

Karakaschiceras and the Late Valanginian of Northern Mexico and Texas

(*Karakaschiceras* und das Obere Valangin von N-Mexico und Texas)

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With 1 Plate and 1 Text Figure

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Abstract: The occurrence at the same stratigraphic level, and often in the same bed, of *Olcostephanus* sp. cf. *baini* (Sharpe), *O.* sp. cf. *atherstoni* (Sharpe), *Bochianites* sp. cf. *thieuloidis* Cantu Chapa, *Acanthodiscus* sp. cf. *magnificus* Imlay, and *Karakaschiceras biassalense* (Karakasch) identifies the Late Valanginian in northern Mexico. *K. biassalense* and *Bochianites* sp. cf. *thieuloidis* occur together in the same bed at Sierra Minas Viejas, Nuevo León, Mexico. *O.* sp. cf. *baini*, *O.* sp. cf. *atherstoni*, *A.* sp. cf. *magnificus*, and *K. biassalense* occur in the same bed in the Sierra Gomas, western Nuevo León. Other occurrences of similar species of *Olcostephanus*, *Karakaschiceras*, and of species of *Bochianites* of the group of *B. neocomiensis* (d'Orbigny) identify Late Valanginian rather than Early Hauterivian.

Kurzfassung: Im nördlichen Mexico finden sich *Olcostephanus* sp. cf. *baini* (Sharpe), *O.* sp. cf. *atherstoni* (Sharpe), *Bochianites* sp. cf. *thieuloidis* Cantu Chapa, *Acanthodiscus* sp. cf. *magnificus* Imlay und *Karakaschiceras biassalense* (Karakasch) im gleichen stratigraphischen Niveau, oft in derselben Schicht, die dann als spätes Valangin zu betrachten ist. *K. biassalense* und *Bochianites* sp. cf. *thieuloidis* wurden in der gleichen Bank im Bereich der Sierra Minas Viejas, Nuevo León (Mexico) gesammelt. *O.* sp. cf. *baini*, *O.* sp. cf. *atherstoni*, *A.* sp. cf. *magnificus* und *K. biassalense* stammen wiederum aus einer Fundschicht der Sierra Gomas, W'Nuevo León. Die sonst bekannten Fundpunkte dieser Arten bzw. von *Bochianites* der *B. neocomiensis*-Gruppe gehören eher dem späten Valangin als tieferem Hauterive an.

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Introduction

Some of the rocks referred to as Lower Hauterivian for the past almost fifty years in northern Mexico and the subsurface of Texas are Late Valanginian. Cooper (1981) suggested this on the basis of the *olcostephanids*. Cantu Chapa (1976), studying fossils from the subsurface of eastern Mexico, thought *Bochianites thieuloidis* to be Late Valanginian.

In many parts of the world the occurrence of *Olcostephanus atherstoni* (Sharpe 1856) and/or *O. baini* (Sharpe 1856) or even species of *Olcostephanus* similar to those two species indicate Late Valanginian (Cooper 1981). If *Bochianites neo-*

comiensis (d'Orbigny) or similar forms, or even *B. oosteri* Sarasin & Schöndelmayer occur with these distinctive olcostephanids, the probability of Late Valanginian is enhanced.

When Thieuloy (1971) renamed certain "leopoldoids" *Karakaschiceras* because their juveniles were more coarsely costate and the venters were greatly different from the venter of *Leopoldia leopoldina* (d'Orbigny), and because they were of a different derivation and lineage from *Leopoldia leopoldina*, he also demonstrated that *Karakaschiceras* was Late Valanginian and *Leopoldia* was Early Hauterivian.

New localities for Late Valanginian in northern Mexico

The author has never been a real proponent of the concept of adhering rigidly to the zonation of stratotypes. However, the refinement of ranges of ammonites and the resulting rezonation of the stratotypes of the Malm and Neocomian in the French Tethyan have been of great value and have made the further refinement of the stratigraphy of northern Mexico and the subsurface of Mexico and adjacent Texas possible.

