

THE VALANGINIAN *DOBRODGEICERAS* NIKOLOV [AMMONITINA]  
FROM PERU

A. C. RICCARDI AND G. E. G. WESTERMANN  
McMaster University, Hamilton, Ontario, Canada

**ABSTRACT**—The literature on *Dobrodgeiceras* is reviewed and the known Peruvian specimens are re-examined. "*Sphaeroceras Broggianus*" Lissón, 1937, with which *D. benavidesi* Nikolov, 1965, is synonymized tentatively, is not a Bajocian sphaeroceratid as previously believed and is placed in the Valanginian genus *Dobrodgeiceras*. The Peruvian species resembles *D. wilfridi* (Karakasch) from Bulgaria and France in the absence or presence of ventral tubercles on the adult body chamber; these tubercles are therefore not regarded as taxonomically significant.

INTRODUCTION

THE olcostephanid genus *Dobrogeites* Nikolov, 1962 (p. 69), was based on the type species *D. ventrotuberculatus* Nikolov from the Upper Valanginian of Bulgaria and later renamed *Dobrodgeiceras* Nikolov, 1963 (p. 94), because of homonymy with *Dobrogeites* Kittl, 1908. The genus was discriminated from *Valanginites* Kilian, 1910, mainly by the presence of ventral tubercles and prominent primaries (Nikolov, 1962, p. 69-70).

Nikolov in 1962 (p. 69, 71) placed the Peruvian holotype and hypotypes of "*Sphaeroceras Broggianus*" Lissón, 1937, in *Dobrodgeiceras*. Later (1965, p. 1153), however, he identified the holotype with Bajocian sphaeroceratids and assigned "*Valanginites broggii*" of Benavides-Cáceres (1956, p. 437) to *Dobrodgeiceras benavidesi*, sp. nov. [Olcostephanidae].

Recently, Thieuloy and Gazay (1967) described a single species of adult *Dobrodgeiceras* from France in which they recognized groups of specimens which lacked ventral tubercles as well as those possessing one or several ventral tubercles. Those without tubercles were identified with *Valanginites* (?) *wilfridi* (Karakasch) while those with tubercles were identified with *Dobrodgeiceras ventrotuberculatum* (Nikolov). Both were classified as subspecies of *D. wilfridi*. *Dobrodgeiceras* was discriminated from *Valanginites* mainly by lateral ornamentation.

We have re-examined all available Peruvian material and confidently reclassify "*Sphaeroceras Broggianus*" Lissón.

ACKNOWLEDGEMENTS

We thank I. Corrales of Sección Paleontológica, Museo Geológico, Escuela de Ingenieros [OI], Lima, for the holotype of "*Sphaeroceras Broggianus*" Lissón, R. L. Batten of the American Museum of Natural History [AMNH],

New York, for the specimens of "*Valanginites broggii*" of Benavides-Cáceres (= *Dobrodgeiceras benavidesi* Nikolov), and A. Pardo of the Carta Geológica Nacional [CGN], Lima, for an additional specimen of *D. broggianum*. This work was carried out during tenure of a fellowship given to A. C. Riccardi by the Consejo Nacional de Investigaciones Científicas y Técnicas de la República Argentina.

SYSTEMATIC PALEONTOLOGY

Family OLCOSTEPHANIDAE Haug, 1910

Subfamily POLYPTYCHITINAE Spath, 1924

Genus DOBRODGEICERAS Nikolov, 1963

[= *Dobrogeites* Nikolov, 1962, non Kittl, 1908]

*Type species*—by original designation *Dobrogeites ventrotuberculatus* Nikolov, 1962; Upper Valanginian, southern Dobrogea, Bulgaria.

DOBRODGEICERAS BROGGIANUM (Lissón, 1937)

Pl. 127, figs. 1-5

1937. *Sphaeroceras Broggianus* nov. sp., Lissón, Rev. Cienc. Lima, 422, p. 153, pl. 1, figs. 1-2.

1942. *Sphaeroceras Broggianus* Lissón, Lissón and Boit, Edad Fósiles Peruanos, p. 61 (reference to holotype).

