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# THE OTTAWA NATURALIST

# THE OTTAWA NATURALIST.

VOL. XX.

OTTAWA, AUGUST, 1906.

No. 5

## THE SPECIES OF BOTRYOCRINUS.

By F. A. BATHER, British Museum (Nat. Hist.), London, S.W., England.

Twelve years have passed since the first publication of a statement that *Botryocrinus* occurs in America 'Crin. Gotland,' *Svensk. Vet.-Akad. Handl.*, XXV. No. 2, pp. 103-105; 1893. Although two of the determinations there made have been accepted by such well-known palaeontologists as Dr. J. F. Whiteaves and Dr. Stuart Weller, the facts appear to be still unrecognized by some American writers on fossil crinoids. It may therefore be useful to consider the generic position and the specific independence of the alleged American forms more fully than heretofore.

Comparison of the American species, rightly or wrongly referred to *Botryocrinus*, with the species found in Europe and Australia is rendered difficult by the fact that the diagnoses of the latter were based mainly on the characters of the arm-structure and partly on those of the stem-structure, whereas the former species are represented only by dorsal cups. It has, therefore, been necessary to re-study the dorsal cups of the European and Australian species and to prepare diagnoses founded on those elements alone. While the European and Australian species are not readily distinguished *inter se* upon these grounds, the dorsal cups of the American species fortunately present more points of difference.

My thanks are due to Dr. Whiteaves for kindly lending me the unique specimen of his *Homocrinus crassus*, of which a plaster cast is now preserved in the British Museum; also to Mr. F. Chapman of Melbourne for sending a wax squeeze of his *Botryocrinus longibrachiatus* to the same museum. A re-examination of this and other material contained in the British Museum has

greatly helped the revision of the diagnoses. I am further specially indebted to Professor H. C. Bumpus for the loan of the holotype of *Cyathocrinus nucleus*.

The contractions and symbols used in this paper are those adopted in Part III.—The Echinoderma—of "A Treatise on Zoology", edited by E. Ray Lankester (London, 1900; see p. 143). The terminology of the type-material follows the recent revision by C. Schuchert & S. S. Buckman (see *Science* [n s], XXI, p. 899; 9 June, 1905; *Ann. Mag. Nat. Hist.* [7], XVI, p. 102; July, 1905; and Introduction to 'Catalogue of the type and figured specimens of fossils . . . . . ' *Bull. U. S. National Mus.*, LIII, Pt I; Sept. 1905). References to previous literature are confined to passages of systematic importance, and, for the sake of brevity, the plate and figure numbers are usually omitted.

#### SWEDISH SPECIES.

##### **Botryocrinus ramosissimus.**

*Botryocrinus ramosissimus*, Angelin, 1878, 'Iconogr. Crin. Suec.' p. 24.

*Botryocrinus corallum*, Angelin, 1878, op. cit. p. 24.

*Botryocrinus ramosissimus*, Bather, 1893, 'Crin. Gotland'. *Svensk Vet.-Akad. Handl.*, XXV, No. 2, p. 117.

Dorsal cup a wide cone, with straight sides, except for a slight projection of RR towards the facet. Height of cup (11. mm.), 100; width at base, 56; width at summit, 139. IBB and BB wider than high. RR not higher than wide. Arm-facet .63 of R. *x* supports 3 or more tube-plates. Proximal columnal obscurely pentagonal.

Lower Ludlovian, Lindström's bed *f*, Gotland.

Cotypes of *B. ramosissimus* and *B. corallum* in Riksmuseum, Stockholm. As lectotype of *B. ramosissimus*, should be taken the specimen lettered *b* (Crin. Gotland, p. 117).

##### **Botryocrinus cucurbitaceus.**

*Sicyocrinus cucurbitaceus*, Angelin, 1878, 'Iconogr. Crin. Suec.' p. 23, 24.

*Botryocrinus cucurbitaceus*, Bather, 1893, 'Crin. Gotland', *Svensk. Vet.-Akad. Handl.* XXV, No. 2, p. 120. Et locc. ibi citt.

Dorsal cup a wide cone, with straight sides except for a very slight projection of RR towards the facet. Height of cup (5. 9

mm), 100; width at base, 50; width at summit, 118. IBB much wider than high. BB and RR about as high as wide. Arm-facet .62 of R.  $x$  supports 3 tube-plates. Proximal columnal pentagonal.

Lower Wenlockian, Lindström's bed *c*, Gotland

Of the two cotypes one is lost; the other, which should be regarded as lectotype, is in Riksmuseum, Stockholm, lettered *a* (Crin. Gotland, p. 121).

#### BRITISH SPECIES.

#### **Botryocrinus ramosus.**

*Botryocrinus ramosus*, Bather, 1891, *Ann. Mag. Nat. Hist.* (6) VII, p. 394.

Dorsal cup incompletely known, apparently a wide cone, with plates slightly rounded and RR not conspicuously projecting. Height (? 10. mm), 100; width at base, ? 60; width at summit, 115. IBB uncertain. BB slightly higher than wide. RR wider than high. Arm-facet .9 of R.  $x$  supports one tube-plate. Proximal columnal unknown.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

Holotype in British Museum, No. 57217.

#### **Botryocrinus decadactylus.**

*Cyathocrinus* (sp. 2) *decadactylus*, Salter, 1873, 'Cat. Cambr. Sil. Foss. Cambridge,' p. 123.

*Cyathocrinus* (sp. 3) *quindecimalis*, Salter, 1873, *op. cit.*, p. 124.