Localities in Mexico at which Late Valanginian fossils have not been previously recorded include Samalayuca, Chihuahua; sierra Minas Viejas, Nuevo León; and Sierra Gomas, western Nuevo León. In the lower part of the Taraises Formation, Sierra Minas Viejas, Nuevo León (Text Fig. 1), occur *Karakaschiceras biassalense* (Karakasch), *Bochianites* sp. cf. *thieuloidis* Cantu Chapa, and *Acanthodiscus* sp. cf. *magnificus* Imlay. *Acanthodiscus magnificus* Imlay was also found there, but as float.

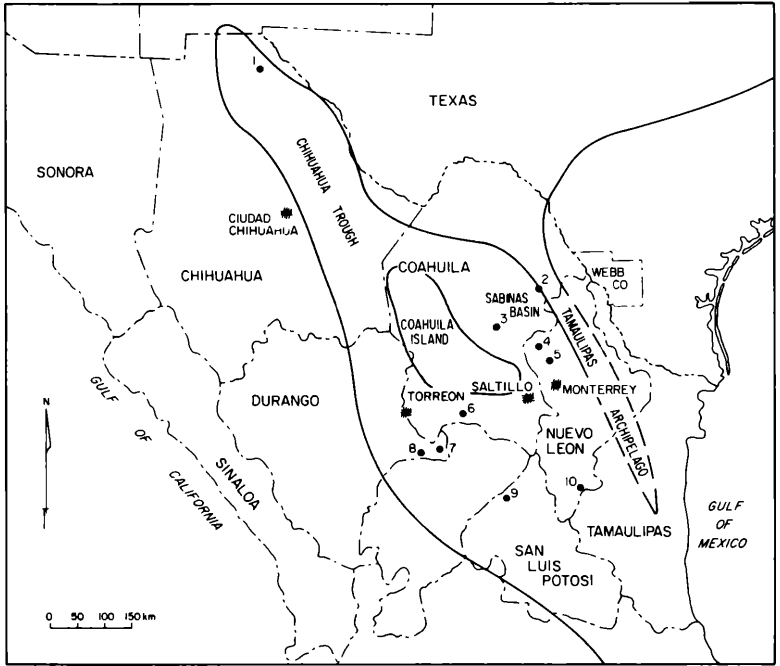
From the lowest exposed part of the Taraises Formation in the Ricón de Pelillo, Sierra Gomas, near Potrero, western Nuevo León, *Olcostephanus* sp. cf. *atherstoni*, *O.* sp. cf. *baini*, *Acanthodiscus* sp. cf. *magnificus* Imlay, and *Karakaschiceras biassalense* (Karakasch), have been collected from the same bed.

From an inlier on the north side of Sierra Samalayuca and west of the highway (Berg 1969, fig. 1) D.S. Webb collected *Karakaschiceras biassalense victoriense* (Imlay).

The Taraises Formation

The Taraises Formation has not been well studied. It was named by Imlay (1936) and divided into a lower unit and an upper unit (Imlay 1936, 1937a). On the basis of a few olcostephanids he considered the lower unit to be not older than Valanginian. On the basis of many fossils, including *Bochianites*, olcostephanids, and *Leopoldia*, he considered the upper unit to be Lower Hauterivian.

Some of the species of olcostephanids described by Imlay from the lower part of the upper unit have been put into synonymy with the Upper Valangian *Olcostephanus atherstoni* (Sharpe 1856) (Cooper 1981). The species of *Bochianites* described by Imlay are mostly related to the Late Valanginian *Bochianites*



Text Fig. 1. Map of northern Mexico and adjacent Texas showing the localities at which Late Valanginian ammonites have been collected: 1. Sierra Samalayuca; 2. Potrero de Oballos (Imlay 1940); 3. Barril Viejo Anticline (Imlay 1940); 4. Potrero; 5. Sierra Minas Viejas; 6. Sierra de Parras (Imlay 1936, 1937a, 1938); 7. Sierra de Symon (Böse 1923); 8. Sierra San Pedro (Peña Muñoz 1964); 9. Real de Catorce; 10. San Lazaro (Imlay 1937b). The heavy line outlines the Chihuahua Trough, the Sabinas Basin, and the Gulf of Mexico with their interconnections during the Late Valanginian. That the Coahuila Peninsula had become an island by the Late Valanginian is still a matter of disagreement.

