported thirty-four species from the area. The fauna has not yet been fully monographed, but from stratigraphical accounts and faunal lists (e.g. Gardiner and Reynolds 1902) it has long been recognized that the assemblages are closely comparable with those from the type Wenlock and Ludlow successions of the Welsh Borderland, with the majority of species common to both areas. These relationships have been confirmed by one of us (Holland 1969*b*) in a preliminary revision of the stratigraphy. However, a number of earlier authors have quoted F. R. C. Reed's (*in* Gardiner and Reynolds 1902) identifications of *Pentamerus oblongus* (J. de C. Sowerby), *Stricklandia lens* (J. de C. Sowerby), and *S.* [= *Costistricklandia*] *lirata* (J. de C. Sowerby) as indicating a Llandovery age for part of the succession in the peninsula. These records are probably a result of misidentifications of post-Llandovery forms such as *Meristina obtusa* (J. Sowerby), ribbing of large *Atrypa* (tectonically flattened and drawn out), *Rhipidium*, and perhaps rhynchonellids. The oldest beds in the Dingle Peninsula are now known to be no older than Wenlock (Holland 1969*a*, *b*).

Within the Wenlock succession there are two distinctive brachiopod species, each very common and dominating its local assemblage at certain localities, which are not known from elsewhere and appear to be endemic to the Dingle area. They have been fairly widely quoted as *Spirifer bijugosa* M'Coy, 1846 [note the misspelling], from the Ferriters Cove and Clogher Head formations, and *Rhipidium* sp., from the

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stratigraphically higher Drom Point Formation; but their affinities and taxonomic relationships with other species have remained obscure. Both species are described in full here so as to clarify these relationships.

The Silurian succession in the western, Clogher Head, inlier of the Dingle Peninsula includes a substantial amount of volcanic rocks, especially in the Clogher Head Formation but also in the Ferriters Cove Formation below and the Mill Cove Formation above (both also Wenlock in age). Volcanic rocks are also prominent in the Wenlock rocks of Inishvickillane, the south-westernmost of the Blasket Islands, off the end of the peninsula and some 15 km south-west of Clogher Head. Neither of the two brachiopod species described here is present in the Wenlock rocks of the Annascaul inlier of the south-eastern part of the Dingle Peninsula some 20–40 km east of Clogher Head (see Holland 1969*b*, fig. 5 or Parkin 1974, fig. 1). Parkin has found there only relatively thin volcanic mud flows and tuff beds. Neuman (1972) postulated volcanic islands as centres of evolution during the lower Ordovician and Cocks and McKerrow (1973) have suggested a similar relationship in the Wenlock of Bohemia. Thus the Dingle brachiopods described here may have been products of the same process, bearing in mind, however, that associated with these endemic species are other forms of wider distribution.

Most of the material described here is deposited in the Geological Museum of Trinity College, Dublin (TCD), though a few specimens are from the National Museum of Ireland (NMI) and the British Museum (Natural History) (BB).

Superfamily PENTAMERACEA M'Coy, 1844
Family PENTAMERIDAE M'Coy, 1844
Subfamily PENTAMERINAE M'Coy, 1844
Genus RHIPIDIUM Schuchert and Cooper, 1931

Type species. Pentamerus Knappi Hall and Whitfield, 1872, p. 3, from the Silurian of Louisville, Kentucky, U.S.A.

Rhipidium hibernicum sp. nov.

Plate 93, figs. 1–6; Plate 94, figs. 1–5

1863 *Pentamerus Knightii* J. Sowerby; Salter, p. 13 [name only: *non* J. Sowerby, 1812].
1867 *Pentamerus Knightii* J. Sowerby; Davidson, p. 142 *pars*, pl. 19, fig. 3, *non* pl. 16, figs. 1–3, *non* pl. 17, figs. 1–10 [*non* J. Sowerby, 1812].
1965 *Rhipidium* aff. *pingue* Amsden; Lamont, p. 20 [*non* Amsden, 1949].
v1969*a* *Rhipidium* sp. Holland, p. 210 [name only].
v1969*b* *Rhipidium* aff. *pinque* [*sic*] Amsden; Holland, p. 305 [name only: *non* Amsden, 1949].
v1974 *Rhipidium* sp. Parkin, p. 284 [name only].

