August 15*th.*

MR. CASSIN, Vice President, in the Chair.

Eight members present.

The following papers were read and referred to committees :

"New Polyzonidæ." By H. C. Wood, Jr., M. D.

"On a new genus of Vespertilionidæ." By H. Allen, M. D.

August 22*d.*

MR. CASSIN, Vice President, in the Chair.

Eight members present.

August 29*th.*

The President, DR. BRIDGES, in the Chair.

Eleven members present.

On report of the respective committees, the following were ordered to be published.

Remarks on the genus TAXOCRINUS, (Phillips) McCoy, 1844; and its relations to FORBESIOCRINUS, Koninck and Le Hon, 1854, with descriptions of new species.

BY F. B. MEEK AND A. H. WORTHEN.

The genus *Taxocrinus*, Phillips, as published by McCoy in 1844, (Carb. Foss. Ireland, p. 178,) was founded upon *Cyathocrinus? macrodactylus*, Phillips, and *Taxocrinus polydactylus*, McCoy, both of which are described, and the latter figured by McCoy, as if composed of five basal pieces directly alternating with the five radial series, the latter forming free arms without any interradial or anal pieces between. Phillips' figures of *T. macrodactylus*, however, (Palæozoic Fossils, pl. xv.,) particularly his figure *b*, certainly shows a small interradial piece wedged in between the truncated superior lateral angles of two of the first radial pieces. From these illustrations, therefore, as well as from the fact that in redescribing the genus in 1851, according to the later improved nomenclature of the parts, (Brit. Pal. Foss. p. 51,) McCoy distinctly says "five hexagonal interradial plates intervene between the second primary radials, resting on the upper lateral edges of the 1st do.,"* it is manifest that there is generally, if not always, one or two ranges of interradial pieces, in adult examples of what are regarded in Europe as typical species of this genus, when found entire.

* From the species included, as well as from that author's usual method of describing these parts of crinoids, it is obvious that by the words "five hexagonal interradial plates intervening, &c.," he means a single piece occupies each of the five interradial, or rather four interradial, and one anal spaces.

The genus *Forbesiocrinus*, proposed by Koninck and Le Hon, in 1854, (*Recherch. sur les Crinoides*, p. 118,) was founded upon their *F. nobilis*, which they think probably the same as *Poteriocrinus? nobilis*, Phillips, originally included by the latter author in his *Isocrinitis*, for which the name *Taxocrinus* was afterwards substituted, when he became aware of the fact that *Isocrinus* had been previously used by Meyer for another group. In their description of *Forbesiocrinus*, Koninck and Lehon characterize it as having five basal pieces, alternating with five series of primary radials consisting of four pieces each, with the anal and interradial spaces each occupied by from 12 to 13 pieces, and the axillary spaces by three small pieces each.

From all the descriptions and illustrations yet published, of the groups *Taxocrinus* and *Forbesiocrinus*, it is therefore clearly evident that these two types as understood by European authors, are distinguished by *Taxocrinus* having but one or two ranges of interradial pieces, or none, and *Forbesiocrinus* having from 12 to 13 of these pieces occupying each interradial spaces, and a few small pieces in the axillary spaces above. In all other points of structure, and arrangement of parts, whether of the column, basal, radial or arm pieces, they are understood and acknowledged to agree exactly. But as it has been found that typical species of *Forbesiocrinus*, possess three more or less developed basal pieces within or beneath those regarded as such by Koninck and Le Hon, (Iowa Report, p. 628,) it might be supposed this character would aid in distinguishing the two groups. It is well known, however, that American typical species of *Taxocrinus*, without interradial or anal pieces, or with but a siugle range of the two, such as *T. Thiemei* and *T. juvenis*,= (*Forbesiocrinus Thiemei* and *F. juvenis*, Hall, Jour. Bost. Soc. N. H. vii., 317 and 318,) possess precisely the same structure, being both described as having small basal and subradial pieces.* Nor can we make the presence of interaxillary pieces, or the small patelliform supplementary pieces, so often seen at the sutures of the radials in well defined *Forbesiocrinus*, a means of distinction, since neither are always present in otherwise typical forms of that group with the interradial spaces filled with plates; while well marked species of *Taxocrinus*, such as *T. Thiemei* aud *T. juvenis*, Hall, (sp.,) the first without anal or interradial pieces, and the latter with the "interradial and anal series consisting of one plate each," are described, the first as having "arm joints showing the small patelloid plates very distinct," and the latter, with "the small patelloid plates indicated by the strong curvature of the suture lines of the radial plates, becoming more distinct in the arm plates." So if we attempt to distinguish these groups at all, we must fall back upon the difference of the one group being without anals or interradials, or with but one or two ranges of these pieces, and the other with a greater number.