?1956. *Valanginites broggii* (Lissón), Benavides-Cáceres, Bull. Am. Mus. Nat. Hist., 108, p. 437, pl. 40, figs. 10-12.

1962. *Dobrogeites broggi* (Lissón), Nikolov, Comp. Rend. Acad. Bulg. Sci., 15, p. 71.

?1965. *Dobrodgeiceras benavidesi* sp. nov., Nikolov, ibid., 18, p. 1154, figs. 1a-d (for *V. broggii* of Benavides-Cáceres, 1956).

*The Peruvian Material*.—The holotype of "*Sphaeroceras Broggianus*" Lissón (monotypy; here pl. 127, fig. 1): complete shell except for peristome, phragmocone somewhat deformed, internal mold of black argillite with part of the test; 5 km from Huaylas on road to Mato, Province of Huaylas, Peru. Deposited in the Museo Geológico, Escuela de Ingenieros (EI), Lima, catalogue No. 42076 (43201).

A small (34.6 mm D) adult sphaerocone with quasi-obvolute phragmocone and elliptically

coiled body chamber. The exposed end of the phragmocone is strongly depressed ovate with rounded umbilical margin. The body chamber, over three-quarters whorl in length, egresses strongly at the umbilical seam; both whorl width and height grow at decelerating rates, the section becoming somewhat higher, but there is no marked "contraction." The preserved end is marked by an oblique constriction along which the peristome has broken away. The ornamentation of the last whorl consists of 18 primary costae (P) commencing on the umbilical margin; they strengthen and lengthen rapidly on the body chamber, become somewhat rursiradate and rise evenly up to the blunt ventro-lateral tubercles, which on the last one-half whorl are located far beyond the maximal whorl width. The secondaries (S) are borne from the tubercles and sometimes by intercalation, in twos and threes, and pass straight, in full strength over the venter; they become somewhat more widely spaced on the last one-quarter whorl, approximately coinciding with a marked rib irregularity which could be due to injury (pl. 127, fig. 1d).

The first of the three exposed septal sutures (text-fig. 1) resembles those of other Olcostephanidae except for its simplicity. The suture is even less complex than in *Valanginites* which according to Tzankov (1943, p. 202) has the simplest suture of the family (cf. *V. simplus* d'Orbigny, 1840-42, pl. 60, fig. 9; *V. nucleus* v. Koenen, 1902, pl. IV, fig. 7 and in Drużczic, 1960, fig. 76).

One "quasi-topotype" (pl. 127, fig. 2): complete internal mold with peristome, brownish (argillaceous?) limestone; Lower Cretaceous Carhuaz Formation, near Huaylas, Los Hornos, on road to Caraz, Peru; collected by R. Rivera, 1948, and deposited in the collections of Carta Geológica Nacional (CGN), Lima, catalogue No. SGM-210.

The specimen closely resembles the holotype described above, differing only as follows: the body chamber contracts markedly, particularly in width, resulting in flatter flanks, a narrower external side and a less globular adult shell; elongation and tuberculation of the primaries commences somewhat later, although at a similar diameter of the slightly smaller conch; the secondaries are slightly weaker; there is a prominent single ventral tubercle coinciding with convergence of secondaries at one-quarter whorl before the aperture and corresponding in position to the rib irregularity of the holotype. The aperture consists of a prominent oblique peristomal constriction separated from the shell by a sinuous rim which projects ventrally in a broad



TEXT-FIG. 1—Septal suture of *Dobrodgeiceras broggianum* (Lissón), holotype, at approximately 20 mm diameter.

horn-like flange. The holotype and two topotypes of "*Dobrodgeiceras benavidesi*" Nikolov (here pl. 127, figs. 3-5); the holotype has a damaged, almost complete body chamber while the topotypes have fragmentary body chambers; all are internal brown calcareous molds. From the base ("Upper Valanginian") of the Lower Cretaceous Carhuaz Formation, Cerro Huallhua, 4 km N.W. of Carhuaz (approximately 50 km S.E. of Huaylas), Province of Huaylas, Peru. Deposited in the American Museum of Natural History [AMNH], New York, catalogue No. 27386:1 to 3.

