SHORTER CONTRIBUTIONS TO GENERAL GEOLOGY

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THE SCAPHITES, AN UPPER CRETACEOUS AMMONITE GROUP

By John B. Reeside, Jr.

INTRODUCTION

This paper presents a summary of the principal publications dealing with the scaphites, an estimate of the generic divisions proposed, and a catalogue of the species recorded in the literature available to the writer.

The scaphites are an especially important group of ammonites because of their wide distribution and relative abundance in many of the Upper Cretaceous faunas of the world. In some areas the succession of species affords a more useful basis for faunal sub-division of the strata than any other single group of fossils, and in many other areas it is a very valuable auxiliary to the other groups. A fairly satisfactory intercontinental correlation has been based on the scaphites alone.

The literature dealing with the scaphite group includes a large part of the papers that describe Upper Cretaceous cephalopods, though many such papers do not treat the scaphites to any greater extent than to describe or record species and do not enter into the problems concerning classification and phylogeny. The writer recognizes, from the errors in the delimitation and chronologic assignment of American species noted in the works of European writers, that he assumes considerable risk of falling into similar errors in attempting to deal with European species with which he has little or no first-hand acquaintance. He has had the temerity to essay in the appended catalogue of species a decision between conflicting statements in the European literature, both as to identity and as to chronologic assignment of various species, and bespeaks a kindly indulgence for such errors as may be included.

TAXONOMIC HISTORY OF THE SCAPHITES

Parkinson 1 in 1811 applied the name Scaphites to "a fossil concamerated shell, commencing with spiral turns, the last of which, after being elongated, is reflected back toward the spiral part." He figured an example of the genus which was afterward referred to the species aequalis Sowerby, thereby making this species the genotype.

For many years afterward all forms of Mesozoic cephalopods that began with a normal ammonitic coil, departed from it, and bent back again to form a hook without leaving the original plane of coiling were referred to Scaphites Parkinson, though it was recognized by many students that such species as ivanii Puzos differed notably from the genotype. D’Orbigny, 2 for example, separated the species known in 1840 into two sections:

Elongati, whose spire is composed of nonembracing whorls, completely uncovered, and whose crook is very long. (S. ivanii.)

Breves, whose spire is composed of embracing whorls, almost entirely covered, and whose crook is very short. (S. aequalis, compressus, constrictus, hugardianus.) [Translated.]

With the advance in knowledge of ammonites, due to the labors of numerous students, and the resultant efforts to arrive at a classification expressive of genetic relationship, various assignments have been given to the scaphites by different authors—indeed, are still given—for there is by no means complete agreement concerning the problems involved.

Neumayr 3 in 1875 considered the scaphites, with the exception of S. ivanii, to be a natural group and on the form of the aptychus and presence of auxiliary lobes in the suture to belong to the perisphinctid stem. On the form of the inner whorls he considered the group to have been derived from Olcostephanus Neumayr.

Meek 4 in 1876 discussed in detail the genus Scaphites, referring it as the sole genus to the family Scaphitidae Meek but not indicating any relationship to other groups. He had already 5 proposed the subgenus Discoscaphites to include certain forms that presented differences from the typical species, and he now proceeded to further elaboration. Meek proposed the subgenus Macroscaphites for the group of Scaphites ivanii Puzos, and it has been considered since under that name by most students as entirely distinct from the scaphites. He restricted Scaphites, in its

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1 Parkinson, James, Organic remains of a former world, vol. 3, p. 145, pl. 10, fig. 18, 1811.

2 D’Orbigny, Alcide, Paléontologie française, 1st ser., Terrain crétacé, vol. 1, p. 514, 1840.


narrower sense, to the rank of a subgenus with three sections—(a) group of *Scaphites aequalis* Sowerby, with coiled part relatively small, narrow umbilicus, round venter, and a single row of nodes, if any, on the margin of the living chamber; (b) group of *Scaphites nodosus* Owen, with coiled part relatively large, deflected part short, venter more or less flattened, with a row of nodes on the margin, and a second row of nodes near the umbilicus; (c) group of *Scaphites trinodosus* and *S. tridens* Kner, with three rows of nodes on the rounded periphery. Under the subgenus *Discoscaphites* Meek proposed to place two sections—(a) group of *Scaphites conradi* Morton, with narrow umbilicus, coiled part forming most of the much compressed shell, flattened periphery, and four to nine rows of nodes on each flank, the outer row being the largest; (b) group of *Scaphites cheyennensis* Owen, much like section a but with relatively wide umbilicus and little-deflected body chamber. Meek in his specific descriptions includes in *Discoscaphites* species that do not possess the numerous rows of nodes, relying on other characters for the assignment. He remarks that some of his groups might appropriately be made separate genera.

Zittel 6 in 1885 placed the genus *Scaphites* under the Stephanoceratidae of Neumayr but apparently was doubtful of its exact relationship, for he separated the discussion of this genus and *Crioeras* Léveillé from that of the other members of the family by a rule. Zittel put into *Scaphites* "with the exception of *Macroscaphites*, whose suture agrees completely with *Lytoceras*, * * * all uncoiled Cretaceous ammonites distinguished by a hook-shaped, reflected living chamber, and whose suture shows auxiliary lobes." [Translated.]

H. Douvillé,7 according to Grossouvre,8 assigned *Scaphites* on the basis of the sutures to the family Pulchellidae Douvillé and compared the young of certain species to *Stoliczkaia dispar* (D'Orbigny) Neumayr. Douvillé, because of the presence of tubercles on the shell, rejected an assignment to the family Lytoceratidae Neumayr favored by some students on account of the bifid lobes of the adult suture.

Grossouvre 9 in 1894 placed the genus in his family Acanthoceratidae on the basis of the suture and the sculpture. He consolidated Douvillé's two groups of Pulchellidae and Acanthoceratidae and therefore followed Douvillé in his assignment. Grossouvre included in the genus forms which in youth resemble *Stoliczkaia dispar*, have a narrow umbilicus, embracing whorls, rounded on the periphery, ornamented with simple ribs which increase on the external region of the flanks by intercalation or by bifurcation. The last whorl separates from the others, forms a straight part, then bends back into a crook in such a way that the coiled part faces the mouth; the latter is ordinarily a little contracted, supplied with a ventral apophysis, dorsal apophysis, and sometimes lateral lappets. On the straight part and the bend, the ornamentation is often modified and becomes nodose; this character is especially accentuated in the latest forms. [Translated.]

Logan 10 in 1899 discussed *Scaphites*, accepting the genus as a member of the Stephanoceratidae and regarding it as a progressive rather than a decadent or retrogressive group, because the sutures do not show degeneration but progression if it is assumed that the later scaphites descended from the earlier. Logan studied the ontogeny of *Scaphites nodosus* Owen and thought he saw in it evidence of a development through *Anarcites*, *Tornoceras*, *Glyphioceras*, *Gastrioceras*, *Paralecoceras*, and *Prorontites*. Later stages he thought to resemble *Scaphites warreni*, and at the end of the fourth whorl the adult *nodosus* form is reached.

Hyatt 11 in 1900 accepted the genera *Scaphites* Parkinson and *Discoscaphites* Meek and proposed *Anascaphites* with *Scaphites ventricosus* Meek and Hayden as the genotype and *Jahnites* with *Scaphites geinitzi* D'Orbigny var. *bidosus* Roemer of Jahn 12 as the genotype. Hyatt gave no diagnoses of the genera but assigned them to the family Scaphitidae Meek and placed them between the family Macro­scaphitidae Hyatt and the family Lytoceratidae Neumayr. Hyatt defined the family as follows:

Two or more rows of tubercles developed in the ephelic or gerontic stage; costae continuous across the venter; aperture evenly constricted on the sides and with a slight, broad rostrum on the venter, caused by a recession of the lateral curves. There is a dorsal lappet, but this is long and bent only in *Jahnites*. The young and sometimes ephelic stages of *Scaphites* possess the costae, form, and general aspect of *Pachydiscus*, and there are species transitional between them.