Holotype. TCD 13646a, b, internal mould of pedicle valve and counterpart external mould; Plate 93, fig. 1*a–d*; from the Drom Point Formation (Wenlock), northernmost cliffs of Great Blasket Island.

Paratypes. TCD 13647–13654, from the same horizon and locality as the holotype; BB 36919 and 36921, Drom Point Formation, Dunquin river 470 m north-east of the bridge where the main road crosses the river.

Diagnosis. Gently biconvex *Rhipidium* with a weakly incurved ventral beak, large triangular inner plates, and very long, slender outer plates which fuse posteriorly

with the brachial processes. Spondylium entirely supported on high septum which passes anteriorly into a long slender myophragm. Radial ornament fairly coarse.

Description

Exterior. Ventribiconvex, with the pedicle valve weakly to moderately curved and the brachial valve only gently curved posteriorly, and almost flat anteriorly in some specimens. Both valves are evenly curved (non-lobate) transversely. Outline broadly subtriangular, hinge line very short and curved, merging smoothly with long, straight to gently curved posterolateral margins; maximum width close to mid-length, anterolateral and anterior margins evenly curved. Anterior commissure rectimarginate and crenulate. Interareas very short or lacking, ventral beak suberect or weakly curved up to, but not crossing, the hinge line. Delthyrium apparently open, delthyrial angle 60–70°. Radial ornament coarsely costellate; costae rarely bifurcate before the 10 mm growth stage, and throughout growth branching is not common, but does occur, mainly close to the mid-line. Ribs strong, even and rounded in section; there are sixteen to eighteen ribs at the 20 mm growth stage of the pedicle valve, with rib-width increasing anteriorly to over 2 mm, separated by rounded interspaces of about the same width. Faint, slightly lamellose concentric growth fila are visible in some shells.

Pedicle valve interior. Spondylium duplex well developed, deep, broad, with lateral plates widely flared outwards to join the posterolateral walls of the valves, enclosing deep lateral cavities; the spondylium may occupy up to a quarter valve length, and is supported throughout its length by a high, slender septum, whose height decreases abruptly below the anterior end of the spondylium to form a low myophragm extending anteriorly for over half the valve length, sometimes as much as 80% of the length. Musculature not observed.

Brachial valve interior. Inner plates broad, triangular, flared widely laterally to join the valve walls. Brachial processes slender, restricted to the posterior third of the valve, supported throughout their length by, and fused with, slender outer plates which are subparallel or slightly divergent anteriorly, and extend beyond the processes for up to 80–90% of the valve length. Both brachial processes and outer plates are inclined slightly ventrolaterally on to the floor of the valve. Musculature not observed.

Dimensions. All the available specimens are too fragmentary to give accurate dimensions, but mature shells reached a length of more than 50 mm and a width of about 45 mm.

Discussion. *Rhipidium hibernicum* is the only known species of *Rhipidium* in the British Isles. A record of the genus by Ziegler *et al.* (1968) in the early Wenlock Nash Scar Limestone of Powys, Wales, can probably be discounted (for discussion see Bassett 1976). The Dingle form was first correctly referred to the genus by Dr. A. Lamont, who informally published the attribution in a Ludlow Research Group Bulletin in 1955. *R. hibernicum* differs from the type species *R. knappi* in being less strongly biconvex and in having fewer bifurcating ribs, while *knappi* is also distinguished in being distinctly trilobate anteriorly. *R. knappi* has an average of

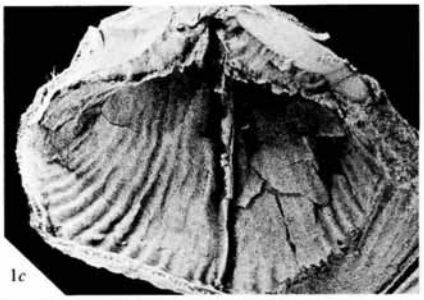
thirty-eight ribs at 40 mm length, as compared with twenty-six in *R. hibernicum*. *R. pingue* Amsden, 1949, from the Brownsport Formation (Ludlow) of Tennessee, U.S.A., with which *hibernicum* has been compared in the past (see synonymy), differs in having coarser, more angular ribs, much shorter outer plates, and less widely flared inner plates, and a shorter ventral septum. The approximately contemporaneous *R. tenuistriatum* (Lindström, 1880) from the Slite Beds (Wenlock) of Gotland, Sweden, differs from *hibernicum* in its stronger convexity, more strongly incurved ventral beak, less coarse ribbing, and shorter ventral septum and outer branchial plates.