neocomiensis (d'Orbigny) and *Bochianites africanus* (Tate). It is the purpose of this paper to suggest that Imlay's species of "*Leopoldia*" from the lower part of the upper unit of the Taraises Formation should be assigned to the Late Valanginian genus *Karakaschiceras* Thieuloy (1971). *Bochianites* sp. cf. *neocomiensis* (d'Orbigny), *B. thieuloidis* Cantu Chapa, *Olcostephanus atherstoni* (Sharpe), and species of *Karakaschiceras* occur at the same horizon.

Böse (1923) thought that he had two levels of *Olcostephanus* in the Valanginian of the Sierra de Symon, easternmost Durango, an upper level with "*Astieria*" *neohispanica* and a lower level with "*A.*" *astieriformis*, and his "*A.*" sp. aff. *atherstoni* (Sharpe) came from the lower level. Cantu Chapa (1966) treats both levels as one and as Late Valanginian.

Imlay's (1938) "*Leopoldia*" *victoriensis* is probably no more than a subspecies of *Karakaschiceras biassalense* (Karakasch 1890). Closely related species from the

lower part of the upper unit of the Taraises Formation are "*Leopoldia*" *flexuosa* Imlay (1938) and "*Leopoldia*" *bakeri* Imlay (1938, 1940). These species have also been described from the Barril Viejo Shale in the Barril Viejo anticline, and *K. bakeri* has been described from the Sierra de Oballos. The two latter localities are in Coahuila.

Karakasch (1902) considered the horizon with *Karakaschiceras biassalense* to be Valanginian, and Kemper, Rawson & Thieuloy (1981) and Thieuloy (1971) consider it to represent the early part of the Late Valanginian.

In addition to northern Mexico the title of this paper mentions Texas. Although no evidence is presented herein for the Texan subsurface, the tectonics of north-eastern Mexico and adjacent Texas imply that the depositional history of the two areas should be similar.

Text Fig. 1 also shows the proposed extent of the Late Valanginian sea in northern Mexico. It includes localities of known Late Valanginian fossils superimposed on the known tectonic framework of northern Mexico.

Systematic Descriptions

Order AMMONOIDEA

Suborder LYTOCERATINA Hyatt 1889

Superfamily ANCYLOCERATACEAE Meek 1876

Family BOCHIANITIDAE Spath 1922

Genus *Bochianites* Lory 1898

Type species: *Baculites neocomiensis* d'Orbigny, 1842; 560-562, pl. 138, figs. 1-5.

Bochianites sp. cf. *thieuloidis* Cantu Chapa 1976 Pl. 1, Figs. 4 & 8

cf. 1976 *Bochianites thieuloidis* Cantu Chapa, pl. 3, figs. 2-4; pl. 7, figs. 11a, b, c.

There are a number of strongly ribbed species of *Bochianites*, including *Bochianites africanus* (Tate 1867) (Cooper 1981), *Bochianites neocomiensis* (d'Orbigny 1842), *Bochianites goubechensis* Mandov (1971), *B. thieuloidis* Cantu Chapa 1976, and *Bochianites* sp. of Imlay (1938), the latter of which compares very favorably with *B. africanus*. *B. neocomiensis* is not as strongly ribbed as *B. africanus* and *B. thieuloidis*. *B. goubechensis* Mandov has some of the ribs effacing on the flank. Other ribbed species are more densely although less strongly ribbed; these include *Bochianites* sp. cf. *neocomiensis* of Patruilius & Avram (1976) and *Bochianites* spp. (Mazenot 1939).

The specimens illustrated by Cantu Chapa (1976) as *B. thieuloidis* do not have the ribs projected as far forward on the venter as do specimens of *B. africanus* (Tate). But Cantu Chapa's specimens are small, and Cooper (1981, figs. 70-2) illustrates smaller specimens of *B. africanus* with only slightly projected ribs. As pointed out by Cooper (1981) *B. maldonadoi* (Karsten, 1886) has finer, thread-like ribbing in the younger stages.