J. P. Smith 13 in 1901 expressed the opinion that the genus *Scaphites* is polyphytic and that some of the species seem to have come from a *Hopites*-like ancestor, though others have larval stages similar to those of *Lytoceras* and *Buculites* and probably have a common origin with them.

W. D. Smith 14 in 1905 published the results of his work on the young stages of *Scaphites nodosus* Owen and *S. condoni* Anderson. He does not accept Logan's views on the derivation of *Scaphites*, holding that the sutures alone are insufficient proof of derivation, and does not see the resemblances which Logan

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7 A definite citation is not given but is probably Douvillé, Henriet, *Notes pour le cours de paléontologie professée à l'École de mines en 1889-1890*, given a limited circulation in 1890.
9 Idem, p. 238.
finds. He likewise considers the genus a degenerate group, not progressive, because it unrolls, has a reduced number of sutureal elements, and is spinose in many species. Smith finds from his study of the form of the whorls, sculpture, and sutural characters that "the Scaphites nodosus group is to be considered as having come from some member of the Stephanoceratidae." 16 The young of this species show a development from a trianidian first lateral lobe to a dicranidian, and there is a constriction at the end of the first whorl. Regarding the group of Scaphites condoni, Smith, from the character of the young stages, believes it to have a common ancestor with Baculites and Lytoceras, or with Baculites to have descended from Lytoceras. He says: "The likeliness of the young stages of S. condoni * * * to the young of Baculites and Lytoceras is more in the general aspect of the shell rather than in any specific characters." 16 The condoni group differs from the nodosus group chiefly in having bifid lobes throughout, whereas in the nodosus group the first lateral lobe of the suture is supposed to develop from a trid to a bifid form, and in having a wide umbilicus and suppressed ribs as compared with the narrow umbilicus and prominent ribs of the nodosus group. The genus therefore, according to Smith, is polyphyletic, the degenerate, phylogeronic descendant of several stocks.

Pervinquière 17 in 1907 considered scaphites of the type of Scaphites aequalis Sowerby on the basis of form, sculpture, and suture to have been derived from Olostephanus Neumayr or Holcodiscus Uhlig, thus reverting to the opinion of Neumayr. He rejected an attachment to the Lytoceratidae because of the presence of several auxiliary lobes in the external suture and several lobes in the internal suture, and to Stoliczkaia Neumayr because of the form of the young. For the group like Scaphites cunliiffei Forbes, Pervinquière favored an assignment to the Lytoceratidae. Scaphites cunliiffei has a discoid form, a wide umbilicus, a suture whose first lateral lobe passes directly from the simple to the bifid stage, and a first whorl with a constriction like that of Baculites and Lytoceras. The features antagonistic to the assignment are the strong sculpture, at least in comparison with Lytoceras, and the presence of several internal lobes in the suture. Pervinquière noted that some of the species of Discosculpites Meek have a discoid form and wide umbilicus, but he was unwilling to accept Meek's name because the development of the American forms was not known. He was unwilling also to include in it S. cunliiffei because the living chamber of the cunliiffei group had not been found.

Yabe 18 in 1910 proposed the genus Yezoites to include scaphites with a suture possessing a single-pointed internal lobe and a very high internal saddle next to it. The external suture, form, and other characters are like those of the normal scaphites. Yabe considered the internal suture to be the most significant criterion in determining the relationship of scaphites. He rejected Hyatt's classification, primarily because of the lack of elaboration of the genera. The full diagnosis of Yezoites is as follows:

Shell as in Scaphites Parkinson, consisting of more or less widely umbilicate spiral whors and of a free, at first straight and then reflected last whorl. Border of the aperture either only thickened or with a constriction and lateral lappets. The external part of the suture as in Scaphites; the internal part with high saddle and small notches in it.

Here belong three species, from the Scaphites beds of Hokkaido, which may be grouped in two sections:

1. Umbilicus of the spiral whors mostly covered by the flanks of the loose whorl; border of the aperture simply thickened.
2. Umbilicus of the spiral whors entirely open; border of the aperture with constriction and lateral lappets. [Translated.]

Yabe did not assign a systematic position to either Scaphites or Yezoites.

Nowak 19 in 1911 reviewed briefly the work of many previous students of the scaphites. He did not consider Yezoites Yabe a valid genus, believing from the work of Pervinquière and W. D. Smith, cited above, that a high internal saddle may be present in groups that by other characters give strong evidence of different derivation. Nowak expressed no opinion as to the ideas of Meek and Hyatt regarding Scaphites. Contrary to Yabe's opinion, Nowak believed that although the form of internal suture should not be neglected in studying scaphites, as has so often been done, it is not the most important criterion but must be considered in conjunction with the form of the shell, the sculpture, and the external suture. The primary feature to be considered in determining relationship is the ontogenetic development as a whole. Nowak compared Scaphites aequalis Sowerby, S. tridens Kner, and S. constrictus Sowerby with the representatives of other genera and concluded that at least three evolutionary series are represented, similar only in possessing an abnormal living chamber—the group of S. aequalis, derived from Holcoptephanus; the group of S. tridens, derived from Acanthoceras; and the group of S. constrictus, derived from Hopiates. For these groups Nowak proposed the names Holcocaphites, Acanthosculpites, and Hoplosculpites, respectively. The diagnoses of these genera given by

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17 Idem, p. 661.
Nowak will perhaps present in briefest possible form his reasons for their institution:

Genus *Holoschaphites.*—Shell with narrow umbilicus; umbilicus broader in youth, narrower in age; whorls stout, last living chamber abnormal. The sculpture of the normal whorls, especially in the young stages, like *Holocostephanus.* [That is, the ribs pass without nodes from the umbilicus, end at the edge of the venter with a nodose thickening, and then split into weaker secondary ribs. Later the ribs of the venter and flank are equal.] Lobes and saddles in external part [of suture] gradually smaller from the outside [of the whorl] inward; the same in the internal part but in the opposite direction. The bifid lobes develop out of trifid; the internal lobe trifid.


Genus *Acanthoschaphites.*—Whorls always somewhat higher than wide, last living chamber abnormal. Sculpture consists of straight or only slightly bent ribs; in youth there are principal ribs which begin at the umbilicus with a nodose thickening and pass over the venter to the other side and auxiliary ribs which are intercalated between these on the venter. Later the auxiliary ribs become longer and, like the principal ribs and the umbilical nodes, disappear. In adult specimens there are [ventral] nodes. The suture possesses an external lobe, two lateral lobes, and one to two auxiliary lobes. The external lobe is longest; next in length comes the first lateral, which is bifid; the trifid second lateral and the following lobes are strikingly shorter than the first lateral. Three internal saddles, the first highest and broadest, the others progressively smaller. The bifid lobes develop out of trifid. Lobes and saddles strongly incised. Species: *A. tridentes* Kner, *gibbus* Schlüter, *roemerii* D’Orbigny, *cunliffei* Forbes, *formatus* Roemer. Species falling within this genus are certainly much more numerous, but their suture lines are mostly unknown.