*Botryocrinus decadactylus*, Bather, 1891, *Ann. Mag. Nat. Hist.* (6) VII, p. 395.

Dorsal cup elegant, rapidly widening above in a concavo-convex curve. The plates show slight traces of axial folding, and RR project slightly. Height of cup (6.5 mm.), 100; width at base, 51; width at summit, 128. All plates wider than high. Arm-facet from .48 to .85 of R.  $x$  supports 3 tube-plates. Proximal columnal obscurely pentagonal.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

The specimens to which Salter attached his MS. names are in the Sedgwick Museum, Cambridge, England, numbered a 494 and a/495 respectively; but since they do not show the characters even of the genus, it seems better to select from among

the numerous other specimens described by me, British Museum No. E1419 as lectotype, regarding the Cambridge specimens as chirotypes.

### **Botryocrinus pinnulatus.**

*Botryocrinus pinnulatus*, Bather, 1891, *Ann. Mag. Nat. Hist.* (6), VII, p. 102; also 1892, ser. cit. IX p. 192.

Dorsal cup widens rapidly above with a concave curve. The plates show traces of axial folding, and RR project markedly. Height of cup (8.5 mm.), 100; width at base, 42-47; width at summit, 129. IBB wider than high. BB as high as wide. RR wider than high. Arm-facet less than .5 of R.  $\alpha$  supports 3 tube-plates. Proximal columnal pentagonal or quinquelobate.

Upper Wenlockian, Upper or Thin Wenlock Limestone, Dudley.

Holotype in Dudley Museum. The heautotype of the second reference (supra) has recently been acquired for the British Museum (No. E 14081).

In the original description of the holotype the measurements of height of cup, and of width at its summit appear inconsistent with the figure, and it seems probable that they were interchanged.

### **Botryocrinus quinquelobus.**

*Cyathocrinus quinquangularis* Phillips, Salter, 1875, 'Cat. Cambr. Sil. Foss. Cambridge,' p. 123.

*Botryocrinus quinquelobus*, Bather, 1892, *Ann. Mag. Nat. Hist.* (6), X, p. 189.

Dorsal cup elegant, widening above, with a slightly concavo-convex curve, RR projecting very slightly. Height of cup (6.25 mm.), 100; width at base, 48; width at summit, circa 160. IBB not higher than wide. BB and RR wider than high. Arm-facet about .66 of R.  $\alpha$  unknown. Proximal columnal quinquelobate.

Upper Wenlockian, Upper Wenlock Limestone, Dudley.

Two cotypes in Sedgwick Museum, Cambridge, England, No. a 435. No. 1 of my description is hereby selected as lectotype.

## AUSTRALIAN SPECIES.

**Botryocrinus longibrachiatus.**

*Botryocrinus longibrachiatus*, F. Chapman, 1903, *Proc. R. Soc. Victoria* (n.s.) XV, p. 108.

Dorsal cup conical, with straight sides, the plates slightly rounded, RR projecting very slightly if at all. Height (7.2 mm), 100; width at base, 44; width at summit, 125. IBB and BB slightly higher than wide. RR about as high as wide. Arm-facet not more than .5 of R. *x* rather wide and apparently supporting 3 tube plates. Proximal columnal quinquelobate.

Silurian, Brunswick, Victoria.

Three cotypes in National Museum, Melbourne, No. 390—392. Of these, No. 390, shown in Chapman's pl. xviii, f. 6, should be taken as lectotype. Plastotype in British Museum, No. E7130.

The present diagnosis differs in some respects from the account given by Mr. Chapman, being based on the excellent wax squeeze which he so kindly sent. From this it appears that the plates were somewhat disarranged, and that the specimen was flattened, thus appearing wider above than it really was. Mr. Chapman only measured to half-millimetres, but measurement with sliding callipers and a vernier gives: Height, 7.2 mm.; width at base, 3.2 mm.; width at summit, 10 mm. In calculating the proportions for the diagnosis I have reduced the last measurement to 9 mm.; it may have been even less. Thus the proportions and form of the cup do not so closely resemble *B. quinquelobus* as would appear from the published figures. It was, Mr. Chapman has informed me, mainly this supposed resemblance which led him to refer the species to *Botryocrinus* notwithstanding the apparent invisibility in both species of structures definitely diagnostic of the genus. Examination of the wax squeeze, however, convinces me that those structures are after all to be seen in *B. longibrachiatus*. Chapman's pl. xviii, f. 6, is in fact viewed from the left posterior radius, l. post. R being the middle of the three plates in the uppermost circlet, the plate on its right hand being *x*, the plate below it on the right being post. B., and the small plate, of which a portion is seen to the right between post. B and *x*, being RA. The edge of r. post. R is seen to the right of *x*.

Mr. Chapman presumably interpreted *x*, which he nowhere mentions, as a radial; but the present identification, when once made, is so obvious that only two facts need be adduced in its support. First, the heptagonal outline of the plate here called post. B. Second, the contrast between the conspicuous arm-facets on l. post. and l. ant. RR, and the absence of any such excavation on *x*. Above *x*, in the angle between it and the proximal IBr. of r. post. arm, are a few small plates (apparently not the ones alluded to and figured as tegminal plates by Mr. Chapman), and one of these seems to be folded at its edges as is so usual in the tube-plates of this genus. The arm-facet, neither mentioned nor very exactly drawn by Mr. Chapman, appears to have had straight, rather steeply sloping sides, ending in a deep axial canal, which has broken through to the front of the plate (compare the account of the ventral groove and axial canal in *B. crassus*). It is not easy to understand the true shape and proportions of the facet; but the narrowness of the primibrachs indicates that its width can scarcely have been half that of the radial.