The specimens were described by Benavides-Cáceres (1956, p. 437) and Nikolov (1965, p. 1154). All specimens are adult. The holotype and one of the two topotypes (pl. 127, figs. 3-4) are much smaller than specimens (1) and (2) described above (23.5 and 19 mm D) and bear respectively one and two ventral tubercles toward the end of the body chambers; the other topotype (pl. 127, fig. 5), one-half whorl body chamber fragment with crushed end of phragmocone, is larger (30-32 mm D) resembling specimens (1) and (2), but the shell portion corresponding to the position of the ventral tubercles in the other specimens is missing. All three specimens are closer to (2) than to (1) with regard to relative dimensions and ornamentation of the body chamber.

*Discussion.*—Thieuloy and Gazay (1967, p. 76-77) pointed out that although the holotype of *Ammonites nucleus* (Phillips) A. Roemer, 1840 (p. 87), type species of *Valanginites* Kilian, 1910 (cf. Spath, 1939, footnote p. 11), appears to have smooth inner flanks, umbilical swellings or bullae are known from other specimens attributed to this species (Struckmann, 1892, p. 73; von Koenen, 1902, p. 142; also cf. Karakasch, 1902, p. 104, 1907, p. 125; Drużczic, 1960, p. 272). Umbilical bullae are also present in *V. tijeirensis* Imlay (1937, p. 562), *V. angusticoronatus* Imlay (1938, p. 557) and *V. dolioliformis* Roch (1930, p. 314), but appear to be missing in *V. simplus* (d'Orbigny, 1840-42, p. 208) and *V. utriculus* (Matheron, 1878-80, pl.

TABLE 1—Measurements of *Dobrodgeiceras broggianum*. D, diameter in mm; U, umbilical width in mm; H, whorl height in mm; W, whorl width in mm; P, primaries per whorl; S, secondaries per whorl.

| Specimen  | Growth Stage    | D    | U   | H     | W     | H/W  | P   | S   |
|---|-----------------|------|-----|-------|-------|------|-----|-----|
| EI 42076<br><i>D. broggianum</i> ,<br>holotype) | body chamber    | 34.6 | 4.5 | 16    | 25    | .64  | 18  | 52  |
|   | body chamber    | 26   | 1-2 | 14    | 23    | .6   | —   | —   |
|   | body chamber    | ~22  | —   | 12    | 20    | .6   | —   | —   |
| AMNH27386:1<br>("D. benavidesi,"<br>holotype)   | body chamber    | 23.5 | 2.5 | 11    | 17-18 | ~.62 | —   | —   |
|   | body chamber    | 18.5 | —   | 10    | 18.5  | .54  | —   | —   |
| AMNH27386:2                                     | body chamber    | 19   | 3   | 9     | 14    | .64  | —   | ~50 |
| AMNH27386:3                                     | body chamber    | ~30  | 4   | ~14   | 22    | .63  | —   | ~55 |
| CGN SGM-210                                     | aperture        | 31.6 | 6.1 | 12.7  | 20    | ~.63 | ~15 | 55  |
|   | body chamber    | 25   | 1-2 | 12.0  | 22.5  | .53  | —   | —   |
|   | end phragmocone | ~20  | —   | ~10.5 | 20    | ~.52 | —   | —   |

B-20), the latter a possible synonym of *V. nucleus* (von Koenen, 1902, p. 142; Kilian, 1910, p. 215; Roch, 1930, p. 314; Tzankov, 1943, p. 200; Thieuloy and Gazay, 1967, p. 77).

In contrast, in *Dobrodgeiceras ventrotuberculatum* (Nikolov, 1962, p. 70), type species and probable synonym of *D. wilfridi* (Karakasch, 1902, p. 106), prominent primaries extend from the umbilical margin to the upper flanks where they bear ventro-lateral tubercles. This tubercle position, correctly referred to as ventro-lateral by Benavides-Cáceres (1956, p. 438) and Nikolov (1962, p. 71; 1965, p. 1155), was described as lateral as well as periumbilical by Thieuloy and Gazay (1967, p. 77), respectively in the genus diagnosis and in the comparison of *Dobrodgeiceras wilfridi* with *Valanginites* spp.