Genus *Hoploschaphites.*—Flat forms with involute whorls; the umbilicus in youth broader, then narrower. Sculpture consists of arched ribs, which at the middle of the flank and on the venter are bent forward; they fork at different heights on the flank without forming nodes. Increase in the number of ribs occurs also by intercalation. Suture consists of an external lobe, two lateral lobes, and one to two auxiliary lobes. The first lateral lobe is usually highest, the external lobe next, and then the second lateral lobe, which reaches scarcely one-third the height of the first lateral lobe. The first internal saddle small and narrow, the second very broad and higher than the first. The lobes and saddles are not much divided and incised. The bifid lobes have arisen from trifid lobes. Species: *H. rochatianus* D’Orbigny, *tafricinus* Pervinquière, *thomasi* Pervinquière, *aquiseriensis* Schlüter, *monasteriensis* Schlüter. *pungens* Binckhorst, *constrictus* Sowerby.

Whether scaphites do not occur also in other ammonite genera and families may be established only by further investigation.

[Translated.]

J. P. Smith 20 in 1913 accepted the genera *Scaphites* Parkinson, *Discoschaphites* Meek, and *Jahnites* Hyatt, placing them in the subfamily Scaphitinae Meek of the family Cosmomceratidae Zittel. He gives a diagnosis of the subfamily only, as follows:

Whorls closely coiled in youth, opening out at maturity into a hook-shaped body chamber. Form robust, thick-set, involute, surface highly ornamented with ribs and knots. Septae finely digitate, usually with several auxiliary lobes.

Frehc 21 in 1915 sought to group the scaphites of the European and American Cretaceous into form groups characteristic of the successive zones and exhibiting a progressive increase in size and in complexity of sculpture from the older beds to the younger. The form groups do not imply community of descent. Frech makes out a case of nearly perfect parallelism between the two sides of the Atlantic, proposing to unite under the same names a number of species previously separated. His grouping is as follows:

1. Group of *S. aequalis*. Small species with threadlike ventral ribs and fewer but stronger lateral ribs; *S. aequalis*, *geinitzi*, *larvaeformis*, *warreni*, and *warreni* var. *silesiaca*. Cenomanian and Turonian.

2. Group of *S. vermisformis*. Medium-sized species with coarse sculpture whose lateral ribs end in nodes: *S. lamberti*, *meslei*, *kiezingswaldentien*, *vermisformis*. Emscherian and lower Senonian.

3. Group of *S. binodusus*. Forms with two rows of lateral nodes on each flank and with ventral ribs, which are partly obliterated: *S. binodusus*, *infatus*, *binodusus* (nodosus?) var. *brevis*, var. *quadrangularis*, var. *plenus*. Lower Senonian. Possibly also *S. gibbus* of the upper Senonian.

4. Group of *S. constrictus* (*Discoschaphites*), presenting only slight modifications from the *binodusus* group. Compressed forms with narrow venter and high sides; dichotomous lateral ribs on the inner whorls, two rows of nodes on the living chamber (umbilical and external), in some species accompanied by suppression of the ribs. (a) Ribs on the septate whorls; living chamber smooth except for two rows of nodes: *S. hippocrepis*, *aquiseriensis*. Lower Senonian. (b) Ribs on the septate and unseptate whorls; the two rows of nodes irregularly developed, in some species distinct throughout (*S. compressus* Roemer), in others with umbilical row suppressed (*S. constrictus*, *roemeri*, *conradi*, *abyssinus*). Middle and upper Senonian.

5. Group of *S. pulcherrimus*, with three to four rows of nodes on each flank, one row on the ventral margin; numerous ribs. Upper Senonian.

(a) Most species have the four rows of nodes (*S. spiniger*, *pulcherrimus*), though some have more numerous *Trachyceras*-like rows of nodes (*S. cheenennsis*, *spinonissimus*). (b) One species, reaching the largest size, has between the two rows of lateral nodes a third row of less numerous but very strong nodes in the plane of symmetry (*S. tridentes*).

Nowak 22 in 1916 dealt with the importance of the scaphites in the subdivision of the Upper Cretaceous. He disagreed with Frech as to the desirability of Frech’s form groups, because the similarities used by Frech are largely superficial and take no account of genetic relationships. Nodes appear in different groups at different times and with different intensity, and the maximum development occurs at different times. Nowak considered the high point of develop-

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ment to have come in his Holcoscaphites in the Cenomanian, in his Acanthoscaphites in the middle of the 
Mucronatus zone (upper Campanian), and in his Hoploscaphites in the very late Cretaceous (Maestrichti-
an). Some of the species of Acanthoscaphites reach 
much larger size than any of the later Holcoscaphites.

Concerning the relation between the European and 
American species, Novak added to the aequalis group, 
besides S. larvaeriformis Meek and Hayden and S. 
warreni Meek and Hayden, S. gillisi Anderson, S. 
klamathensis Anderson, S. condoni Anderson, and the 
Emscherian S. vermiciformis Meek and Hayden. No-
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sus Roemer and S. nodosus Owen but assigned S. 
nodosus var. plenus Meek to S. tridens Kner var.

Spath 23 in 1922 recognized Nowak's three genera 
as valid. He suggested that possibly some Cam-
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vari Schlüter (Hoplioplacenticeras Paulcke).

The writer, in recent papers, 24 has accepted Nowak's 
divisions of the scaphites as valid, though not accept-

24 Reeside, J. B., Jr., The cephalopods of the Eagle sandstone and related forma-
tions in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 
151, pp. 20-21, 1927; Cephalopods from the lower part of the Cody shale of Oregon 

The writer, in recent papers, 24 has accepted Nowak's 
divisions of the scaphites as valid, though not accept-

ing his names Holcoscaphites and Hoploscaphites (see 
below, p. 27), and has proposed Desmoscaphites to 
include scaphites with the following features: Shell 
of moderate size with stout, well-rounded whorls; 
umbilicus small; sculpture on earlier whorls of stout 
rounded ribs, which increase both by forking and by 
to Hugardianus.

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PRESENT STATUS OF THE GROUP

The summary of the more important papers relating to the scaphites given above shows that, *Macroscaphites* not included, nine generic names have been proposed:

Scaphites Parkinson, 1811.
Discoscaphites Meek, 1870.
Anascaphites Hyatt, 1900.
Jahnites Hyatt, 1900.
Yezoites Yabe, 1910.
Holcoscaphites Nowak, 1912.
Acanthoscaphites Nowak, 1912.
Acanthoscoaphites Nowak, 1912.
Desmoscaphites Reeside, 1927.

*Scaphites* Parkinson was sufficiently comprehensive in its original definition to include all the later names and has the species *aequalis* Sowerby as the genotype. (See pl. 10, figs. 13–15.)

*Discoscaphites* Meek was established on the basis of the compressed form of the shell and the presence of numerous rows of nodes on the ribs, though in the actual application of the name by Meek species without nodes on the flanks were included in the genus. The genotype is the species *conradi* Morton. (See pl. 9, figs. 2–7.)

*Anascaphites* Hyatt was defined only by the citation of the species *ventricosus* Meek and Hayden as the genotype. It is a very stout shell, without nodes but with numerous relatively fine, sharp ribs, and attains a large size for the group. The writer has studied and described typical examples of the species and believes that the suture, the various stages in the development of the shell, and the adult features ally it closely with *Scaphites aequalis* and that it does not deserve generic rank. (See pl. 10, figs. 1, 2.)

*Jahnites* Hyatt was based on *Scaphites geinitzi* D’Orbigny var. *binodosus* Roemer as elaborated by Jahn, who found it to have a relatively long, bent dorsal lappet, apparently the fundamental character which Hyatt had in mind in establishing the genus. (See pl. 10, fig. 3.) However, a dorsal lappet occurs in species of seemingly distinct derivation, differing in them only in length. The species *ventricosus, warreni, stantoni, nodosus, nicolleti* and some European species show a distinct dorsal lappet, bent much as Jahn’s figures show it, though shorter. The feature is therefore hardly of generic value.

