A NEW ORDOVICIAN CRINOID FROM DOLGELLAU, NORTH WALES

by D. E. B. BATES

ABSTRACT. *Iocrinus brithdirensis* sp. nov. from the Llanvirnian of Dolgellau (Merioneth) is described.

A FAUNA of trilobites, crinoids, and molluscs is listed in the Directory of British Fossiliferous Localities as occurring at Brithdir, Dolgellau. The reference given (Cox and Lewis 1945, p. 80) mentions only *Ogyginus corndensis*, *Conularia*, and didymograptids of the *bifidus* group. The horizon is thus lower Llanvirnian, and the succession is of calcareous flags and ashy mudstones, resting on agglomeratic mudstones. Fourteen specimens of a crinoid have recently been found.

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Class CRINOIDEA J. S. Miller 1821
Subclass INADUNATA Wachsmuth and Springer 1881
Order DISPARATA Moore and Laudon 1943
Family IOCRINIDAE Moore and Laudon 1943
Genus IOCRINUS Hall 1866

Iocrinus brithdirensis sp. nov.

Plate 45

Diagnosis. A species of *Iocrinus* with a smooth conical calyx, the plates without independent convexity, over twice as wide at the top as at the base and slightly wider than high; basals as wide as high and three-quarters the height of the radials; radials slightly wider than high, with an evenly concave facet occupying the full width of the upper margin; primibrachs five to eight, just over twice as wide as high; secundibrachs ten to eleven, tertibrachs eight to twelve, the more distal plates becoming as high as wide; anal plate and proximal plates of the anal tube just higher than wide, more distal plates becoming relatively higher and developing a sharp fold; stem pentagonal at the base of the calyx, but becoming round distally, formed of columnals of varying height.

Holotype. BMNH E51710*a–b*, counterpart moulds; width of calyx 7·7 mm.; height of calyx 5·1 mm.

Paratypes. BMNH E51711*a–b*, counterpart moulds; width of calyx 7·5 mm.; height of calyx, 5·7 mm. BMNH E51712*a–g*, counterpart slabs with several specimens.

Horizon and locality. Ogyginus corndensis beds, Llanvirnian, in banks of Nant Helygog, 1,660 yards east by south from Gorwyr farm, 90 yards upstream from the sheep washery. Nat. Grid. Ref. SH/795183.

Description. Cup just wider than high, though flattened in all specimens, cone-shaped, the sides faintly convex in side view, the diameter at the top being just over twice that at the junction with the stem; plates smooth and without independent convexity. Basals

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three-quarters the height of the radials, pentagonal, as high as wide. Radials slightly wider than high, widening slightly upwards, facet evenly concave and occupying the full width of the upper margin.

Apparently five to eight primibrachs, just over twice as wide as high, subcircular in cross-section, bearing a sharp-edged food groove containing small ambulacral plates. Ten to eleven secundibrachs, eight to twelve tertibrachs. Arms branch five to six times, the distal portions narrow with a sharp ridge running up the lower (dorsal) side, more than fourteen times the length of the calyx.

Superradianal plate pentagonal, wider than high, bearing on its left side the anal tube, on its right the right posterior arm, with five to six primibrachs. Proximal plates of the anal tube (including the anal plate) just wider than high, becoming higher than wide and developing a sharp ridge on both their anterior and posterior sides. The more distal side plates of the tube are sharply folded transversely, concave with raised sutures between them, two for every central plate. Entire anal tube over ten times the height of the calyx.

Tegmen not seen.

Stem formed of columnals of varying height, sharply pentagonal in cross-section at the base of the calyx, becoming round and decreasing in diameter away from the calyx.

Discussion. The new species differs from *I. shelvensis* Ramsbottom in having the radials as wide as high, and without a sigmoidal shaped re-entrant on the facet; in having the basals three-quarters the height of the radials; and probably in having more secundibrachs. *I. whitteryi* Ramsbottom has the brachials, even in the distal parts of the arms, substantially wider than high, and has only four secundibrachs (in the one specimen seen by Ramsbottom).