Occurrence. Unlike *Holcospirifer bigugosus*, which is found at many localities and various horizons in the Wenlock rocks of the Dingle Peninsula, *R. hibernicum* is recorded from only four places and seems to be restricted stratigraphically to a particular upper Wenlock horizon. Substantial collections have been obtained from the cliff section at the northern extremity of the Great Blasket Island, where a small area of fossiliferous rocks of the uppermost Drom Point Formation is in faulted contact with the fluviatile sediments of the Dingle Group which form the bulk of the island. Preservation is in a strikingly ochrous decalcified siltstone in some beds of which moulds of *Rhipidium* are the dominant fossil; although mostly fragmentary, the specimens here are undistorted and unflattened. These beds succeed and are associated with *Chondrites* bearing beds, which are also present on the coastal sections of the adjacent mainland of the peninsula where the *Rhipidium* bank is faulted out. The same *Rhipidium*-rich beds, though in a less decalcified condition, are found inland in the Dunquin river 470 m north-east of the bridge where the main road crosses the river. The distinctive lithology again suggests a particular facies control. Here the *Rhipidium* horizon at the top of the Drom Point Formation is succeeded by the Croaghmarhin Formation which yields both uppermost Wenlock and Ludlow faunas. The *Rhipidium* which Davidson (1867, pl. 19, fig. 3) figured as *Pentamerus knightii* is given as from Ballyaglish, east of Ferriters Cove, Dingle. The actual exposure has not been located but the position of Ballyaglish within the Clogher Head inlier is structurally consistent with the horizon exposed on the Great Blasket and in the Dunquin river. Finally Parkin (1974) has recorded two specimens of *Rhipidium*

EXPLANATION OF PLATE 93

Figs. 1–6. *Rhipidium hibernicum* sp. nov. 1*a–d*, ventral view of internal mould of pedicle valve, posterior view, latex cast, and latex cast of counterpart external mould, holotype, TCD 13646a, b, Drom Point Formation (Wenlock), northernmost cliffs of Great Blasket Island. 2*a–d*, dorsal view of internal mould of brachial valve, latex cast, posterior view of mould, and enlargement of cast to show the brachial apparatus with long, slender, outer plates, broad, triangular inner plates, and short brachial processes fused to outer plates, paratype, TCD 13647, same horizon and locality as holotype. 3, internal mould of brachial valve showing long, subparallel outer plates of brachial apparatus, paratype, TCD 13648, same horizon and locality as holotype. 4, longitudinal section through mould of umbonal region of pedicle valve showing the spondylium and supporting septum, and the gentle curvature of the beak, paratype, BB 36919, Drom Point Formation, Dunquin river 470 m north-east of the bridge where the main road crosses the river. 5, internal mould of pedicle valve, paratype, TCD 13649, same horizon and locality as holotype. 6, latex cast of external mould of brachial valve showing trace of outer plates, paratype, TCD 13650, same horizon and locality as holotype. Fig. 2*d* ×4, all other figs. ×1·5.

1a

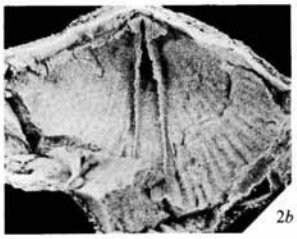


1c

1b

1d

2a



2b

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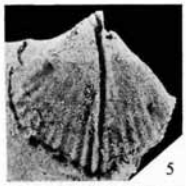

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6

2d

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from the lower part of the upper Wenlock Landing Place Formation on the island of Inishvickillane, where they are associated with *Chondrites* smaller than those seen in the Clogher Head inlier.

Superfamily SPIRIFERACEA King, 1846
Family DELTHYRIDAE Waagen, 1883
Subfamily KOZLOWSKIELLINAE Boucot, 1957
Genus HOLCOSPIRIFER gen. nov.

Derivation of name. From the Greek 'holcos' meaning groove, referring to the nature of the fold.

Type species. Spirifer bigugosus M'Coy, 1846.

Diagnosis. Kowslowskielline with a plicate fold and lacking a ventral median septum.

Species assigned. Spirifer bigugosus M'Coy, 1846—described here.