Locality.—Both specimens of *Bochianites* sp. cf. *thieuloidis* Cantu Chapa are from the Taraises Formation, from just above the southwest bank of the arroyo in the southeast end of the potrero of Sierra Minas Viejas, Nuevo León, Mexico. *Bochianites africanus* (Tate) is latest Valanginian, zone of *Olcostephanus baini* of Cooper (1981). Further evidence of the Late Valanginian age of the specimens from Mexico is their occurrence with *Karakaschiceras*.

Bochianites sp.

Pl. 1, Fig. 9

This is a small specimen, nearly circular in cross-section, and without visible ornamentation. It could be compared to *Bochianites oosteri* Sarasin & Schöndelmayer (1902), *Bochianites paskentaensis* Anderson (1938), *Bochianites glaber* Kitchen (1908), and *Bochianites* sp. Cantu Chapa (1976, pl. 7, figs. 1&7), all of which are less oval in cross-section than is this specimen. It can also be compared to smooth specimens of *Bochianites* from the Tithonian, such as the one illustrated by Cantu Chapa (1963, pl. 1, fig. 6) from the Tithonian of Mexico. More circular cross-sections seem more common to the Tithonian.

Locality.—The specimen illustrated on Pl. 1, Fig. 9, is from a depth of 5,433 m in Humble no. 1 Benavides, Webb County, Texas. It apparently occurs with *Corongoceras* (?) sp. and is probably Tithonian.

Suborder AMMONITINA Hyatt 1889

Superfamily PERISPHINCTACEAE Steinmann 1890

Family OLCOSTEPHANIDAE Haug 1910

Subfamily OLCOSTEPHANINAE Haug 1910

Genus *Olcostephanus* Neumayr 1875

Synonymy: See Cooper (1981) for synonymy.

Type species: *Ammonites astierianus* d'Orbigny (1840), subsequently designated by Lemoine (1906).

Olcostephanus sp. cf. *atherstoni* (Sharpe 1856)

Pl. 1, Figs. 2, 11 & 15

Synonymy: See Cooper (1981) for synonymy for Sharpe's species.

The specimens from Mexico generally agree with Cooper's (1981) diagnosis, with three ribs per tubercle and with one or two intercalating ribs. Because I have only fragments compressed by sedimentation, it is not possible to determine with any accuracy the number of umbilical tubercles. Density of ribbing seems to be about right for the species.

Localities.—The specimens illustrated in Figs. 2 & 15 of Pl. 1 are from the lowest Taraises Formation that is exposed in the Rincón de Pelillo, Sierra Gomas, near Potrero, western Nuevo León, Mexico. The specimen illustrated by Fig. 11 of Pl. 1 was collected by C.L. Baker and Emil Böse in 1921 (Böse & Cavins 1928) from the

Taraises Formation near the villita of Los Arcos in the vicinity of Real de Catorce, west-central San Luis Potosí. Imlay (1937a, b; 1938) also described species of *Olcostephanus* from San Lazaro and Sierra de Parras, Mexico.

Olcostephanus sp. cf. *baini* (Sharpe 1856)

Pl. 1, Figs. 5 & 13

Synonymy: For synonymy of Sharpe's species, see Cooper (1981: 263).

Two small fragments herein referred to *Olcostephanus* sp. cf. *baini* (Sharpe 1856) certainly are not the microconchs as diagnosed by Cooper (1981). The ribs do not branch regularly with three from each node as in *O. atherstoni*, and the preservation is not sufficient to determine the number of nodes with any accuracy.

Locality.—Both specimens are from the lowermost exposed Taraises Formation in the Rincon de Pelillo, Sierra Gomas, near Potrero, western Nuevo León, Mexico. Actually the identification is made more dubious because Cooper (1981) lists no forms of *Olcostephanus baini* from Mexico in his synonymies. However, the level appears to be the same as that for *O. atherstoni*.