Now, however well this difference may serve to separate into two groups the few known European species, an attentive study of our more numerous American forms has shaken our confidence iu the possibility of separating all the species hitherto discovered, into two sharply defined genera, until some more reliable characters can be pointed out. Our reasons for this conclusion will be better understood by consulting the following list of 22 American and European species and varieties, with a tabular statement of the number of the various parts of each.†

* Our *Taxocrinus gracilis*, of this paper, with a single series of interradials, shows clearly three small pieces under the five considered the basals, by most authors.

† We have not included *Taxocrinus interscapularis*, Hall, (Iowa Report, pl. i. fig. 3,) in this list, because it deviates from the typical forms of the genus, and seems allied to *Dimerocrinus*. Phillips, though differing from that genus in not having the arms composed of a double series of minute interlocking pieces, as well as in some other points of structure,

Table showing the gradations of structure from TAXOCRINUS *to* FORBESIOCRINUS.

		1 Interradials.	2 Anals.	3 Interaxillary.	4 Secondary do.	5 Primary rad.	6 Secondary do.	Remarks.
1.	*Taxocr. polydactylus*, McCoy.....	0.....	0.....	0.....	0.....	4 to 7	2.....	
2.	——— *Thiemi*, Hall, (Sp.)	0.....	0.....	0	0.....	3.....	not bifurcat'g again	
3.	——— *nuntius*, Hall, (sp.).....	0..... ..	0.....	0.....	0.....	3.....	3.....	
4.	——— *communis* Hall, (Young,)	0.....	0.....	0.....	0.....			
5.	——— " " (Adult,)	1.....	1 & 3 rudimentary.	0.....	0.....	4....	4 to 7.....	
6.	——— *macrodactylus*, Phillips..	1.....	1.....	0.....	0.....	4.....	5 to 6... ...	Type of T axocrinus.
7.	——— *juvenis*, Hall, (sp.).....	1.....	1.....	0.....	0.....	4	4.....	
8.	——— *spinifer*, Hall, (sp.).....	1..... ...	unknown...	0.....	0.....	3.....	3.....	
9.	——— *Kellogii*, Hall, (Sp.)	1.....	1.....	0.....	0.....	4.....	5.....	
10.	——— *ramulosus*, Lyon & Cass..	1.....	3 to 6.....	3.....	1.....	4.....	4 to 6.....	
11.	——— *tuberculatus*, Miller, (sp.)	2.....	2.....	0.....	0.....	3.....	3.....	
12.	*Forbesiocr. asteriæformis*, Hall...	4.....	4.....	0.....	0	4 to 5	4 to 5.....	
13.	——— ——— *Meekii*, Hall	5 or more..	unknown...	2 or more.	0.....	3 to 4	unknown...	
14.	——— ——— " (var.).....	7.....	"	1.....	0.....	4.....	4.....	
15.	——— ——— *Giddingsi*, Hall.....	8 to 10.....	many.....	1.....	0.....	4.....	4 or 5.....	
16.	——— ——— *Whitfieldi*, Hall	10.....	unknown...	1.....	1.....	4.	2.....	
17.	——— ——— *Shumardianus*, Hall...	12 or more	"	0.....	0.....	4.....	3.....	
18.	——— ——— *Agassizi*, Hall,†	15 to 25 ...	30 to 40 ...	3.....	1 to 3	3.....	3.....	*Five* basal pieces ??
19.	——— ——— *excelsus*, L.&C. (sp.)‡	20 to 25 ...	5 to 7.....	1 to 3.....	0.....	5	4 to 6.....	
21.	——— ——— *Safordi*, Hall.....	30.....	?	8 to 9.....	?	3 or 4	4.....	
22.	——— ——— *Wortheni*, Hall.....	30 or more	20 or more	10 or more	4 or more..	4.....	3.....	

† By referring to the description and diagram of *Forbesiocrinus Agassizi*, (Sup. Iowa Report,) pages 66 and 67, it will be seen that one of the subradial pieces is there by an oversight described as the first anal. It is also worthy of note, that the diagram there given, shows clearly five basal pieces. If this is correct we may doubt the propriety of placing this species in the genus at all.

It has not been considered necessary to mention in this table the number of *basal* pieces, because both groups agree in having three of these pieces.

‡ Messrs. Lyon and Casseday described this species as the type of a new genus *Onychocrinus*, in 1859. We do not see, however, that it can be distinguished from *Forbesiocrinus*, as now understood.