*Yezoites* Yabe was based on scaphites like *S. aequalis* in most characters but possessing an internal suture with a long single-pointed dorsal lobe; a very high, somewhat dissected saddle next to it; and a small second internal lobe and saddle. The species *planus* Yabe was used by Yabe as the chief basis for his discussion and is to be taken as the genotype. (See pl. 10, figs. 4–9.) As Nowak has shown, the distinctive features occur in scaphites that from other characters seem to have had differing derivations, and it is unwise to ignore everything but the internal suture in seeking generic characters.

*Holcoscaphites* Nowak was founded upon *Scaphites aequalis*, which, though not so designated, must be taken as the genotype. It includes chiefly smaller shells with narrow umbilicus; stout whorls; ribs that form a nodose thickening or actual node at the margin of the venter and split into finer ribs on the venter; suture with parts gradually smaller from the median plane of the shell to the line of involution and with bifid lateral lobes in the adult stages derived from trifid embryonic lobes; suture only moderately incised. (See pl. 9, fig. 1.) This generic group certainly appears to be valid, but inasmuch as *Scaphites* Parkinson was previously founded on the same genotype it is not in accord with the usual practice to drop the earlier name, which should rather be restricted to the scope of the later definition. This group should therefore be designated *Scaphites* Parkinson emended. It is interesting to note that this restricted genus has nearly the compass of Meek’s section *a* of *Scaphites* s. s. (See p. 22.)

*Acanthoscoaphites* Nowak, founded on the species *tridens* Kner, includes shells that generally attain a large size for the group, with whorls somewhat higher than wide; ribs straight, with nodose thickening near the umbilicus, intercalated secondary ribs, and in the adults lateral and ventral nodes; suture with long external lobe, long bifid first lateral lobe, and much shorter second lateral and auxiliary lobes; three internal saddles, decreasing regularly from the dorsal lobe to the line of involution; bifid lobes in the adult suture developed from trifid embryonic lobes; suture much incised. (See pl. 11, figs. 1, 2.) This generic group appears to be valid. Meek long ago had set it apart as his sections *b* and *c* of *Scaphites* s. s. (See p. 22.)

*Hoploscaphites* Nowak, founded on the species *constrictus* Sowerby, includes compressed shells with involute whorls, mostly of moderate size for the group; ribs curved, increasing in number by intercalation and by forking; nodes few or numerous on the flanks; suture usually with first lateral lobe longest, external lobe next in length, and second lateral and auxiliaries much shorter; first internal saddle narrow, second wide; suture only moderately incised; bifid lobes in the adult arise from trifid embryonic lobes. (See pl. 9, figs. 8–10.) This group also seems to be valid, but inasmuch as Nowak puts into it all of Meek’s species of *Discoscaphites*, it seems to the writer that Meek’s earlier name has...
precedence. There appears to be no doubt that Nowak is correct in associating the discoscaphites with his Hoploscaphites, and as Frech previously had used the generic name Discoscaphites for the species strictus, the usage of the name for the whole group may be considered established.

Desmoscaphites Reeside, with the species bassleri. Reeside as the genotype, includes moderately large shells with constrictions on the early whorls and with a symmetrically trifid first lateral lobe in the adult suture. It is therefore distinct from the other shells with constrictions on the early whorls and with four apparently valid. These designate four genera, customarily placed in the species divisions and is a valid genus.

The following assignment of species to generic groups is based for the European species largely on the nine names proposed there are, in short, those made by Meek. Whether all the forms customarily placed in the species nodosus Owen belong to Acanthoscaphites may be doubted, but this comprehensive species needs extensive revision before much can be said of it with confidence, and in the meanwhile it may be left as Nowak assigned it. Scaphites: abyssinus, africanus?, angulatus, aquilaeus, aquisgranensis, arnaudi, binodatus, bigny, brahminicus, brahmaus, brachialis, brachiwusten, brevis, bronxensis, brunneus, bufardi, burinii, burtianus, buxus, caduanus, calamus, callis, cancattus, cantatus, capitatus, chapmanius, chapmanii, chipps, choristratus, clarkianus, clarki, clausulatus, claviger, conradi, conradi var. intermedius, conradi var. inornatus, perrini, planus (Roman and Mazeran), pavana, plicatellus, pygmaeus, roemeri (Brauns), spinosissimus, tuberculatus, verrucosus, worthensis?

CATELOGUE OF THE SPECIFIC NAMES APPLIED TO SCAPHITES

The following catalogue of the specific names applied to scaphites includes all that the writer has met in a perusal of the literature at his disposal. For some of the species no generic assignment is given, owing to the facts that the data given in the literature are insufficient and that the writer lacks adequate material on which to base a conclusion.

Synonyms and abandoned names are shown in italics; valid names are shown in heavy-face type.


Scaphites abyssinus, Meek, F. B., and Hayden, F. V., Smithsonian check list, 1860.

Scaphites (Discoscaphites) abyssinus, Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 441, pl. 35, figs. 2, 4, 1876.

Fox Hills sandstone. [Maastrichtian.]

aequalls Sowerby. Scaphites.

Sowerby, James, Mineral conchology of Great Britain, vol. 1, p. 63, pl. 18, figs. 1–3, 1813.

Cenomanian.

aequalls Sowerby var. turonensis Roman and Mazeran.

Scaphites.


Turonian.

africanus (Pervinquière). Discoscaphites?

Scaphites africanus, Pervinquière, Léon, Études de paléontologie tunisienne, pt. 1, Céphalopodes des terrains secondaires p. 123, pl. 4, figs. 34, 35, 1907.


Cenomanian.

aandoensis (Stoliczka) Kossmat.

Ammonites aandoensis, Stoliczka, Ferdinand, Fossil Cephalopoda of the Cretaceous rocks of southern India, Ammonitidae, vol. 1, p. 94, pl. 47, fig. 3, 1865.

Scaphites aandoensis, Kossmat, Franz, Untersuchungen über die südindische Kreideformation: Beitr. Paläon­
tologie Osterr.-Ungarns u. des Orients, vol. 11, p. 139, pl. 17, fig. 3, 1897.

Upper Trinchnopoly [Santonian].
angulatus (Lopuski). *Discoscaphites*.


Maestrichtian.


aqua*laensis* Reeside. *Scaphites*.

Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 25, pl. 18, figs. 15–27; pl. 19, figs. 1–7, 1927.

Lower Campanian.


Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 25, pl. 19, figs. 8–13, 1927.

Lower Campanian.


Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 26, pl. 19, figs. 14–21; pl. 20, figs. 1–6, 1927.

Lower Campanian.

aqua*spirans* (Schlüter) Frech. *Discoscaphites*.

*S*Scaphites* aquaspirannes*, Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 81, pl. 24, figs. 7–9, Cassel, 1871.


Lower Quadratkenkreide [Lower Campanian].

ar*naudi* (De Grossouvre). *Discoscaphites*.


Middle Coniacian.

auritus Schlüter. *Scaphites*.

Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 77, pl. 23, figs. 5–11, Cassel, 1871.

Schlipherfläner. [Turonian.]

aff. auritus Schlüter.

Burckhardt, Carlos, Faunas cretácicas de Zumpango del Río: Inst. geol. México Bol. 33, pp. 95, 96, pl. 22, figs. 5–10, 1919.

Turonian.

auritus Fritzsch and Schloenbach (not Schlüter). See fritzchi *De Grossouvre*.

bas*seri* Reeside. *Desmoscaphites*.

Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 16, pl. 21, figs. 17–21; pl. 22, figs. 8–12, 1927.