Spirifer sulcata var. *elongata* Munthe, 1910, from the Eke Beds (Ludlow) of Gotland, Sweden.

Spirifer insignis Hedström, 1923, from the Klinteberg and Hemse Beds (late Wenlock and Ludlow) of Gotland, Sweden.

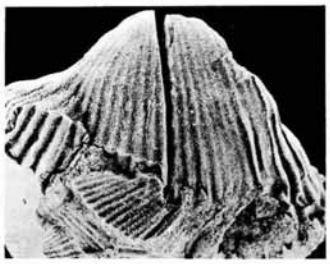
Discussion. Only two other kozlowskielline genera are known. *Holcospirifer* is most closely related to *Boucotinskia* Brunton and Cocks, 1967, but differs in having a plicate fold and sulcus, in the same way as the eospiriferid *Nikiforovaena* differs from *Striispirifer*. *Boucotinskia* has a non-plicate fold and sulcus (Bassett and Cocks 1974, pl. 11, fig. 2). Both *Holcospirifer* and *Boucotinskia* differ from *Kozlowskiellina* Boucot, 1958 in lacking a ventral median septum. Bassett and Cocks (1974, p. 39) regarded the Gotland *insignis* as a subspecies of *elongata*, and included them questionably within *Boucotinskia*. Both have a plicate fold and sulcus, and are thus assigned here to *Holcospirifer*.

EXPLANATION OF PLATE 94

Figs. 1–5. *Rhipidium hibernicum* sp. nov. 1, latex cast of external mould of pedicle valve, paratype, TCD 13651, same horizon and locality as holotype. 2*a*, *b*, ventral and lateral views of internal mould of pedicle valve showing the gentle curvature of the beak, paratype, TCD 13652, same horizon and locality as holotype. 3, internal mould of posterior portion of brachial valve, paratype, BB 36921, horizon and locality as for BB 36919. 4, latex cast of internal mould of pedicle valve showing long septum supporting the spondylium, paratype, TCD 13653, same horizon and locality as holotype. 5*a*–*c*, internal mould of pedicle valve, latex cast of median area, and posterior view of median area of mould, paratype, TCD 13654, same horizon and locality as holotype. All ×1·5.

Figs. 6–8. *Holcospirifer bigugosus* (M'Coy, 1846). 6*a*, *b*, dorsal and posterior views of internal mould of brachial valve, lectotype, NMI G3/1. 1975, Sir Richard Griffith Collection, from Ferriters Cove. Specimen kindly loaned by the Director, National Museum of Ireland. 7*a*, *b*, external mould of pedicle valve and latex cast, TCD 13655, Ferriters Cove Formation, Coonakeel, north side of Ferriters Cove, 290 m east of Ferriters Castle. 8*a*, *b*, internal mould of brachial valve and latex cast, TCD 13656, Ferriters Cove Formation, north side of Ferriters Cove, 290 m east-north-east of previous locality. All ×1·5.

1



2a

2b

3

4

5a

5b

5c

6a

6b

8a

7a

7b

8b

BASSETT, COCKS and HOLLAND, *Rhipidium hibernicum* and *Holcospirifer bigugosus*

Holcospirifer bigugosus (M'Coy, 1846)

Plate 94, figs. 6–8; Plate 95, figs. 1–6

v1846 *Spirifer bigugosa* M'Coy, p. 36, pl. 3, fig. 23 [*Spirifer bigugosus* [*sic*] in plate legend].
v1862 *Spirifer bigugosa* M'Coy, p. 36, pl. 3, fig. 23 [second edition, unchanged].
1863 *Spirifera bijugosa* (M'Coy); Salter, p. 13 [name only].
1867 *Spirifera bijugosa* (M'Coy); Davidson, p. 89, pl. 10, figs. 1–3.
1902 *Spirifer bijugosus* M'Coy; Gardiner and Reynolds, pp. 234 et seq. [name only].
v1969*b* *Macropleura bijugosa* (M'Coy); Holland, pp. 302, 304 [name only].

Type locality. M'Coy (1846, p. 36) recorded this fossil as 'very abundant in the shales of Doonquin, Dingle, County Kerry; very common in the slates of Ferriter's Cove, Dingle, Co. Kerry'. The Ferriters Cove Formation and Clogher Head Formation (both Wenlock) are well exposed in Ferriters Cove and the 'Doonquin' reference is to the latter (Holland 1969*b*). The species is widely distributed in both formations.