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From this statement, it will be seen that, starting from such forms as *Taxocrinus polydactylus*, *T. Thiemei*, &c., without interradial or anal pieces, we pass by a very easy gradation through the young of *T. communis*, having a single range of granules representing interradials, to the adult of the same, with one well developed interradial in each space, and one anal surmounted by two or three granules. Then we have several other species, with a single range of interradial and anal pieces, after which we pass to *T. ramulosus*, with one interradial, three to six anals, and three interaxillary pieces, and then to *T. tuberculatus*, with two interradial and two anal pieces in each space; after which we have *F. asteriæformis*, with its four interradials and four anal pieces. Continuing down the list, we find, as we pass from species to species, the number of these intermediate plates increasing as gradually as we could expect these pieces in species of the same genus of crinoids to do, until we arrive at *F. Wortheni*, with its thirty or more interradials, and twenty or more anals. Nor is it probable this is the maximum number of these pieces sometimes visible between the rays, since it is known that in some species, such as *F. exculptus*, Lyon and Casseday (sp.), they continue on up, and pass without change or interruption, into a series forming a solid dome above. Hence it is probable that in the typical forms of *Taxocrinus*, without interradials, or but one or two ranges, and long ponderous rays, such as *T. macrodactylus*, *T. polydactylus* and *T. ramulosus*, the visceral sac corresponded in size with that of the column and rays, or in other words, extended as far up at least as the second bifurcation, and that it was merely protected by a dermal envelope between the rays and above. The fact that this integument protecting the softer parts, may have, in some instances, merely secreted a rudimentary piece at the bottom of each interradial space, or one or two well developed plates, or filled the whole space partly or entirely, or continued the process of secreting calcareous matter, until the whole summit was arched over with a solid vault, although probably presenting in the various degrees of this process good specific differences, can scarcely, we should think, be regarded in this group as presenting sufficiently important characters for the distinction of genera, especially when these differences are not coincident with any other peculiarities. In addition to this, when we bear in mind that different sized individuals of the same species, as in *Forbesiocrinus Agassizi* and *F. exculptus*, the number of interradial pieces are acknowledged to vary in the first instance from fifteen to twenty five, and in the second from twenty to twenty-five, we can readily understand that some caution is necessary in basing even specific distinctions on these differences alone.

Nor on the other hand, if we direct our attention to the primary or secondary radial pieces, or to the arms, do we see anything to sustain the generally accepted distinction of two genera in this group; for, if we make the radial series, for instance, a basis of classification, we would have, as may be seen by glancing at the 5th and 6th columns of the foregoing table, to place *Taxocrinus nuntius*, without anals or interradials, not only along with *Forbesiocrinus spinifer*, with its single range of interradials, but with *F. Agassizi*, with its thirty to forty anals, and twenty-five to thirty interradials. The same method would also place a variety of *F. Meeki* with seven interradials in the same group with *Taxocrinus juvenis*, Hall, with its single range of interradial pieces.

Now from these facts, it must be evident, we think, that if *Forbesiocrinus* is to be retained as a distinct genus from *Taxocrinus*, it will have to be separated upon some characters or differences not yet observed. Hence, although we shall continue to use the two names, for the sake of convenience, ranging under *Taxocrinus* species without interradial or anal pieces, as well as those with one or two of each; and under *Forbesiocrinus*, those with a greater number of these pieces, we shall do so—at least until better evidences of their being distinct genera have been adduced—with the understanding that we

regard the latter group as a section or subgenus under the old name *Taxocrinus*. In this sense, then, we leave under the names *Forbesiocrinus*, our *F. Monroensis* and *T. Norwoodi*, as well as all those mentioned in the foregoing list from No. 12 to 22 inclusive. Our *F.? semiovatus*, however, seems to be a typical *Taxocrinus*, and its name should be written *Taxocrinus semiovatus*. The species *Forbesiocrinus nuntius*, *F. Thiemei*, *F. communis*, *F. Kellogi*, *F. spinifer*, and *F. juvenis*, of Hall, we regard as likewise typical forms of *Taxocrinus*, and hence their names should be written *Taxocrinus nuntius*, *T. theimei*, *T. communis*, *T. Kellogi*, *T. spinifer*, and *T. juvenis*.

TAXOCRINUS GRACILIS, Meek and Worthen.