Santonian.

binodosus (Roemer). *Discoscaphites*.

*S*Scaphites* binodosus*, Roemer, F. A., Die Versteinerungen des oberen Kreidegebirges, p. 90, pl. 13, fig. 6, 1841.


Upper marl at Dülmen. [Santonian according to Nowak.]

brahminicus (Stoliczka) Kossmat.

*Ammonites brahminicus*, Stoliczka, Ferdinand, Fossil Cephalopoda of the Cretaceous rocks of southern India, Ammonitidae, vol. 1, p. 169, pl. 51, fig. 7, 1865.


Upper Trichinopoly (?) beds. [Coniacian-Santonian?]

cheyennensis (Owen) Meek. *Discoscaphites*.

*Ammonites cheyennensis*, Owen, D. D., Description of new and imperfectly known genera and species of organic remains, collected during the geological surveys of Wisconsin, Iowa, and Minnesota, p. 578, pl. 7, fig. 2, 1852.

*Scaphites cheyennensis*, Meek, F. B., and Hayden, F. V., Smithsonian check list, p. 23, 1864.


Fox Hills. [Maestrichtian.]

compressus D’Orbigny. *Scaphites*.

D’Orbigny, Alcide, Paléontologie française, 1er sér., Terrain crétacé, vol. 1, p. 317, 128, figs. 4, 5, 1841.

Craie chloritée. [Senonian?]

aff. compressus (D’Orbigny) Bonarelli and Nágera.


compressus Roemer (not D’Orbigny). See roemeri D’Orbigny.

compressus Owen. [=*Scaphites nicoleti* (Morton).]

Owen, D. D., Description of new and imperfectly known genera and species of organic remains collected during the geological surveys of Wisconsin, Iowa, and Minnesota, p. 580, pl. 7, fig. 4, 1832.

condoni Anderson. *Scaphites*.


Lower Chico. [Cenomanian.]

condoni Anderson var. *appressus* Anderson. *Scaphites*.


Lower Chico. [Cenomanian.]

condoni (Morton) Meek. *Discoscaphites*.

*Ammonites conradi*, Morton, S. G., Synopsis of the organic remains of the Cretaceous group of the United States, p. 39, pl. 18, figs. 1, 3, 1844.

*Scaphites conradi* D’Orbigny, Prodrome de paléontologie, p. 214, 1856.

Fox Hills sandstone. [Maastrichtian.]

conradi (Morton) var. gulosus Morton. Discoscaphites.
Ammonites conradi var. gulosus, Morton, S. G., Synopsis of the organic remains of the Cretaceous group of the United States, p. 39, pl. 16, fig. 2, 1834.

Scaphites conradi var. gulosus, Gabb, W. M., Synopsis of the Mollusca of the Cretaceous formations, p. 82, 1861.

Scaphites (Discoscaphites) conradi var. gulosus, Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 432, pl. 36, fig. 1, 1876.
Fox Hills sandstone. [Maastrichtian.]

conradi (Morton) var. intermedius Meek. Discoscaphites.
Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 433, pl. 34, fig. 3, 1876.
Fox Hills sandstone. [Maastrichtian.]

conradi (Morton) var. petechialis Morton. Discoscaphites.
Ammonites conradi Morton var. petechialis, Morton, S. G., Synopsis of the organic remains of the Cretaceous group in the United States, p. 39, pl. 16, fig. 1, 1834.


constrictus (Sowerby) Frech. Discoscaphites. Ammonites constrictus, Sowerby, James, Mineral conchology of Great Britain, p. 189, 184 A, fig. 1, 1817.

Scaphites constrictus D'Orbigny, Alcide, Paléontologie française, 1st ser., Terrain crétacé, vol. 1, p. 522, pl. 129, figs. 8–11, 1841.


Maastrichtian.

constrictus (Sowerby) var. erussus Lopuksi. Discoscaphites. Lopuksi, Geslaw, Contribution à l'étude de la faune crétacée du plateau de Lublin: Soc. sci. Varsovie Compl. rend., année 4, pl. 3, p. 134, pl. 2, figs. 5, 6; pl. 3, figs. 1, 2, 1911.
Maastrichtian.

Senonian. [Campanian?]

constrictus (Sowerby) var. tenuistriatus Kner. See tenuistriatus Kner.

constrictus (Sowerby) var. vulgaris Nowak. Discoscaphites. Hoploscaphites constrictus (Sowerby) var. vulgaris, Nowak, Jan, Untersuchungen über die Cephalopoden der oberen Kreide in Polen, pt. 2, Die Skaphiten: Acad. sci. Cracovie Bull. internat., année 1911, sér. B, p. 583, pl. 32, fig. 6; pl. 33, figs. 8–12, 1912.
[Campanian?]
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fritschi De Grossouvre. Scaphites—Continued.
[Turonian?]
geinitzi D’Orbigny. Scaphites.
D’Orbigny, Alcide, Prodrome de paléontologie, p. 214, 1850.
Turonian.
geinitzi D’Orbigny var. binodosus Roemer of Fritsch and Schloenbach (not S. binodosus Roemer). See lamberti De Grossouvre.
geinitzi D’Orbigny var. intermedius Scupin. Scaphites.
Priesenerschichten. [Turonian.]
aff. geinitzi Jahn, not (D’Orbigny) Schlüter. Scaphites.
Turonian.
aff. geinitzi Jahn, not (D’Orbigny) Schlüter. Scaphites.
Burekhardt, Carlos, Faunas cretácicas de Zumpango del Río: Inst. geol. México Bol. 33, p. 96, pl. 22, fig. 12, 1919.
Turonian.
gibbus (Schüller). Discoscaphites.
Scaphites gibbus, Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 87, pl. 26, figs. 6–9, 1871.
Mucronatenkreide. [Maestrichtian.]
gillis Anderson. Scaphites.
Lower Chico. [Cenomanian.]
graellis Yabe. Scaphites.
[Maestrichtian.]
haugi (De Grossouvre). Discoscaphites?
Scaphites haugi, De Grossouvre, Albert, Les ammonites de la croie supérieure: Recherches sur la croie supérieure, pt. 2, Paléontologie, p. 244, pl. 31, fig. 5, 1894.
Middle Campanian.
hilli Adkins and Winton. Scaphites.
Lower beds of Pawpaw formation (upper Washita). [Cenomanian.]
hippecrepis (DeKay) Morton. Scaphites.
Scaphites hippecrepis, Morton, S. G., Synopsis of the organic remains of the Cretaceous group in the United States, p. 41, pl. 7, fig. 1, 1834.
Merchantville clay of New Jersey. [Lower Campanian.]
hippecrepis (DeKay) var. crassus Reeside. Scaphites.
Lower Campanian.
hippecrepis (DeKay) var. pusillus Reeside. Scaphites.
Lower Campanian.
hippecrepis (DeKay) var. tenius Reeside. Scaphites.
Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 23, pl. 16, figs. 11–16, 1927.
Lower Campanian.
hugardianus D’Orbigny. Scaphites.
Upper Gault. [Vraconian.]
?idoneus (Stolizka) Kossmat.
Ammonites idoneus, Stolizka, Ferdinand, Fossil Cephalopoda of the Cretaceous rocks of southern India, Ammonitidae, vol. 1, p. 64, pl. 34, fig. 1, 1865.
Upper Trichinopoly beds. [Santonian?]

Inermis Anderson. Scaphites.
Chico formation. [Cenomanian.]
Inflatus Roemer. Scaphites.
Upper marl at Dülmen. [Lower Campanian according to Nowak.]

Iris (Conrad). Discoscaphites?
[Ripley formation, Campanian or Maestrichtian.]