Type specimens. M'Coy described the collection of Sir Richard Griffith, now in the National Museum of Ireland. Only one block containing specimens of *bigugosus* (and regarded as type material) is now available from this collection (NMI G3. 1975). Although none of the specimens on the block can be identified directly with M'Coy's illustration (which was probably a reconstruction), nevertheless they are syntypes, and we here select as lectotype NMI G3/1. 1975 (Plate 94, fig. 6*a*, *b*). The locality is simply given as 'Ferriter's Cove'.

Other material. TCD 13655 Ferriters Cove Formation, Coonakeel (literally 'bay of the narrow', though the locality is on a small headland), north side of Ferriters Cove, 290 m east of Ferriters Castle; TCD 13656 Ferriters Cove Formation, north side of Ferriters Cove, 290 m east-north-east of previous locality; TCD 13657–13658 Clogher Head Formation, clifftop exposure west of Dunquin and 220 m north of Redcliff Cove; TCD 13659–13661 Clogher Head Formation, Ferriters Cove (detailed localities unknown).

Description

Exterior. Ventribiconvex; valves elliptical in outline, half to two-thirds as long as wide, maximum width just anterior to the hinge line. Ventral beak suberect, ventral interarea long, curved, apsacline, with large open delthyrium flanked by thin detached delthyrial plates. Delthyrial angle about 40°. Dorsal interarea very short. Radial ornament plicate and fimbriate; ribs subangular in cross-section, with five to fifteen (mode 10) non-branching, equally spaced lateral plicae on either side of the fold and sulcus, which are prominent, widening anteriorly, with a central groove in the fold and a faint complementary plication in the sulcus. Concentric ornament fine,

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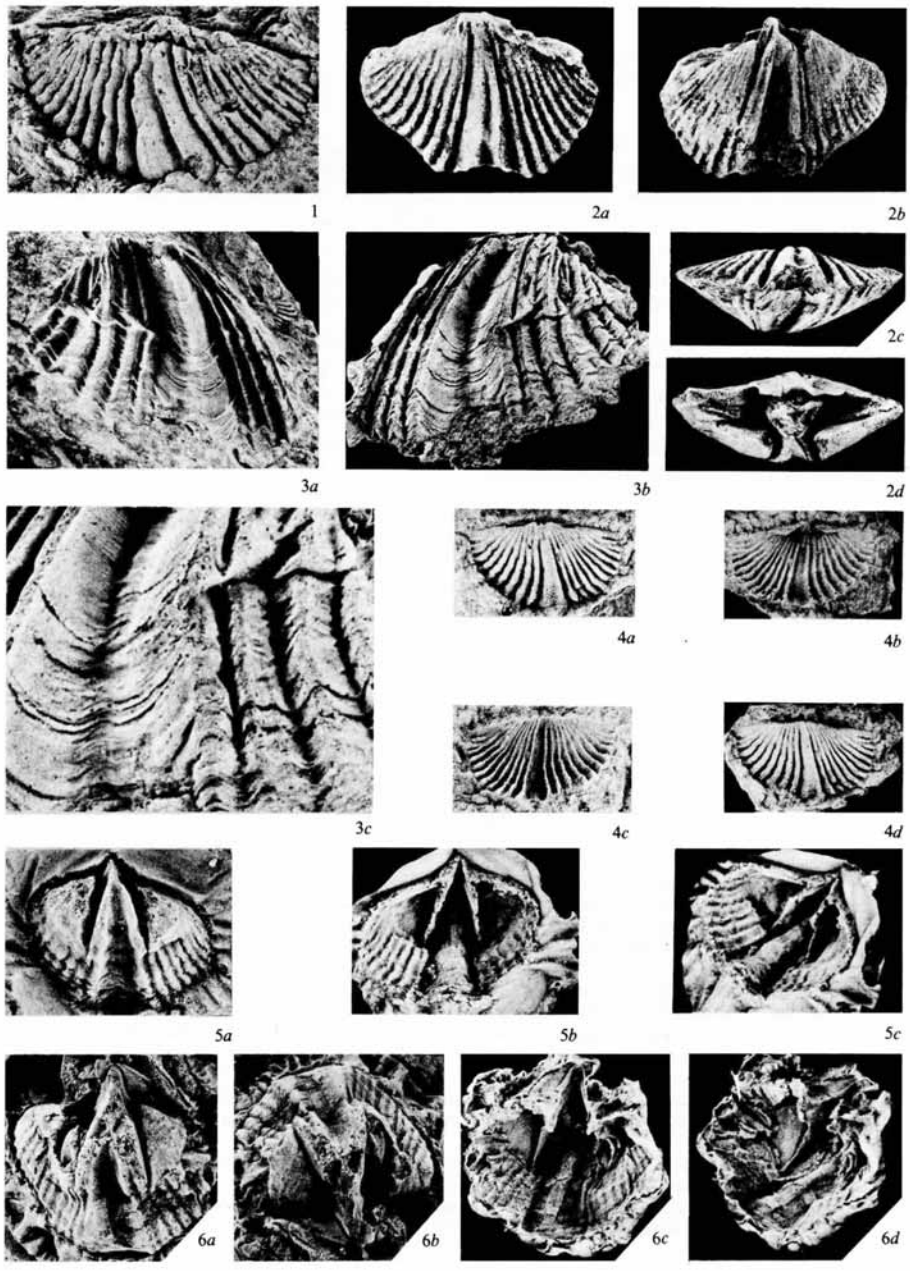
EXPLANATION OF PLATE 95