## AMERICAN SPECIES.

**Botryocrinus nucleus.**

- Dendrocrinus nucleus*, Hall, 1876, *Rep. N. Y. State Mus. Nat. Hist.* XXVIII, Documentary Edit., explan. pl. xv, ff. 7-9.  
*Cyathocrinus nucleus*, Hall, 1879, op. cit., Museum Edit., p. 136.  
*Homocrinus nucleus*, Wachsmuth & Springer, 1886, 'Revision of Palaeocrinoidea', III, p. 220, *Proc. Acad. Nat. Sci. Philadelphia*, 1886, p. 144.  
*Botryocrinus nucleus*, Bather, 1893, 'Crin. Gotland', *Svensk. Vet.-Akad. Handl.* XXV, No. 2, p. 104.

Dorsal cup with straight sides up to the RR, which project markedly towards the arm-facet. Slight trace of axial folding on BB. Height of cup (8-11.5 mm.), 100; width at base, 43; width at summit, 125-130. IBB low, much wider than high. BB wider than high. RR higher than wide. Arm-facet more than .66 of R. *x* supports 1 tube-plate. Proximal columnal circular, with tendency to quinquelobation.

Upper Wenlockian, Niagara shales of Waldron, Ind.

Holotype, American Museum of Natural History, No. 1898.

Piastotype in British Museum, No. E14075.

It should be noted that the holotype is a young specimen, and that, according to Hall, it, or at least the figures of it, "do not fairly represent the species." Therefore the specimens on which Hall based his diagnosis and description should be more important than the specimen figured. Unfortunately they are not to be found in the American Museum of Natural History, and I have had to rely on Hall's description and on the little holotype which Professor H. C. Bumpus most kindly entrusted to me for examination. Its chief measurements are: Height of cup to top of RR, 3.6 mm.; width at base, 1.7 mm.; width at summit, 5 mm.

Neither the description nor the figures of Hall indicate distinctly that this species is a *Botryocrinus*; indeed he himself says that it is "a true *Cyathocrinus* in structure". Hall, however, as has been previously pointed out (Wachsmuth & Springer, 'Revision' I, p. 82; Bather, 'Brit. Foss. Crin. VIII, *Cyathocrinus*', *Ann. Mag. Nat. Hist.* (6), IX, p. 206; 1892), "extended the diagnosis of *Cyathocrinus* to include forms with a small quadrangular radianal". Such a plate is shown in Hall's fig. 7, but in the actual specimen it is so obscure that one looks for confirmatory evidence. If such a plate were present the posterior and right posterior basals would be heptagonal. Now Hall says of this species "subradial plates [i. e. basals] wider than high, three of them pentagonal [err. pro 'hexagonal'] and two heptagonal." Therefore there was a small quadrangular radianal. That the species is not a *Homocrinus* follows from the shape of anal  $x$ , which has a broadly excavate upper surface. The shape of the cup markedly resembles that of the Gotland species of *Botryocrinus*, and the geological age harmonises. There is therefore no reason to doubt the correctness of this reference.

### Botryocrinus Polyxo.

*Cyathocrinus Polyxo*, Hall, 1863, *Trans. Albany Inst.* IV, p. 199. (Date of vol. 1864; author's edition issued 2 May, 1863.)

*Homocrinus polyxo*, Wachsmuth & Springer, 1886, 'Revision of Palaeocrinoidea', III, p. 220, *Proc. Acad. Nat. Sci. Philadelphia*, 1886, p. 144.

*Botryocrinus polyxo*, Bather, 1893, 'Crin. Gotland', *Svensk. Vet.-Akad. Handl.* XXV, No. 2, p. 105.

*Botryocrinus polyxo*, Weller, 1900, *Chicago Nat. Hist. Survey, Bulletin* IV, Part I, p. 66. Et locc. ibi citt.

Dorsal cup rather widely spreading upwards with concavo-convex curve; plates with axial folds; RR projecting markedly to the facet. Height of cup (197 mm.) 100; width at base, 48; width at summit, 132. Plates, especially IBB and RR, wider than high. Arm-facet .28 of R.  $x$ , which is very wide, supports 3 (or more?) tube-plates. Proximal columnal quinquelobate; IBB project beyond it.

Upper Wenlockian, Niagara shales of Waldron, Ind.

Four cotypes in American Museum of Natural History, No. 1897. These are said to be figured by Hall, *Rep. N. Y. State Mus. Nat. Hist.* XXVIII, pl. xv, ff. 10-17. But Hall there mentions five specimens. Which of them is missing?

Since Dr. Stuart Weller has confirmed the reference of this species to *Botryocrinus*, it is unnecessary to argue the point. His description is but slightly modified from Hall's and is presumably based on the co-types, or at any rate on topotypes. But when he says that the somewhat rare specimens found in the dolomite of Bridgeport near Chicago "are indistinguishable from typical individuals from Waldron" it must be objected that his figure (pl. xiv, f. 12) by no means bears out this statement. The plates in this specimen are a little disarranged, and possibly have lost some of their outer form by solution; but it is easy enough to see the following points of difference. The dorsal cup shows no sign of spreading upwards, but seems to have had straight sides. The absence of axial folds may possibly be due to solution; but it is clear that the radials do not project towards the facet, which consequently has not the markedly oblique slope seen in the cotypes. Approximate proportions, based on the figure, are: height, 100; width at base, 45; width at summit, at most, 123. The plates are perhaps wider than high, but not nearly so much so as in the cotypes. The arm-facet, which appears shallow, and far from "indenting the plate to about one-fourth of its depth", is drawn as at least .46 the width of the radial.  $x$  does not appear at all wide; and RA, which is here narrower, has its long axis passing upwards from right to left, whereas in all Hall's figures it passes upwards from left to right. In short, if there is a species of *Botryocrinus* to which one would have thought it impossible to refer

this figure, that species is *B. polyxo*. Dr. Weller may reasonably be asked for an explanation.\*

### Botryocrinus crassus.

*Homocrinus crassus*, Whiteaves, 1889, *Contrib. Canad. Pal.* 1, p. 95.