From the above description and discussion, it is evident that "*Sphaeroceras Broggianus*" Lissón and "*Valanginites broggii*" of Benavides-Cáceres (= *Dobrodgeiceras benavidesi* Nikolov) are closely related or identical and that both belong in *Dobrodgeiceras* Nikolov. However, Nikolov (1965, p. 1153) separated the two forms because of (1) the presence of a ventral tubercle, (2) alleged much thicker primary ribs and (3) finer secondaries in the latter. He then placed the holotype of "*S.*" *broggianum* in the Bajocian sphaeroceratids and Benavides-Cáceres' specimens, as *D. benavidesi* n. sp., in *Dobrodgeiceras*. Any resemblances between them were brushed aside as "purely a matter of homeomorphy . . . a well known phenomenon within Mesozoic ammonites". In fact, no Sphaeroceratinae or Otoitinae (both of the family Otoitidae) are known to bear extended primaries with ventro-lateral tubercles. The closest homeomorphy is probably *Frogdenites*

Buckman (questionably a subgenus of *Labyrinthoceras* Buckman) to which Arkell (1953, p. 335; in Arkell and Playford, 1954, p. 591) had in fact assigned "*Sphaeroceras*" *broggianum* Lissón. However, *Frogdenites*, like the other involute Otoitidae, has a much more complex septal suture. Furthermore, Lissón's holotype and only specimen was collected in an area of extensive outcrop of the Lower Cretaceous Chimú and Santa-Carhuaz Formations where the Jurassic is regionally represented only by Tithonian probably disconformably overlying Sinemurian beds (Wilson et al., 1967).

From the re-examination of the Peruvian material and in consideration of the recent investigation (Thieuloy and Gazay, 1967) on French *Dobrodgeiceras wilfridi* (Karakasch), it appears that (1) the presence or absence of ventral tubercles varies within a paleo-population, (2) the holotype of "*S.*" *broggianum* has no weaker primaries than "*D. benavidesi*," and (3) the greater strength of the secondaries in the holotype of "*S.*" *broggianum* could be related to its relatively large size. Nikolov's supposed differences are therefore considered to be of no taxonomic significance. Furthermore, the difference in adult diameter between the holotypes (34.6 vs. 23.5 mm) does not seem to be significant since clear size segregation is absent within the Peruvian material, and the total size range (19 to 34.6 mm) is smaller than that of a single French sample of *D. wilfridi* (26 to 51 mm).

The classification at the subspecies level of groups "A" and "B" of *Dobrodgeiceras wilfridi* (Karakasch) by Thieuloy and Gazay (1967) based on presence or absence of ventral tuberculation (tubercle frequency 0 to 8) in a sample from the Basses Alpes, France, does not seem

appropriate; the use of the subspecies category in paleontology is usually confined to stratigraphically or geographically distinct taxa, while the French sample was regarded as being derived from a single population which included the intermediate group "C" at a somewhat larger frequency than "B" (N of "A" = 11; N of "B" = 2; N of "C" = 3). The interpretation of this variation as genetic polymorphism is probably correct, but the argument against sexual dimorphism, *i.e.* that it is unknown in related species, is weak; dimorphism of the common macroconch-microconch type, the microconch bearing lappets, certainly occurs in other Olcostephanidae. The restricted presence of ventral tubercles on the adult body chamber is reminiscent of the recently described dimorphism in the perisphinctid *Pectinatites* in which the microconch (male) bears "horns" (Cope, 1967, p. 15). However, the "horns" of *Pectinatites* differ from the tubercles of *Dobrodgeiceras* in which, furthermore, marked size dimorphism is missing; yet a new type of sexual dimorphism, recently described from *Scaphites* (Cobban, 1969, p. 8), excludes size segregation. The possibility that a hitherto unknown type of sexual dimorphism, expressed in the absence or presence of ventral tubercles on the adult body chamber, existed in *Dobrodgeiceras* remains remote; any more precise statement has to be based on large new samples.