Figs. 1–6. *Holcospirifer bigugosus* (M'Coy, 1846). 1, internal mould of brachial valve, syntype on same slab as lectotype, NMI G3/3. 1975, Sir Richard Griffith Collection, from Ferriters Cove. 2*a–d*, dorsal, ventral, anterior, and posterior views of steinkern, TCD 13657, note the distinctive groove on the dorsal fold, Clogher Head Formation, clifftop exposure west of Dunquin and 220 m north of Redcliff Cove. 3*a–c*, external mould of pedicle valve, latex cast, and enlargement of part of cast to show kozlowskiellinid ornament, TCD 13659, Clogher Head Formation, Ferriters Cove. 4*a–d*, internal mould of brachial valve and latex cast, counterpart external mould and latex cast, TCD 13660a, b, Clogher Head Formation, Ferriters Cove. 5*a–c*, internal mould of pedicle valve and latex cast, and oblique view of cast showing the high, distinctive dental plates, TCD 13658, horizon and locality as for TCD 13657. 6*a–d*, ventral and posterior views of internal mould of pedicle valve, latex cast, and oblique view of cast showing shape of dental plates, TCD 13661, Clogher Head Formation, Ferriters Cove. Fig. 3*c* ×4, all other figs. ×1·5.



BASSETT, COCKS and HOLLAND, *Holcospirifer bigugosus*

lamellose, sometimes accentuated at coarse growth stages. Although most specimens are poorly preserved, very fine radially aligned spines cross the growth lamellae, giving the appearance of a fine eospiriferid-like radial ornament in places.

Pedicle valve interior. Teeth small, cyrtomatodont, rounded and slightly curved, supported by prominent dental plates which diverge at an angle of approximately 40°, drop abruptly below the teeth, and then decrease in height to join the floor of the valve at about mid-valve length. The teeth and plates are straight and bound deep lateral cavities which are undercut below the interarea, and in a few gerontic specimens include secondary calcite posterolaterally. There is no median septum. Muscle scars obscure, but suboval and confined to the posterior area between the dental plates.

Brachial valve interior. Notothyrial cavity shallow and longitudinally striated in some specimens, with a very small central process. Sockets small, shallow, bounded laterally and dorsally by wide hinge plates and medially by short crural plates. There is no median septum. The notothyrial platform extends for a short distance anteriorly as a broad, low ridge which tapers anteriorly between the impression of the fold. Form of spiralia and musculature unknown.

Dimensions. The material in this case is distorted, but large specimens of *H. bigugosus* must have exceeded 25 mm in length and 40 mm in width.

Discussion. The slightly younger *H. elongatus* (and its subspecies *insignis*) differs from *H. bigugosus* in its stronger concentric ornament. It is also more alate, with more sharply pointed extremities (Bassett and Cocks 1974, pl. 11, figs. 3–7), the fold is more strongly grooved, and the sulcus contains a pair of plications in some specimens.

This paper is a contribution to Project Ecostratigraphy.

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