*Botryocrinus crassus*, Bather, 1893, 'Crin Gotland'. *Svensk. Vet.-Akad. Handl.*, XXV, No. 2, p. 103.

*Botryocrinus crassus*, Whiteaves, 1898, *Contrib. Canad. Pal.* 1, p. 375.

Dorsal cup bell-shaped, inflated near base and slightly constricted near middle of BB. RR very slightly projecting towards the facet. Height of cup (14 mm), 100; width at base, 32; width at summit, 95. IBB wider than high BB higher than wide. RR wider than high below, but less wide than high above. Arm-facet about .66 of R. *x* supports at least 3 tube-plates. Proximal columnar circular.

Middle Devonian, Hamilton Group, Thedford, Ont.

Holotype in Mus. Geol. Surv. Canada at Ottawa. Plasto-type in British Museum, No. E14060.

Redescription of the holotype (following the order of Dr. Whiteaves' original description):—

Dorsal cup somewhat bell-shaped, rather broad and sharply inflated near the base, and very slightly constricted just about the middle of the basals. Height of dorsal cup, from lower margin of infrabasals to top of radial facet, 14 mm., to bottom of facet, 12.75 mm.; maximum width of cup, 13.4 mm.; width at base, 4.5 mm. Infrabasals (IBB) pentagonal, about one half the size of the basals, and wider than high. Basals (BB) moderately large, about equal in size to the anterior radials; higher than wide; the three anterior ones hexagonal, the two posterior ones heptagonal and truncated above. Radial plate (RA) equal in size to the IBB, rhomboid (see measurements below) and resting obliquely between the two posterior BB, the right posterior radial, and the superior anal plate *x*. Radials (RR) pentagonal, outer surface nearly flat below, slightly raised in the middle, and above this

\*Dr. Weller has been so generous with his help to me in the past, that on 6th Jan., 1896, I presumed to ask for the loan of material that would enable these doubts to be set at rest. Either my letter or his reply must have gone astray, and the publication of these remarks can no longer be delayed. 10th July, 1906.

truncated abruptly and obliquely by the facet for the arms, angle of facet with general side of cup being  $135^{\circ}$ . The facet is shallowly excavated with contour almost circular, but broader than high, width 4 mm.; height 3.1 mm.; axial canal small, ovate, marginal, its acutely pointed apex opening directly into the ventral groove, which forms an obtusely angular notch in the centre of the upper margin of the plate. Right and left posterior RR a little smaller than the rest. Superior anal plate  $x$  pentagonal, equal in size to the r. post. R. and faceted above for the reception of plates of the anal tube (vide infra). Cup-plates thick; all rounded towards the sutures, especially in the upper part of the cup; outer surface apparently smooth, but where the test is well preserved, as on post B. and ant. R., are slight traces of shagreen ornament

Measurements in millimetres :—

	Height.	Width below.	Width above.	Length of suture between plates.
IBB.....	4.	2.5	5.	3.
l. ant. B.....	8.	5.4	7.	4.5
ant. R.....	6.5	7.	6.4	4.
to bottom of facet....	4.			
r. post. R.....	5.	5.4	4.75	4.
to bottom of facet....	2.75			
anal $x$ .....	4.8	4.7	3.75	{ l. side 4. r. .. 2.6

Each of the sutures bounding RA is 3 mm. long, and the plate in each direction is 3.6 mm.

Relations of the species :—

The radials slope outwards towards the facet, in the way characteristic of *Botryocrinus*. The axial canal is quite distinct from the ventral groove, though not actually separated therefrom by stereom. The sides of the ventral groove slope inwards at a wide angle, and at the same time separate from one another, so that the communication between ventral groove and axial canal becomes wider. Right posterior radial has portions of 3 or 4 rather solid covering plates. The chief point of difference between *Homocrinus* and *Botryocrinus*, so far as the dorsal cup is concerned, lies in the number of plates supported by the anal plate  $x$ . These plates are not preserved, but one can see the facets for

them on the upper surface of the plate  $x$ . There is one small, deeply grooved facet in the middle, and another rather smaller immediately to the right of this. The right and left slopes of anal  $x$  have larger curved facets, of which that on the left still bears a fragment of the succeeding tube-plate. Two small similar facets are clear on the adjacent slope of left posterior radial and one at all events is to be made out on right posterior radial. These facets are surrounded by a slightly elevated rim, so that their size and position are well defined. The arrangement of the tube-plates of the proximal row must therefore have been very like that of *Botryocrinus ramosissimus*, as figured in 'Crinoidea of Gotland' I, pl. v, fig. 164.

Among all specimens of *Botryocrinus* hitherto examined, this is the only one in which the greatest width of the cup is less than the height. This fact and the bell-shape of the cup certainly warrant the retention of the species.

#### *Botryocrinus americanus*.

*Botryocrinus americanus*, R. R. Rowley, 1904, Greene's 'Contrib. Indiana Palaeont.', Part XVIII, p. 184, pl. lv, ff. 12-14.