The Peruvian *Dobrodgeiceras broggianum* and the probably synonymous *D. benavidesi* resemble the European *D. wilfridi* (Karakasch), particularly group "C" of Thieuloy and Gazay (1967, p. 75), but differ in the more widely spaced and more prominent secondaries (approximately 50–55 vs. 61–80 per whorl).

## REFERENCES

- Arkell, W. J. 1953. Bajocian ammonites collected by Sir Henry Hayden near Kampadzong, Tibet. *Geol. Mag.* 90:331–336; pl. XIII–XIV.
- Arkell, W. J. and P. E. Playford, 1954. The Bajocian ammonites of western Australia. *Roy. Soc. London, Phil. Trans., B*, No. 651, v. 237:547–605, pl. 27–40.
- Benavides-Cáceres, V. E. 1956. Cretaceous System in northern Peru. *Am. Mus. Nat. Hist., Bull.* 108: 353–494, pl. 31–66.
- Cobban, W. A. 1969. The Late Cretaceous ammonites *Scaphites leei* Reeside and *Scaphites hippocrepis* (DeKay) in the western interior of the United States. *U. S. Geol. Surv., Prof. Pap.* 619:1–29, pl. 1–5.
- Cope, J. C. W. 1967. The palaeontology and stratigraphy of the lower part of the upper Kimmeridge Clay of Dorset. *Brit. Mus. Nat. Hist., Geol. Bull.* 15 (1):1–79, pl. 1–33.
- Drużczic, V. V. 1960. Ammonoidea, Part I, p. 249–308, pl. I–XLVII. *In* Drużczic, V. V. and M. P. Kudrjavcev (Eds.). *Atlas of Lower Cretaceous Faunas of the Northern Caucasus and Crimea* [in Russian]. Soviet Sci. Invest. Nat. Gas, Moscow.
- Imlay, R. W. 1937. Lower Neocomian fossils from the Miquihuana region, Mexico. *J. Paleont.* 11: 552–574, pl. 70–83.
- . 1938. Ammonites of the Taraises Formation of northern Mexico. *Geol. Soc. Amer., Bull.* 49:539–602, 15 pl.
- Karakasch, M. 1902. Note sur le Crétacé Inférieur de Biassala (Crimée). *Lab. Géol. Fac. Sci. Univ. Grenoble, Trav.* 6 (1):93–107, 1 pl.
- . 1907. Le Crétacé inférieur de la Crimée et sa faune [in Russian, summary in French]. *Soc. Imp. St. Pétersbourg, Trav.* 32:1–482, pl. I–XXVIII.
- Kilian, W. 1910. Unterkreide (Palaeocretacicum), p. 169–287, pl. 1–8. *In* Frech, F. *Lethaea Geognostica; II, Mesozoicum; vol. 3, Kreide.*
- Kittl, E. 1908. Beiträge zur Kenntnis der Triasbildungen der Nordöstlichen Dobrudscha. *Kais. Akad. Wiss. (Wien), Denkschr.* 81:522.
- Koenen, A. v. 1902. Die Ammonitiden des Norddeutschen Neocom (Valanginien, Hauterivien, Barremien und Aptien). *Kön. Preuss. Geol. Landesanst. Bergak., Abhandl., N. F.* 24:1–451, pl. 55.
- Lissón, C. I. 1937. Género *Sphaeroceras* Bayle, *Sphaeroceras broggianum* nov. sp. *Rev. Ciencias Lima* 422:153–155, 1 pl.
- and B. Boit. 1942. Edad de los fósiles Peruanos y distribución de sus depósitos (4 cd.). Lima, p. 1–320, 1 map.
- Matheron, Ph. 1878–80. *Recherches Paléontologiques dans le Midi de la France.* Marseille, 12 pl.
- Nikolov, T. 1962. *Dobrogeites*, a new genus of Valanginian ammonites. *Acad. Bulg. Sci., Compt. Rend.* 15:69–71, 3 fig.
- . 1963. New name for a Valanginian Ammonite genus. *Geol. Mag.* 100 (1):94.
- . 1965. A new Valanginian Ammonite (*Dobrodgeiceras benavidesi* sp. nov.) from Peru. *Acad. Bulg. Sci., Compt. Rend.* 18:1153–1155, fig. la-d.
- Orbigny, A. d'. 1840–42. *Paléontologie française; Terrains Crétacés; I, Céphalopodes.* Paris, p. 1–662, 148 pl.
- Phillips, J. 1829. *Illustrations of the geology of Yorkshire; or a description of the strata and organic remains; Part I, The Yorkshire Coast.* London (3. ed., 1875), p. 1–354, 1 map, 28 pl.
- Roch, E. 1930. *Études Géologiques dans la Région Méridionale du Maroc Occidental.* Serv. Carte Géol. Maroc, Notes et Mém. 9:7–541, pl. 1–26, 1 map.
- Roemer, F. A. 1840. *Die Versteinerungen des Norddeutschen Kreidegebirges.* Hannover, p. 1–136, pl. 16.
- Spath, L. F. 1939. The Cephalopoda of the Neocomian belemnite beds of the Salt Range. *Geol. Surv. India Mem., Palaeont. Indica, N. S.* 25:1–154, pl. I–XXV.
- Struckmann, C. 1892. *Die Grenzschichten zwischen Hilsthon und Wealden bei Barsinghausen am Deister.* Kön. Preuss. Geol. Landesanst. Bergakad., *Jahrb.* 2:55–79, pl. XI–XIII.
- Thieuloy, J.-P. and M. Gazay, 1967. Le genre *Dobrodgeiceras* Nikolov en Haute Provence. *Fac. Sci. Lyon I.ab. Géol., Trav., N. S.* 14:69–78, pl. 16.
- Tzankov, V. 1943. Contribution à l'étude du genre *Holcostephanus* Neumayr 1875 [in Bulgarian, Summary in French]. *Bulg. Geol. Soc., Rev.* 14: 167–206, pl. I–X.