All of Imlay's (1938) species of *Olcostephanus* are restricted to the lower part of the Taraises Formation, units 1 and 2 (Imlay 1936). Unit 2 contains *Bochianites* sp. (Imlay 1938), which compares favorably to *Bochianites africanus* (Tate), indicating that at least the lower part of unit 1 and 2 of the upper part of the Taraises Formation are Late Valanginian.

Family BERRIASSELLIDAE Spath 1922
Subfamily NEOCOMITINAE Spath 1924
Genus *Acanthodiscus* Uhlig 1905

Type species: *Ammonites radiatus* Bruguière (1789), subsequently designated by Spath (1924).

Acanthodiscus magnificus Imlay 1938

Pl. 1, Figs. 7 & 10

1938 *Acanthodiscus magnificus* Imlay, p. 572, pl. 9, figs. 1, 2, 7, 8; pl. 13, fig. 4, text fig. 3.

1940 *Acanthodiscus magnificus* Imlay. - Imlay, p. 163-164, pl. 18, fig. 1.

The specimen illustrated in Figs. 7&10 of Pl. 1 agrees with Imlay's specimens (Imlay 1938, pl. 9, figs. 1, 2, 7, 8 and pl. 13, fig. 4; 1940, pl. 14, fig. 1 and pl. 18, fig. 1), except the specimen has been flattened by sedimentary load and the true whorl-width is not displayed. Such flattening may also have accentuated the lateral nodes.

Locality.—The specimen was found on the beds bearing *Bochianites* sp. cf. *thieuloidis* Cantu Chapa but was float and could have originated in a higher level. It is from the Taraises Formation, southwest bank of the arroyo in the potrero at the southeast end of Sierra Minas Viejas, Nuevo León, Mexico.

Acanthodiscus sp. cf. *magnificus* Imlay 1938

Pl. 1, Fig. 6 & 12

The two small specimens figured by Figs. 6 & 12 of Pl. 1 are compared to Imlay's species, even though the keels are not visible. The ribbing is similar to that of Imlay's specimen (1938, pl. 9, fig. 1&2) but the ribbing in juveniles of related species is variable and also similar.

Localities.—The specimen illustrated in Pl. 1, Fig. 6, is from the lower part of the Taraises Formation, just above the southwest bank of the arroyo in the southeast end of the potrero of Sierra Minas Viejas, Nuevo León, Mexico. It was collected from a bed that also contains *Bochianites* sp. cf. *thieuloidis* Cantu Chapa and *Karakaschiceras biassalense* (Karakasch). The specimen illustrated in Pl. 1, Fig. 12, is from the lowest Taraises Formation exposed at the head of the Rincón de Pelillo, Sierra Gomas, near the village of Potrero, western Nuevo León, Mexico. There it was found in the same bed as *Karakaschiceras biassalense* (Karakasch), *Olcostephanus* sp. cf. *atherstoni* (Sharpe), and *O.* sp. cf. *baini* (Sharpe).

Subfamily ENDEMOCERATINAE Schindewolf 1966

Genus *Karakaschiceras* Thieuloy 1971

Type species: *Hoplites biassalensis* Karakasch 1890

Karakaschiceras biassalense biassalense (Karakasch 1890)

Pl. 1, Figs. 1, 14 & 16

1890 *Hoplites biassalensis* Karakasch, pp. 435-436, pl. 1, figs. 4 & 5

1907 *Hoplites biassalensis* Kar. - Karakasch, pp. 81-82, pl. 10, figs. 9a, b; pl. 11, fig. 3; pl. 12, fig. 2; pl. 24, fig. 28; pl. 26, fig. 4.

?*Hoplites leopoldi* D'orb. - Karakasch, pp. 76-81, pl. 10, figs. 8 a, b.

1960 *Leopoldia biassalensis* (Karakasch). - Drushchish & Kudryatseva, pp. 285-286, text fig. 79; pl. 28, figs. 4a, b; pl. 29, fig. 1.

?*Leopoldia leopoldi* (d'Orbigny). - Drushchish & Kudryatseva, p. 285, pl. 28, figs. 3a, b.

1971 *Karakaschiceras biassalense* (Karakasch). - Thieuloy, p. 2299.