Kieslingswaldensis Langenhan and Grundey. Scaphites.
Langenhan, Alvin, and Grundey, Max, Das Kieslingswald-Kreidegebirge: Jahresbericht des Glatzer Geologischen Vereins, vol. 10, p. 9, pl. 1, fig. 1, 1891. [Publication not seen.]
Emesicherian-Coniacian.

Kingianus Stolizka. Scaphites.
Stolizka, Ferdinand, Fossil Cephalopoda of the Cretaceous rocks of southern India, Ammonitidae, vol. 1, p. 169, pl. 81, fig. 7, 1865.
Ootator beds. [Cenomanian.]

Klamathensis Anderson. Scaphites.

Klinsdawaldensis Langenhan and Grundey. Scaphites.
Langenhan, Alvin, and Grundey, Max, Das Kieslingswald-Kreidegebirge: Jahresbericht des Glatzer Geologischen Vereins, vol. 10, p. 9, pl. 1, fig. 1, 1891. [Publication not seen.]
Emesicherian-Coniacian.
lamberti De Grossouvre. **Scaphites.**

*Scaphites geinitzi* D’Orbigny var. *binodus* Roemer, Fritsch, Anton, and Schloenbach, Urban, Cephalopoden der böhmischen Kreideformation, p. 43, pl. 14, fig. 13, 1872.

*Scaphites lamberti*, De Grossouvre, Albert, Les ammonites de la craie supérieure: Recherches sur la craie supérieure, pt. 2, Paléontologie, p. 239, pl. 32, figs. 4, 7, 1894.

Lower and middle Campanian.

**larvaeformis** Meek and Hayden (not Frech). **Scaphites.**


Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 418, pl. 6, fig. 6, 1876.

Carilie shale. [Upper Turonian.]

**larvaeformis** Frech (not Meek and Hayden). **Scaphites.**


Lower Campanian.

leel Reeside. **Scaphites.**

Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 26, pl. 20, figs. 17–22; pl. 21, figs. 1–7, 1927.

Lower Campanian.

leel Reeside var. *parvus* Reeside. **Scaphites.**


Lower Campanian.

levis Reeside. **Scaphites.**


Lower Campanian.

**mandonensis** (Morton) Meek. **Discoscaphites.**


Fox Hills sandstone. [Maestrichtian.]

merlani Pictet and Campiche. **Scaphites?**


Upper Greensand [Cenomanian].

meslei De Grossouvre. **Scaphites.**

De Grossouvre, Albert, Les ammonites de la craie supérieure: Recherches sur la craie supérieure, pt. 2, Paléontologie, p. 239, pl. 32, figs. 4, 7, 1894.

Lower and middle Campanian.

**monasteriensis** (Schluter). **Discoscaphites.**

*Scaphites monasteriensis*, Schlüter, Celmens, Cephalopoden der oberen deutschen Kreide, p. 91, pl. 27, figs. 6, 7, 1877.


Mucronatenkreide. [Maestrichtian.]

moreauensis Owen. [= *Discoscaphites cheyennensis* (Owen) Meek.]

Owen, D. D., Description of new and imperfectly known genera and species of organic remains, collected during the geological surveys of Wisconsin, Iowa, and Minnesota, p. 579, pl. 8, fig. 7, 1852.

Fox Hills sandstone. [Maestrichtian.]

**mullananus** (Meek and Hayden) Stanton. **Scaphites.**


[Upper part of Colorado group, Coniacian.]

**multinodosus** Von Hauer (1858, not Von Hauer 1886).


[= *Scaphites constrictus* D’Orbigny according to De Grossouvre, Albert, Les ammonites de la craie supérieure: Recherches sur la craie supérieure, pt. 2, Paléontologie, p. 248, 1894.]

[Maestrichtian?]

**multinodosus** Von Hauer (1860, not Von Hauer 1858).


[= *Scaphites pulcherrimus* Roemer according to De Grossouvre, Albert, Les ammonites de la craie supérieure: Recherches sur la craie supérieure, pt. 2, Paléontologie, p. 251, 1894.]

**nebrascensis** Owen. [= *Discoscaphites conradi* (Morton) Meek.]

Owen, D. D., Description of new and imperfectly known genera and species of organic remains, collected during the geological surveys of Wisconsin, Iowa, and Minnesota, p. 577, pl. 8, fig. 3; pl. 9, fig. 2; 1852.

**nicolleti** (Morton) Meek. **Discoscaphites.**


*Scaphites* (Discoscaphites) nicolleti (Morton), Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 435, pl. 34, figs. 2, 4, 1876.

Fox Hills sandstone. [Maestrichitian?]

**niedzwiedzkii** (Uhlig). *Discoscaphites*.


Senonian. [Maestrichitian?]

**nodosus** (Owen) Nowak (not Lopukhi). *Acanthoscaphites*.

Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 428, pl. 25, figs. 2-4, 1876.


Upper Pierre shale. [Upper Campanian.]

**nodosus** Lopukhi (not Owen). *Discoscaphites*.


**novimexicanus** Reeside. *Desmoscaphites*.

Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 17, pl. 11, figs. 1-4, 1927.

Santonian.

**obliquus** Sowerby. *Scaphites*.

Sowerby, James, Mineral conchology of Great Britain, vol. 1, p. 53, pl. 18, figs. 1, 2, 1813.

Cenomanian.

**ornatissimus** D'Orbigny.

D'Orbigny, Alcide, Prodrome de paléontologie, p. 214, 1850. Senonian [of D'Orbigny].


Lower marl at Lenförd. [Campanian?]


[=*S. constrictus* Sowerby according to Böhm, Johannes, Die Kreidebildung des Furberra und Sulzbergs bei Siegsdorf in Oberbayern: Palaeontographica, vol. 38, p. 48, 1891.]

**pava*na** (Forbes) Kossmat.


[=S. constrictus var. *pana* according to Pervinquière, Léon, Études de paléontologie tunisienne, pt. 1, Céphalopodes des terrains secondaires, p. 124, 1907.]

Valaduayur beds. [Campanian.]

**peroni** Pervinquière. *Scaphites*.


Cenomanian.

**peroni** var. *Inornatus* Pervinquière. *Scaphites*.


Cenomanian.
**pseudoaequalis** Yabe. Scaphites.

**pulcherrimus** (Roemer) Nowak. Acanthoscaphites—Con.


Lower marl. [Upper Campanian.]

**pungens** (Binckhorst). Discoscaphites.

Ammonites pungens, Binckhorst, J. T., Monographie des gastéropodes et des céphalopodes de la craie supérieure du Limbourg, Classe des céphalopodes, p. 32, pl. 5a, figs. 1 a–d, 1861.


Maestrichtian.

**pygmaeus** Holzapfel.


Lower Senonian. [Lower Campanian.]

**quadrispinosus** (Geinitz) Nowak. Acanthoscaphites.

Scaphites quadrispinosus, Geinitz, H. B., Das Quadersandsteingebirge in Deutschland, p. 116, pl. 7, fig. 2; pl. 8, fig. 2, 1850.

Lower Senonian. [Lower Campanian.]

**reesei** (Wade). Acanthoscaphites?

Scaphites reesei, Wade, Bruce, The fauna of the Ripley formation on Coon Creek, Tenn.: U. S. Geol. Survey Prof. Paper 137, pp. 183–184, pl. 61, figs. 3–7, 1926. Ripley formation. [Upper Campanian.]

**reniformis** Morton.


**Scaphites reniformis** Morton, S. G., Synopsis of the organic remains of the Cretaceous group of the United States, p. 42, pl. 2, fig. 6, 1834.