Wilson, J., L. Reyes and J. Garayar. 1967. Geología de los Cuadrángulos de Mollebamba, Tayabamba, Huaylas, Pomabamba, Carhuaz y Huari. Serv. Geol. Min. Peru, Bol. 16:1-95, 4 pl. 1 geol. map.

MANUSCRIPT RECEIVED DECEMBER 19, 1969

McMaster University contributed \$110.00 toward the publication of this paper.

---

EXPLANATION OF PLATE 127

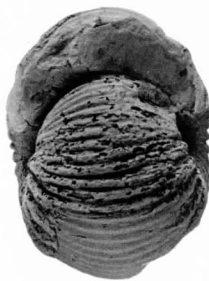
- FIGS. 1a-d—*Dobrodgeiceras broggianum* (Lissón), Holotype, EI 42076 (43201), near Huaylas, Peru; a-b, lateral views; c, apertural view, d, ventral view,  $\times 1$ .
- 2-5—*Dobrodgeiceras* cf. *D. broggianum* (Lissón) (= *D. benavidesi* Nikolov). 2a-e, CGN, SGM-210, "quasi-topotype"; a-b, lateral views; c, apertural view; d-e, ventral views  $\times 1$ ; 3a-c, "*D. benavidesi*" Nikolov, Holotype, AMNH27386:1, "Upper Valanginian" near Carhuaz, Peru; a-b, lateral views; c, ventral view  $\times 1.5$ ; 4a-b, "*D. benavidesi*," topotype, AMNH27386:2; a, lateral view; b, ventral view  $\times 1.5$ ; 5a-b, "*D. benavidesi*," topotype, AMNH27386:3; a, ventral view; b, lateral view;  $\times 1$ .



1a



1b



1c



1d



2a



2b



2c



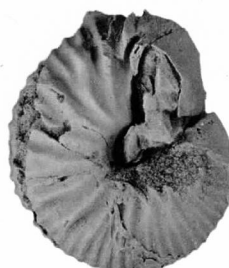
2d



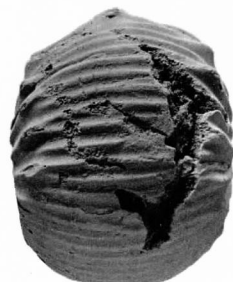
2e



3a



3b



3c



4a



4b



5a



5b