Body small, expanding moderately from the base. Basal pieces small, and looking like the last joint of the column divided into three pieces; subradial pieces so small and narrow as to allow the lower middle extremity of the first radials to come nearly, or in some instances, quite down upon the basal pieces; four of them triangular and more or less wedge-shaped so as to project up between the first radials as much as half the length of the latter; the fifth one larger than the others, but slightly tapering, and truncated above by the anal? piece, so as to present a quadrangular or subpentagonal outline. First radial pieces considerably larger than the subradial, of nearly equal length and breadth, or a little wider than long, hexagonal in form, the inferior sloping, and upper horizontal sides much longer than the others. Second radials, in four of the rays, shorter than the first, wider than long, and generally hexagonal; in the fifth ray of the specimen under investigation, the second piece has its right margin enormously, and perhaps abnormally, developed, and extended obliquely upwards, so as to fill the whole interradial space above the comparatively minute interradial piece, quite up as far as the second bifurcation of the rays, with one solid plate. In the ray containing this singularly developed second piece, there are two other primary radial pieces succeeding it, of near the natural size and form, upon the last (fourth) one of which the first bifurcation takes place; after this each of the divisions bifurcates again on the fourth piece, and the two inner subdivisions again on the fourth piece, while the two outer ones send off subdivisions, one on the sixth, and one on the seventh piece. In the ray immediately to the right of that just described, and apparently the anterior one, no division takes place until upon the eighth piece, all the pieces between the second and eighth being transversely oblong or about twice as wide as long, and gradually diminishing in size. In the other three rays, the first division takes place on the third piece, and the second and third divisions also on the third piece, the arms rather rapidly diminishing in size with each bifurcation.

Interradial pieces very small, rather longer than wide, somewhat wedge-shaped above, and resting between the short superior lateral sloping sides of the first radials, and supporting on each superior sloping side a short truncated margin of the contiguous second radials, which generally meet over the little interradial, so as to isolate it from the free space above, though not always. Anal piece a little larger than the interradials hexagonal in form, and resting with one short side upon a truncated upper side of the largest subradial; while it connects on the right with a first and second primary radial, and on the left with a second and third primary radial, and one first secondary radial.

Surface of body apparently smooth, but showing granules on some of the divisions of arms. Patelliform accessory pieces not developed between the primary radial pieces, but quite distinct between some of the secondary. Column, as in other species of the group, round and tapering downwards from the base, near which it is composed of very thin pieces.

This species, although somewhat like *T. interscapularis*, Hall, (Iowa Report,

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pl. 1, f. 3,) from the same locality, will be at once distinguished by its more spreading rays, greater interradial and interbranchial spaces, and particularly by its proportionally smaller and shorter interradial pieces, as well as by having the latter resting upon the superior lateral truncated sides of the first radials, instead of upon one of the second, while it has no interaxillary pieces as seen in *T. interscapularis* It likewise shows some differences in the bifurcations of its arms, after the first division.

A marked feature in the specimen from which the description was made out, is the extraordinary development of the right margin of one of the second primary radial pieces, by which it is made to fill the entire adjacent interradial space. This, however, as already stated, is probably abnormal.

Locality and position. New Buffalo, Iowa. Hamilton division of the Devonian.

Descriptions of new species of CRINOIDEA, &c., from the Palæozoic rocks of Illinois and some of the adjoining States.

BY F. B. MEEK AND A. H. WORTHEN.

RADIATA.

ECHINODERMATA.

CYSTIDEA.

Genus COMAROCYSTITES, Billings, 1854.

Comarocystites, Billings, Canadian Journal, vol. ii. p. 269, 1854; Report Geol. Survey Canada, p. 288, 1856; Decade iii. Canadian Organic Remains, p. 61, 1859.

"Body ovate, the smaller extremity being the base; pelvis small, of three plates, above which are from eight to eleven irregular rows of plates, mostly hexagonal; mouth near the summit provided with a valvular apparatus; arms free, grooved, and composed of a single series of joints bearing pinnulæ; ambulacral orifice in the apex between the arms; column round and smooth. The plates of the only species that has been collected present, in some conditions of preservation, a peculiar vesicular structure of their exterior surfaces, while sometimes they are solid and smooth."

"Generic name *Comaron*, a strawberry."

COMAROCYSTITES SHUMARDI, M. & W.

Body obovate, the summit being more broadly rounded than the lower extremity; height about one-tenth greater than the breadth. Basal pieces wider than long, irregularly heptagonal and octagonal, extending out horizontally from the column, and having, at two of the sutures, small supplementary pieces wedged in between, so as to come nearly in contact with the end of the column. Succeeding ranges of plates above, five, very irregularly arranged, and differing in size and form, but increasing in diameter from below upwards, mostly hexagonal or heptagonal in form; all deeply concave on the outside, with prominent sharp carinæ at the sutures; when these angular prominences are weathered or worn, slit-like pores are seen passing through the sutures, which they cross at right angles, being partly common to each of the contiguous plates. Height, 1·50 inch; breadth, 1·30 inch; greatest breadth of one of the plates next to upper range, 0·44 inch. Arms and openings of the summit unknown.

This species is nearly allied to *C. punctatus*, Billings, the type of the genus, from which it may be distinguished by having only five ranges of plates above the base, instead of seven or eight, as well as by the greater size of the plates