Dorsal cup spreading out rapidly from the narrow column, then ascending with approximately straight sides; all plates somewhat tumid, especially BB, which have wart-like prominences in their lower part. Height of cup (as drawn 81—86 mm.), 100; diameter of column (2.3 mm.) 27; width at bottom of BB and top of RR (circa. 95 mm.), 113. IBB low as seen from the side, but their length is greater than their width. BB higher than wide. RR (except perhaps the two posterior) slightly wider than high. Arm-facet more than .5 of R. Number of tube-plates supported by  $x$  uncertain. Proximal columnal circular.

Middle Devonian, Hamilton Group, near Charlestown, Ind.

Holotype in collection of G. K. Greene, New Albany, Ind.

Professor Rowley's clear description unfortunately omits a few details that would have helped to complete the present diagnosis.\*

\*Mr. Greene would, I am confident, have acceded to my request to borrow the holotype for examination; but, as I regret to learn from Prof. Rowley, illness has prevented him from attending to business for some months. 10th July, 1906.

The figures suggest that the arm-facet occupies the whole upper surface of the radial, but it is merely described as more than half the width. It might be possible to distinguish facets for tubeplates on the summit of  $x$ , though the phrase "its top suture on a line with the top of the radials" suggests that it only supported one plate. Though very different in shape from all other dorsal cups of *Botryocrinus*, there seems no reason to doubt Prof. Rowley's ascription of his species. After all, the characters are only an intensification of those noted in *B. crassus* from the same formation.

It should, however, be recalled that there exist other Palæozoic genera with the dorsal cup constructed as in *Botryocrinus*. The Devonian representative of such genera is *Cosmocrinus* (Jaekel, 1898, *Zeitschr. deutsch. geol. ges.*, L, Protok. p. 28). *C. Holzapfeli* Jaekel, *Poteriocrinus dilatatus* Schultze, and *Cyathocrinus ornatissimus* Hall were referred to this genus by Dr. Jaekel, and of these the first should be made genoelectotype. A good figure of the cup has been given only for *C. dilatatus*, and this, though marked with exceptionally strong axial folds, appears to have the characteristic *Botryocrinus* structure. Redescription of *C. ornatissimus* is much needed. At present it can only be said that, in the absence of direct evidence from the arms, there is no reason for referring any other American species to *Cosmocrinus*.

*Cosmocrinus* is a distinct side-branch of Devonian age, but perhaps the American Devonian fossils here referred to *Botryocrinus* represent a transition from that typically Silurian genus to the very similar Carboniferous *Barycrinus*. Protuberant basals, like those of *Botryocrinus americanus*, are seen in *Barycrinus stellatus*, *B. bullatus*, *B. subtumidus*, *B. mammatus*, and others. Perhaps indeed *Botryocrinus americanus* is really a *Barycrinus*. And perhaps *Botryocrinus* itself should be merged in that genus. Fifteen years have passed since I expressed my inability to distinguish between *Botryocrinus*, *Barycrinus*, and *Vasocrinus*, and since I "thought it better simply to describe the long-known genus *Botryocrinus* as fully as possible, with the aid of new material, and to leave to the American palæontologists the task of comparing it afresh with these other more particularly American genera." All that American palæontologists have done in the matter since then has been to accept without discussion my reference of certain American species to *Botryocrinus*. May we not hope for an independent study of this question from one of the many careful workers who are now turning their attention to the fossil crinoids of North America?

SOME NEW PLANTS FROM THE CANADIAN ROCKIES  
AND SELKIRKS.

EDITH M. FARR.

In the summer of 1904 I collected specimens of a *Pachystima* which proved upon examination to be a hitherto undescribed species and was given the name of *P. macrophyllum*. It was found in fruit at Bear Creek Station in the Selkirks while the more usual form, *P. Myrsinites*, was collected in flower in the month of May, at Cedar Creek, in the same range of mountains. In order to complete the study of these forms it was necessary to secure specimens of *P. macrophyllum*, in flower, and of *P. Myrsinites* in fruit. Accordingly a special effort to that end was made this past summer when the region of the Selkirk Mts. was again visited. *P. macrophyllum* was obtained in full flower at Bear Creek Station on the twenty-fifth of May, *P. Myrsinites* in flower at Six Mile Creek on the eighteenth of May, and at Glacier on the twenty-sixth of the same month. During the first week in August *P. Myrsinites* was found in fruit at Glacier so that the two forms were then complete.

In general appearance the two differ widely, and this is especially evident when they are both seen at the same season of the year. As stated in the paper published in November, 1904, in the "Contributions from the Botanical Laboratory of the University of Pennsylvania," *P. Myrsinites* is of compact habit, the branches being erect and stiff, the leaves arranged in a decussate manner, giving a bushy appearance to the shrub. Further, the entire plant has a yellowish tone, while the leaves are thicker and more rounded than in *P. macrophyllum*. *P. macrophyllum* is of a loosely spreading habit, the branches being somewhat drooping and graceful, the leaves spreading in such a manner as to give a 2-ranked, flattened appearance to the branches. This species has a bright, almost bluish green tone as compared with *P. Myrsinites*, and the leaves are, as a rule, three to five times as long as broad.

Still another form was collected at Bear Creek Station, the same locality in which *P. macrophyllum* has been found. This plant was collected by Mrs. Charles Schäffer, and I take the

liberty of naming it in honor of the late Dr. Charles Schaeffer of Philadelphia, who spent many summers in this region and was much interested in the flora of the Canadian Rockies and Selkirks.