**rochatianus** D’Orbigny. Scaphites.

D’Orbigny, Alcide, Prodrome de paléontologie, p. 147, 1850. Cenomanian.

**roemer** (D’Orbigny) Nowak (not Brauns). Acanthoscaphites.

Scaphites roemer, Roemer, F. A., Versteinerungen des norddeutschen Kreidegebirges, p. 91, pl. 15, fig. 4, 1841.

Scaphites roemeri, D’Orbigny, Alcide, Prodrome de paléontologie, p. 214, 1850.


Upper Campanian.
roemer! Brauns (not D'Orbigny).

*Scaphites* binodatus, Roemer, F. A., Die Quadratenkreide des Sudmerberges bei Goslar: Palaeontographica, vol. 15, p. 197, pl. 32, fig. 9, 1865.

*Scaphites* sp., Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, pl. 23, fig. 23, 1871.

*Scaphites roemeri*, Brauns, A., Über den Sudmerberg bei Oekter: Zeitschr. ges. Naturwiss., 1875, p. 342, pl. 8, figs. 4, 5. [Emeicher. [Coniacian.]

*roguenensis* Anderson. *Scaphites*.


Lower Chico. [Conian.]

*semicostatus* Roemer. *Scaphites*.

Roemer, F. A., Die Kreidebildungen von Texas, p. 35, pl. 1, fig. 5, 1852.

Austin chalk. [Coniacian.]

*septem-costatus* Cragin. *Scaphites*?


Eagle Ford shales. [Turonian.]

*similaris* Stoliczka. *Scaphites*.

*Scaphites aequalis*, Stoliczka, Ferdinand, Fossil Cephalopoda of the Cretaceous rocks of southern India, p. 167, pl. 81, fig. 46, 1895.


Ootatoor. [Cretaceous n.]

*similis* Whitlefield. *Scaphites*.

Whitlefield, R. P., Gastropoda and Cephalopoda of the Redtenbacher. [Upper Campanian.]

*spiniger* (Schlüter) Nowak. *Acanthoscaphites*.

*Scaphites spiniger*, Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 82, pl. 25, figs. 1–7, 1871.


Merchantville clay. [Lower Campanian.]

*spinulosisseus* Frech.


Upper *Muertonius* zone. [Upper Campanian.]

*stantoni* Reeside. *Scaphites*.

Reeside, J. B., jr., The cephalopods of the Eagle sandstone and related formations in the Western Interior of the United States: U. S. Geol. Survey Prof. Paper 151, p. 23, pl. 17, figs. 10–21; pl. 18, figs. 1–7, 1927.

Lower Campanian.

*stephanoceroides* Yabe.


[= *Eozites perrini* according to Yabe, Hisakatsu, Die Scaphiten aus der Oberkreide von Hokkaido: Beitrag Paläontologie Osterr.-Ungarns u. des Orients, vol. 23, p. 172, 1910.]

*striatus* Mantell (not Kner). [= *Scaphites aequalis* Sowerby.]


*striatus* Kner (not Mantell).


[= *Scaphites roemeri* D'Orbigny according to Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 90, 1871.]

[= *Hoploscaphites constrictus* var. *tenuistratis* (Kner) according to Nowak, Jan, Untersuchungen über die Cephalopoden der oberen Kreide in Polen, Teil 2, Die Skaphiten: Acad. sci. Cracovie Bull. internat., année 1911, sér. B, p. 585, 1912.]

Maastrichtian.


*subglobosus* (Whitfield). *Acanthoscaphites*?


Bearpaw shale. [Upper Campanian.]

*tenulocostatus* Pervinquière. *Scaphites*.


Middle Cenomanian.

*tenustratus* (Kner). *Discoscaphites*.


[= *Scaphites constrictus* var. *tenustratus* according to De Grossouvre, Albert, Les ammonites de la craie supérieure: Recherches sur la craie supérieure, pt. 2, Paléontologie, p. 249, 1894.]


[= *Maastrichtian?]

*cf. teshioensis* (Yabe) Bureckhardt.

Bureckhardt, Carlos, Faunas cretácicas de Zumpango del Río: Inst. geol. México Bol. 33, p. 97, pl. 22, fig. 11, 1919.

Turonian.

*texanus* Roemer. *Scaphites*.

Roemer, F. A., Die Kreidebildungen von Texas und ihre organischen Einschlüsse, p. 35, pl. 1, fig. 4, 1852.

Austin chalk. [Emscherian.]

*Mantell (not Kner).
thomas! Pervinquiere. Scaphites.

Pervinquiere, Leon, Etudes de palentologie tunisienne, pt. 1, Cephalopodes des terrains secondaires, p. 121, pl. 4, figs. 30, 31, 1907.

Cenomanian.


Acanthoscaphites tridens (Kner), Nowak, Jan, Untersuchungen über die Cephalopoden der oberen Kreide in Polen, pt. 2, Die Skaphiten: Acad. sci. Cracovie Bull. internat., année 1911, sér. B, p. 570, pl. 32, fig. 4; pl. 33, figs. 27, 29, 1912.

[Upper Campanian.]


[Upper Campanian.]


[Scaphites tridens according to Schlüter, Clemens, Cephalopoden der oberen deutschen Kreide, p. 95, 1871.]


[Upper Campanian.]

trispinosus (Geinitz) Nowak. Acanthoscaphites. Scaphites trispinosus, Geinitz, H. B., Das Quadersandsteingebirge, p. 116, pl. 7, figs. 1 a–b, 1850.


Upper Campanian.


[=Scaphites compressus Roemer (S. roemeri D'Orbigny) according to Frech, Fritz, Uber Scaphites: Centralbl Mineralogie, Jahrg. 1915, No. 18, p. 556, text fig. 14, 1915.]

[Upper Campanian?].


Upper Campanian.


Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 425, pl. 6, figs. 7, 8, 1876.

Upper Colorado formation. [Coniacian.]


Cody shale (Coniacian).


Cody shale (Coniacian).


Cody shale (Coniacian).


vermiculius Shumard.


[=Macroscaphites according to Meek, B. F., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 419, 1876.]


Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 423, pl. 6, fig. 4, 1876.

Upper Colorado formation. [Coniacian.]

vermiciformis Meek and Hayden var. binneyl Reeside. Scaphites. Reeside, J. B., jr., Cephalopods from the lower part of the Cody shale of Oregon Basin, Wyo.: U. S. Geol. Survey Prof. Paper 150, p. 8, pl. 6, figs. 1–8, 1927.

Cody shale. (Coniacian.)
verneuilli (D’Orbigny) De Groot soup. Discoscaphites Ammonites verneuilli, D’Orbigny, Alcide, Palaeontologie française, Terrain crétaçé, Céphalopodes, p. 329, pl. 98, figs. 5-5, 1840.
Upper Campanian.

verrucosus Shumard.
Navarro formation. [Campanian.]

Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 420, pl. 6, fig. 5; text figs. 61-63, 1876.
Canilla shale. [Upper Turonian.]

Scaphites warreni var. silesiaca, Frech, Fritz, Uber Scaphites: Centralbl. Mineralogie, Jahrg. 1915, No. 21, p. 557, figs. 6, 8.
[Upper Campanian.]

wottonensis Adkins and Winton. [Macroscaphites?]
Lower Washita. [Coniacian?]

wyo mingensis Meek. [=S. warreni Meek and Hayden.]
Meek, F. B., Invertebrate Cretaceous and Tertiary fossils of the upper Missouri country: U. S. Geol. Survey Terr. Rept., vol. 9, p. 421, pl. 13, figs. 5-7, 1876.

[Coniacian?]

[Coniacian?]