About fourteen fairly complete specimens were collected, enabling a few statistical estimates of proportions to be made (Table I). The calyces are variably flattened in most specimens, so that, although the height and width of the calyx are highly significantly correlated, there is no guarantee that the proportions would be the same in unflattened specimens. Similarly the relation between the width of the calyx and the width of the stem immediately beneath it may be altered.

Crinoids are not common members of the British Ordovician faunas: previous to Ramsbottom's monograph (1961) only five species had been described, to which he added a further seventeen. This is due to several factors. As Ramsbottom pointed out (op. cit., p. 31) the absence of crinoid workers is probably a major factor, but crinoids, especially the diagnostic calyces, are undoubtedly rare. This is in part due to preservation, but also to lack of favourable facies. Palaeoecological observations on these

EXPLANATION OF PLATE 45

Iocrinus brithdirensis sp. nov. from the Llanvirnian of Brithdir, Dolgellau, North Wales. All photographs are of latex casts, whitened with ammonium chloride. None has been retouched.

Fig. 1. Anterior view of holotype, BMNH E51710*a*, ×9.
Fig. 2. Posterior view of holotype, BMNH E51710*b*, ×8.
Fig. 3. Detail of the food grooves of the holotype, ×4·6.
Fig. 4. Posterior view of the anal tube of the holotype, ×1·7.
Fig. 5. Posterior view of paratype, BMNH E51711*a*, ×1·2.
Fig. 6. Anterior view of the calyx of the holotype, ×2·2.

TABLE 1

a. Statistics of width (w) and height (h) in thirteen specimens of *Iocrinus brithdirensis* sp. nov.

$\bar{w}$ mm. (var. w)	6·62 (0.479)	a (var. a)	0·911 (0.0328)
$\bar{h}$ mm. (var. h)	5·23 (0.397)	b (var. b)	0·70 (1·454)
r	0·725		

b. Statistics of width of calyx (w) and width of stem (s) at the base of the calyx in eleven specimens of *I. brithdirensis*.

$\bar{w}$ mm. (var w)	6·71 (0·483)
$\bar{s}$ mm. (var. s)	2·51 (0·122)
r	0·601

c. Statistics of width (w) and height (h) of radials in fourteen specimens of *I. brithdirensis*.

$\bar{w}$ mm. (var. w)	3·20 (0·191)	a (var. a)	0·422 (0·00565)
$\bar{h}$ mm. (var. h)	3·09 (0·034)	b (var. b)	1·738 (0·05904)
r	0·766		

crinoids are few, and indeed little is known in general about the palaeoecology of the group (Laudon 1957, p. 961).

The Brithdir crinoids occur in an ashy micaceous mudstone, confined to only one bedding plane in the 20 feet of strata exposed at the locality. On the bedding plane they are abundant, and mainly complete, except for the extremities of some of the arms and the lower parts of the stems. They are not in the position of life, but most specimens are laid on their sides, with the arms and anal tube spread in a fan enclosing about 45° to 70°. In a few cases the arms have been spread out in a 360° circle. The disposition of the arms in some of the slabs suggests current orientation.

Comparison of the species of *Iocrinus* suggests that there are two distinct geographical groups within the genus. The American species, *I. crassus*, *I. similis*, *I. subcrassus*, and *I. torontoensis* all have a relatively wide cup (in which the basals are less than half the height of the radials), both sets of plates have vertical ridges on them, and the stem at its junction with the calyx is half the diameter of the latter. In contrast the British species, *I. shelvensis*, *I. whiteryi*, and *I. brithdirensis*, have smooth basal and radial plates, without strongly marked ridges, the calyx is cone shaped, with the stem at its base less than half the diameter of the calyx, and the stem is altogether more slender. *I. cambriensis* does not correspond closely to either of the species groups, and indeed its generic position is in doubt (Ramsbottom 1961, p. 6).

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