Specimens collected by Mr. Louis Krautter at Black Butte, Siskiyou Co., California, differ markedly in certain respects from those already mentioned, and are, I think, worthy of being assigned to a separate species. I have therefore described them under the name *P. Krautteri*.

The distinguishing points in the above named species may be mentioned as follows:—

In *P. Schaefferi* and *P. macrophyllum*, the habit is loosely spreading with the leaves borne in one plane while in *P. Myrsinites*, the habit is compact and rigid with the leaves spreading in a decussate fashion; the habit of *P. Krautteri*, is somewhat intermediate, the leaves closely ascending, but in one plane only. The internodes in *P. Myrsinites* are on an average much shorter than in *P. macrophyllum*, while in *P. Schaefferi* they are extremely variable although seldom surpassing the shortest in *P. macrophyllum*; in *P. Krautteri* they vary slightly and are intermediate between *P. Myrsinites* and *P. macrophyllum*. In *P. Myrsinites* the petioles are suddenly contracted into the midrib, in *P. macrophyllum* and *P. Krautteri*, the petioles are swollen and this swelling is frequently continued into the midrib.

The four forms vary strikingly in the shape, size, veining, texture and color of the leaves.

*P. Myrsinites* and *P. Schaefferi* produce an abundance of flowers but comparatively few are found on *P. macrophyllum* and *P. Krautteri*. The sepals and petals are more elongated in *P. macrophyllum* than in *P. Myrsinites* while the filaments of the latter are much longer in proportion to the length of the anthers. The style of *P. macrophyllum* and of *P. Krautteri* is rather slender and the stigma slightly bilobed; in *P. Schaefferi*, the stigma is strongly bilobed; and in *P. Myrsinites* the style is stout and the stigma rounded. In both *P. Myrsinites* and *P. macrophyllum* very little fruit is produced. This is especially striking in *P. Myrsinites* where the flowers occur in great profusion. *P. Schaefferi* and *P. Krautteri* have not been seen in fruit.

In *P. macrophyllum* the flowers are very markedly pro-

tandrous. In all the forms the color of the flowers is similar, a brick red, but in *P. macrophyllum* it is rather deeper in shade than in the other species.

Following are descriptions not only of those species hitherto undescribed but also of *P. Myrsinites* and of *P. macrophyllum*.

*Pachystima Myrsinites*, sp. nov.

Twigs short, dense, radiate, sienna brown with 4 narrow dark ridges, the internodes 6-10 mm. long, the leaves densely and decussately spreading, nearly sessile or shortly petiolate, the petioles suddenly contracted beneath into the flat midrib, lamina sub-rotund to oval and elliptic, the veins very obscure in 3-4 pairs, radiating, the margin dentate, teeth not incurved, thickened and revolute below, thinning out above. yellowish-green above and below, thick, opaque.

Flowers odorless, very numerous, densely clustered in fascicles of 5-6, rarely 3-4, on arrested, bi-bracteolate branches springing from axils of foliage leaves; sepals broadly oval, the midrib faint or absent, apex rounded; petals oval to ovate, nearly as broad as long; stamens 4, inserted into a quadrate disc, filaments twice the length of the anthers; flowers slightly protandrous to gynodioecious; style short, thick, stigma rounded. Fruit scanty.

*Pachystima macrophyllum*, sp. nov.

Twigs elongate, loosely spreading in one plane, cinnamon brown, longitudinally 4-ridged, the ridges dark brown, the internodes 10-20, usually 15 mm. long, the leaves arranged in one plane and springing from between the stem ridges, shortly petiolate, the petioles gradually contracted into the leaf midrib, lamina oval-elliptic to oblanceolate, the veins evident, in six pairs, longitudinally oblique, the margin incurved-toothed from near the middle upwards, strongly thickened and revolute, glaucous green above, bright green below, translucent.

Flowers few, in fascicles of 2-3, sometimes 1, on short branches in axils of foliage leaves; sepals ovate, contracted at base, the midrib usually prominent, the margins slightly toothed, apex pointed; petals broadly ovate, twice longer than broad, finely but irregularly toothed along upper margins, apex rounded; stamens 4, inserted into a quadrately circular disc, filaments and

anthers of equal length; flowers protandrous, the ovary sunk in the disc; style rather slender, at first short, later elongated, stigma slightly bilobed. Fruit scanty.

*Pachystima Schaefferi*, sp. nov.

Twigs spreading as in *P. macrophyllum*, but the color and ridges approaching *P. Myrsinites*, the internodes very variable, from 2-10 mm. long, the leaves in one plane, shortly petiolate, the petioles slightly swollen, the bladdery swelling often prolonged into the midrib, lamina lanceolate to linear-lanceolate, the veins evident, in 6-7 pairs, intermediate in position between *P. Myrsinites* and *P. macrophyllum*, the margin blunt-toothed from the middle upwards, slightly thickened, not revolute, bright green above and below, translucent.

Flowers agreeably odorous, very numerous, in short clusters of 2-5, on slightly elongated branches; sepals and petals as in *P. macrophyllum*; stamens 4, inserted into a quadrate disc; filaments one and one-half to two times longer than anthers; style rather thin, stigma strongly bilobed.

*Pachystima Krautteri*, sp. nov.

Twigs elongate, closely spreading in one plane, grayish-brown, the internodes 9-11 mm. long, the leaves rather crowded, closely ascending in one plane, shortly petiolate, the petioles gradually attenuate into the midrib, lamina elliptic to elliptic-lanceolate, the veins evident below, obscure above, in 4-5 pairs, obliquely radiating, the margins strongly and sharply dentate in the upper half, thickened and revolute, bright yellowish-green, rather thick, almost opaque.