LIST OF SPECIES ARRANGED BY MAJOR CHRONOLOGIC DIVISIONS

Below is a list of species arranged by major chronologic divisions. A query (?) indicates doubt as to age. Under each division the species in group a are American; those in group b extra-American.

Maestrichtian:
(a) abyssinus, cheyennensis, conradi, conradi var. gulosus, conradi var. intermedius, conradi var. petechialis, ?tria, mandanensis, nicoleti.
(b) angulatus, constictus, constictus var. crassus, constictus var. vulgaris, diversusculus, gibbus, monasteriensis, niedzwiedzkii, nodosus (Lopuski), tenulistratus.

Upper Campanian:
(a) nodosus (Owen), nodosus var. brevis, nodosus var. plenus, nodosus var. quadrangularis, reesidel, subglobosus, verrucosus.
(b) ?compressus, ?constictus var. quiriquinensis, cunliifii, haugi, forntas, pavana, ?patellae, pulcherrimus, quadrispinosus, roemeri (D’Orbigny), spiniger, spinosissimus, tridens, tridens var. bipinjis, trinodosus, trispinosus, tuberculatus, varians, verneuilli.

Lower Campanian:
(a) aquilaensis, aquilaensis var. costatus, aquilaensis var. nanus, hippocrepis, hippocrepis var. crassus, hippocrepis var. pusillus, hippocrepis var. tenulis, leci, leci var. parvus, levis, similis, stantoni.
(b) aquipragnensis, inflatus, mesiei, potieri.

Santonian:
(a) basaleri, novimexicanus.
(b) ?andoorensis, binodosus, ?idoneus.

Coniacian:
(a) mullan anus, semicoatatus, texanus, ventricosus, ventricosus var. depressed, ventricosus var. interjectus, ventricosus var. oregonensis, ventricosus var. stantoni, vermiciformis, vermiciformis var. binneyi.
(b) arnaudi, ?bralunicus, kieslingswaldensis, lamberti, roemeri (Brauns).

Turonian:
(a) larvaliformis, septemcostatus, warreni.
(b) aequulis var. tenuicostatus, ?fritschi, geinitzi, ?ornatus, pavana, ?plicatellus, pulcherrimus, sussimus, tridens, tridens var. bispinosus, trinodosus, trispinosus, tuberculatus, varians, verneuilli.

Coniacian:
(a) condoni, condoni var. appressus, gillisi, hilli, inermis, klamathensis, perini, rogersis.
(b) aequulis, africanus, evolutus, formosus, graecilis, kingi­anus, obliquus, peroni, peroni var. inornatus, planus (Yabe), planus var. gigas, pseudosequellus, puerceulis, puerceulis var. teshioensis, rochatianus, similis, tenuicostatus, thomasi, yonekurai, yokoyamai.

Upper Gault:
(b) hugardianus.
PLATES 9–11
FIGURE 1. *Scaphites aequalis* Sowerby, from Podzameczek, Poland; three sutures, after Nowak, Acad. sci. Cracovie Bull. internat., année 1911, sér. B, text fig. 6, p. 568, 1912. Referred by Nowak to *Holoscaphtes* 24, 26

FIGURES 2-4. *Discoscaphites conradi* (Morton) Meek, from top of Pierre shale on Beaver Creek, 1 mile south of Linton, N. Dak.; side and peripheral views and suture 24, 26

FIGURES 5-7. *Discoscaphites nicolleti* (Morton) Meek, from top of Pierre shale half a mile north of Linton, N. Dak.; side and peripheral views and suture 24, 26

FIGURE 8. *Discoscaphites constrictus* (Sowerby) Frech var. *vulgaris* Nowak, from Lemberg, Poland; side view, after Nowak, op. cit., pl. 33, fig. 10, 1912. Referred by Nowak to *Hoploscaphtes* 24, 26

FIGURE 9. *Discoscaphites constrictus* (Sowerby) Frech var. *tenuistriatus* Kner, from Lemberg, Poland; side view, after Nowak, op. cit., pl. 33, fig. 14, 1912. Referred by Nowak to *Hoploscaphtes* 24, 26

FIGURE 10. *Discoscaphites constrictus* (Sowerby) Frech; two sutures, enlarged, after Nowak, op. cit., text figs. 15, 16, p. 581, 1912. Referred by Nowak to *Hoploscaphtes* 24, 26
FIGURES ILLUSTRATING THE GENERA OF THE SCAPHITES
FIGURES ILLUSTRATING THE GENERA OF THE SCAPHITES
PLATE 10

FIGURE 1. Scaphites ventricosus Meek and Hayden, from upper part of Colorado formation at Chippewa Point, near Fort Benton, Mont.; side view, after Meek, U. S. Geol. Survey Terr. Rept., vol. 9, pl. 6, fig. 7b, 1876. Hyatt's type of Anasaphites. 22, 26

FIGURE 2. Scaphites ventricosus Meek and Hayden, from Cody shale in sec. 6, T. 51 N., R. 100 W., Wyo.; suture of a typical specimen. 22, 26

FIGURE 3. Scaphites geinitzi D'Orbigny var. binodosus Roemer, from Priesen, near Laun, Bohemia; side view, after Jahn, K.-k. geol. Reichsanstalt Jahrb., vol. 41, text fig. 3, p. 181, 1892. Hyatt's type of Jahnites. 22, 26

FIGURES 4, 5. Scaphites planus Yabe, from vicinity of Opirauishibets, Province of Teshio, Hokkaido, Japan; side and peripheral views, after Yabe, Beitr. Paläontologie Oesterr.-Ungarn u. des Orients, vol. 23, pl. 15, figs. 15a,b, 1910. Referred to Yezoites by Yabe. 23, 26

FIGURES 6, 7. Scaphites planus Yabe, from same locality as Figures 4 and 5; dorsal and ventral sutures, after Yabe, op. cit., pl. 15, figs. 17, 18, 1910. Referred to Yezoites by Yabe. 23, 26

FIGURE 8. Scaphites puerculus Jimbo, from same locality as Figures 4 and 5; dorsal suture with part of ventral suture, after Yabe, op. cit., pl. 15, fig. 22, 1910. Referred to Yezoites by Yabe. 23, 26

FIGURE 9. Scaphites sp., from Lenentz, Laun, Bohemia; dorsal suture, after Yabe, op. cit., pl. 15, fig. 30, 1910. Referred to Yezoites by Yabe. 23, 26

FIGURES 10–12. Desmoscaphites bassleri Reeside, from the Telegraph Creek formation in sec. 27, T. 1 S., R. 30 E., Mont.; side view and suture of adult and side view of early whorls. 25, 27

FIGURES 13, 14. Scaphites aequalis Sowerby; from the Greensand of Yeovil, England; side and peripheral views of the type specimen, after Sowerby, Mineral conchology of Great Britain, pl. 18, figs. 1, 2, 1813. 21, 26

FIGURE 15. Scaphites aequalis Sowerby, from Dorsetshire, England; side view of the genotype specimen, Scaphites of Parkinson; after Parkinson Organic remains of a former world, pl. 10, fig. 10, 1811. 21, 27
PLATE 11

Figure 1. *Acanthoscaphites tridens* (Kner) Nowak, var. *trispinosus* Geinitz, from Porszna, Poland; side view, after Nowak, Acad. sci. Cracovie Bull. internat., année 1911, sér. B, pl. 32, fig. 5, 1912.------------------------- 24, 27

Figure 2. *Acanthoscaphites tridens-trinodosus* (Kner) Nowak, from Kierniczki, Poland; two sutures, after Nowak, op. cit., text figs. 8, 9, p. 572, 1912.--------------------------------- 24, 27
FIGURES ILLUSTRATING THE GENERA OF THE SCAPHITES