1981 *Karakaschiceras biassalense* (Karakasch). - Kemper, Rawson & Thieuloy, p. 283, pl. 43, figs. 1, 3.

Kemper, Rawson & Thieuloy (1981) have recently discussed the genus *Karakaschiceras*, including a short discussion of *K. biassalense* (Karakasch 1890). In younger stages it is an involute species with slightly sigmoid ribs, some of which start at plus or minus 17 umbilical bullae, and many of which are intercalated. Karakasch's specimen appears to have had slightly less than 80 ribs at the ventral edge at a diameter of 58 mm (Karakasch 1890; Drushchish & Kudryatseva 1960). At an early diameter the ribs fade out on the flanks, but continue to appear along the margin of the venter. Prior to a diameter of 45 or 50 mm the ribs may terminate in small nodes. The specimens from Mexico seem to agree with this species in all ways. However, the compressed internal molds do not yield any views of keels, and this makes them hard to work with.

Plate 1

(Bar scale for all figures represents 0.4 cm.)

Figs. 1, 14, 16. - *Karakaschiceras biassalense biassalense* (Karakasch). 1 (WSA-16167), 14 (WSA-16067), lowest exposed part of the Taraises Formation, head of Rincón de Pelillo, near Potrero, Sierra Gomas, western Nuevo León, Mexico (coll. K. Young). 16 (WSA-17342), Taraises Formation, 100 m from top in nodular limestone, southeast end of Sierra Minas Viejas, Nuevo León, Mexico (coll. J.L. Wilson).

Figs. 2, 11, 15.—*Olcostephanus* sp. cf. *atherstoni* (Sharpe). 2 (WSA-13464), 15 (UT-41038), lowest exposed part of the Taraises Formation, head of Rincón de Pelillo, near Potrero, Sierra Gomas, western Nuevo León, Mexico; (2, coll. K. Young; 15, coll. R. Fuentes F. 11 (WSA-4166), Taraises Formation, Los Arcos, west-central San Luis Potosí, Mexico (coll. C.L. Baker and E. Böse).

Fig. 3.—*Karakaschiceras biassalense victoriense* (Imlay). WSA-19805, from inlier west of the Juárez-Ciudad Chihuahua highway south of Samalayuca and north of Sierra Samalayuca, Chihuahua, Mexico (coll. D.S. Webb).