Flowers few, in clusters of 1-3, on short branches, sepals ovate-deltoid, midrib not discernible, the margins entire, or nearly so, petals not seen, stamens 4, disc as in *P. macrophyllum*, style rather slender, with slightly enlarged, faintly bilobed stigma. Fruit not seen.

The following new species were also collected during the summer of 1905. The type specimens of these, as well as of those of *Pachystima Schaefferi* and *P. Krautteri* are in the Herbarium of the University of Pennsylvania.

*Arnica Louiseana*, sp. nov.

Plant 7-20 cm. high, slender, pubescent. Leaves in about three pairs, the two lowest at base of stem, the lowest pair 2-4 cm. long, elliptical to obovate, on short winged petioles, mostly entire, the second pair 4-6 cm. long, elliptical, sessile, sparingly and saliently denticulate, the uppermost pair usually much smaller, narrowly ovate to lanceolate, entire or denticulate, all slightly glandular on both surfaces, the margins sparingly glandular and bearing a few long white hairs, fragrant.

Heads of flowers 1-3, usually 3, fragrant, 4 cm. broad, borne on long, slender, nodding, pubescent peduncles, the hairs interspersed with glands; ray and disc flowers light yellow, rays 8-10, 12-14 mm. long. Involucre 1 cm. high, campanulate, densely glandular villous at base, brownish-purple, the bracts lanceolate, acute, bearing scattered white hairs especially towards the apex, uniseriate, equal.

Receptacle slightly convex; achenes linear, strongly striate, brownish-black with a few short, scattered, white hairs; pappus white.

This species is perhaps more closely related to *A. Lessingii*, Greene, than to any other, but is a much smaller plant. The margins of the leaves are slightly glandular-ciliate while in *A. Lessingii* they are strongly pubescent.

It has usually three heads instead of one only as in that species; the bracts of the involucre uniseriate instead of biseriate, glandular and villous at base instead of pubescent. The rays are about half the length of those in *A. Lessingii*. The pale yellow color of the flowers and their drooping tendency distinguish it from other *Arnica*s of the region. It was found growing among the loose rocks on the slopes of Mt. Fairview, at Lake Louise in the Canadian Rocky Mts.

*Hieracium Albertinum*, sp. nov.

25-50 cm. high, the stem villous throughout with long, rigid, white hairs arising from black papillæ.

Leaves 5-12 cm. long, narrowly elliptical, tapering at both ends, the upper sessile, the lower narrowed into margined petioles.

Heads about 2 cm. broad, numerous in a paniculate raceme, light yellow. Involucre 12 mm. high, conspicuously clothed with long, soft, white hairs, bracts linear, mainly in one series

Achenes oblong, striate, dark brown; pappus tawny.

*Hieractum Albertinum*, was collected on the fourteenth of August, 1905. It was found growing abundantly with *Eriogonum subalpinum*, Greene, *Silene Lyallii*, Watson, and *Heuchera ovalifolia*, Nutt., on a grassy slope above the trail between Lake Louise and Moraine Lake. The long white hairs with which the plant is so profusely covered give it a silvery appearance which is very striking and typical.

*Dryas tomentosa*, sp. nov.

Similar to *D. Drummondii*, Richards, but the leaves covered on both surfaces with a thick white tomentum, giving them a pale gray color above and white beneath; the petioles rather stout, clothed with white floccose pubescence. The yellow flowers are borne on stout floccose-pubescent scapes. The sepals are densely glandular with purplish-black stalked glands.

This interesting form of *Dryas* was collected near the summit of the Pass leading from Emerald Lake into the Yoho Valley, at an altitude probably of 5500 feet. It was growing in patches with *Drummondii*, with which it did not seem to intergrade, but preserved its own individuality.

*Ranunculus apetalus*, sp. nov.

Slender, 25-37 cm. high, villous with scattered hairs, becoming glabrate below.

Leaves 18-50 mm. broad, the basal orbicular to cordate in outline, from deeply crenate to 5-9-lobed or divided, the divisions cuneate and irregularly lobed, petioled; the cauline divided to the base, the cuneate divisions deeply and variously incised; sessile, clothed with loosely matted hairs or the lower glabrous, gray green.

Flowers several, about 1 cm. broad, borne on long peduncles. Sepals 5, very concave, sub-orbicular, villous on the exterior, the margins often petaloid, yellowish-green. Petals wanting.

Head of fruit oblong to ovoid. Achenes inflated, compressed

laterally, not angled, pubescent, tipped with the minute curve of style, 1-ovuled, maturing very irregularly.

This *Ranunculus* closely resembles *R. affinis*, R. Br. *var. validus*, Gray, in the heterophyllous character of the leaves, but these are not succulent as they are said to be in that variety. No trace of petals can be discerned in bud, half open flower or fully matured bloom; but the sepals have a decidedly petaloid appearance owing to the margins being quite yellow and glabrous.

It was found growing by the roadsides at Banff, Alberta.

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### RICHARDSON'S MERLIN.

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I notice that very little reference is made in the "Catalogue of Canadian Birds" in connection with the nesting habits of Richardson's merlin, and think, perhaps, it would not be out of place for me to give my own experience of this bird while spending the summer of 1904 at Lethbridge, Alberta.

During the first week of May, 1904, I observed several pairs of these birds in the poplars that abound in the bottoms of the Belly River. I thought at the time that they were pigeon hawks, and that they were probably nesting in natural cavities in trees; but events proved otherwise.

On May 7th I made another visit to the locality where one pair was seen and was surprised at not being greeted with the usual harsh and scolding cries of the birds. Everything being quiet, I thought they had left the district or had been shot. While passing underneath a dilapidated magpie's nest, which was placed some 7 feet overhead in a scrubby poplar, I was surprised to see the female merlin flush from the same. The nest contained a pretty set of five eggs, which were simply laid on crumpled mud. The eggs are of a dark reddish brown color, resembling the duck hawk's eggs, being, of course, much smaller. The male bird came over from some of the adjacent poplars and the pair became pugnacious, sometimes darting within a foot of one's head, and uttering harsh cackling cries.

During the next two weeks I located three other magpies' nests containing full sets of this bird, the merlins in every instance being very noisy and wicked.

During the first week in June I took a beautiful second set of five eggs of this bird. This clutch was laid in the deserted nest of the American roughlegged hawk, which was placed about 60 feet up in a large poplar. This set is blotched with cinnamon color, not being of a general wash like the other sets. The pigment no doubt gave out in this case.

I am confident that these birds were just breeding locally, as they were not observed anywhere else. The many magpies' nests in the vicinity of Lethbridge seem to attract the birds, although I saw a pair of merlins looking after an old crow's nest, but was unable to visit the spot again.

To clinch the matter of identification I forwarded a set of these eggs to Mr. Walter Raine, of Toronto, and another to Mr. E. Arnold, of Battle Creek, Mich., and both gentlemen agree that the eggs are none other than Richardson's merlin.

W. J. BROWN.

Westmount, Que., July 10th, 1906.

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#### THE GOLDEN WINGED WARBLER IN MANITOBA.

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While watching a small lot of warblers in thickish woods on the morning of May 22nd I noted an unusual one among them which on close inspection proved to be a male golden-winged warbler (*Helminthophila chrysoptera*) in full plumage. Numerous Magnolia warblers, redstarts and a few others were with it. This—so far as I am aware—is the second record of this bird appearing in Manitoba, the other having been taken by Mr. W. Hine, near Winnipeg about the 27th day of May, 1887—See Catalogue of Canadian Birds, part III., page 583, and *The Auk*, Vol. VII., page 404.

NORMAN CRIDDLE.

Aweme, Manitoba.

## CORRESPONDENCE.

The Editor OTTAWA NATURALIST :

DEAR SIR,—In the last issue of *The Auk* Rev. G. W. G. Eifrig notes a peculiar fact about the field sparrow. "That it is found in the fall migration in Ottawa but that apparently nothing is recorded of its summer home to the north nor of its spring migration." As bearing on this subject I might say that I found single specimens of this bird in song on August 31, 1905 and July 27, 1899, at Kazuabazua, on the blueberry barrens, and on August 7, 1899, I recorded two in song near Ottawa, but have no memo. of the exact locality. The fact of the bird being there in full song at midsummer is practically as good a proof of its summer residence as if the nest and eggs were actually found. There is a good deal of the country north of Ottawa where the original forest has been destroyed which has now been given up to blueberry and to sweet fern, and I should think it likely that the field sparrows would occur all through this country where these conditions obtain. Ottawa is by no means the only place which shows erratic distribution of this species. In London it is very common and equally so at Toronto but in Guelph there is not a single record, and I am not sure but that this condition applies to the whole of Wellington county in which Guelph is situated, yet the bird is found much further north in western Ontario. It does not seem that there is any lack of suitable ground in the Guelph region. A raspberry thicket on the edge of a field or hazel or thorn bushes in an half open woods are its usual habitat and these combinations occur all over the country.

W. E. SAUNDERS.

London, Ont., July 18th, 1906.

## REVIEW.

MOUNTAIN WILD FLOWERS OF CANADA. A SIMPLE AND POPULAR GUIDE TO THE NAMES AND DESCRIPTIONS OF THE FLOWERS THAT BLOOM ABOVE THE CLOUDS By Julia Henshaw, Toronto, William Briggs, 1906, pp. 384.

When a book on Canadian wild flowers is prefaced by letters of endorsement from Prof. Macoun and Dr. Fletcher, its excellence may be taken for granted, but the most hurried glance through "Mountain Wild Flowers of Canada" is sufficient to stamp it the finest work of its kind that has been published in America. The hundred full page half-tones reproduced from the best of many hundred photographs of mountain flowers taken by the author are in themselves worth far more than the price of the book. But to one who knows and loves mountain flowers the chief value of Mrs. Henshaw's work lies in the record of her own notes and observations which follow the technical description of each species. Many of the illustrations represent species which have not before been figured, but descriptions and illustrations while they make a book useful and attractive cannot compare in value with the record in simple beautiful language of the results of many years study of the growing plants. What Mrs. Trail has done for the wild flowers of eastern Canada, Mrs. Henshaw is doing for the west and they stand alone.

Intended primarily as a help to the tourist or botanist who is not familiar with alpine flowers, "Mountain Wild Flowers of Canada" is in the attractiveness of its illustrations and the poetic beauty of the author's notes so far beyond any other popular botanical work that no lover of nature can afford to be without it. A few sentences extracted from the preface will indicate Mrs. Henshaw's style: "Who can adequately describe the luxuriant profusion of these alpine meadows? Who can tell in mere words of the glory and the glamour of such a scene? All around one the dazzling peaks in their frozen and pitiless beauty point long slender fingers up to God; cruel crevasses split the gigantic rocks from tree-less top to pine-clad base where glaciers cling to the cliff with sparkling tentacles, and lichened stone-slopes are graciously clothed by the creeping juniper, and the pale green of Lyall's larches.

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