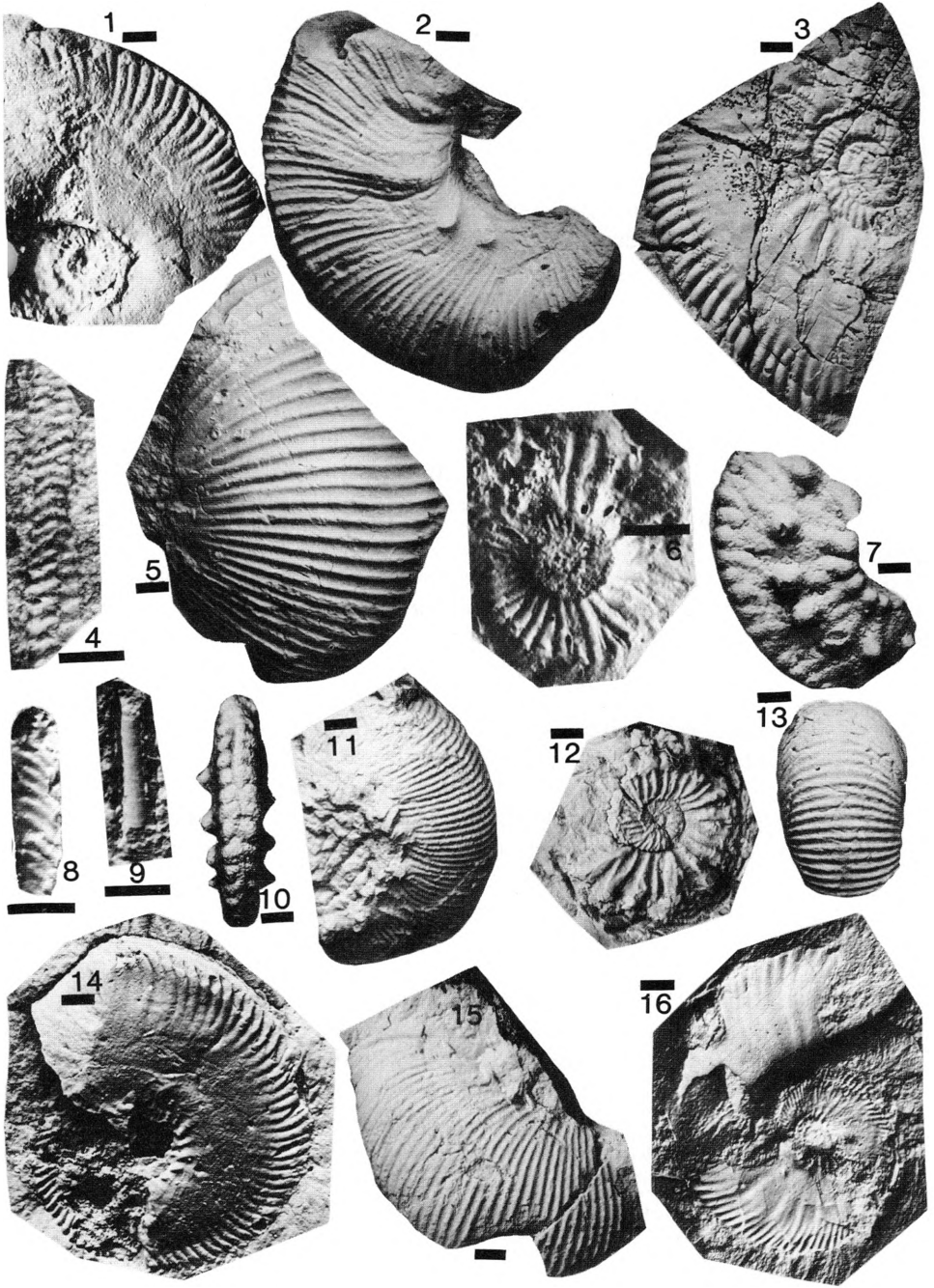
Figs. 4, 8.—*Bochianites* sp. cf. *thieuloidis* Cantu Chapa. 4 (WSA-16129), 8 (WSA-17374), lower Taraises Formation, just above southwest bank of arroyo in southeast end of the potrero of Sierra Minas Viejas, Nuevo León, Mexico (coll. K. Young).

Figs. 5, 13.—*Olcostephanus* sp. cf. *baini* (Sharpe). 5 (WSA-13501), 13 (UT-41041), lower part of exposed Taraises Formation, head of Rincón de Pelillo, near Potrero, Sierra Gomas, western Nuevo León, Mexico; 5, coll. K. Young; 13, coll. R. Fuentes F.).

Figs. 6, 12.—*Acanthodiscus* sp. cf. *magnificus* Imlay. 6 (WSA-18373), lower Taraises Formation, just above the southwest bank of arroyo in the southeast end of the potrero of Sierra Minas Viejas, Nuevo León, Mexico (coll. K. Young). 12 (UT-41039), lower part of the exposed Taraises Formation, head of Rincón de Pelillo, near Potrero, Sierra Gomas, western Nuevo León, Mexico (coll. R. Fuentes F.).

Figs. 7, 10.—*Acanthodiscus magnificus* Imlay. WSA-16212, float on the lower Taraises Formation, southwest bank of arroyo in southeast end of the potrero of Sierra Minas Viejas, Nuevo León, Mexico (coll. K. Young).

Figs. 9.—*Bochianites* sp. WSA-16016, from depth of 5,433 m, Humble no. 1 Benavides, Webb County, Texas (coll. J. Twining). This specimen is probably a Late Tithonian *Bochianites*.



Leopoldia leopoldi (d'Orbigny) in Drushchish & Kydryatseva (1960, pl. 28, fig. 3a, b) has a venter and juvenile costation that appear to be more like those of *K. biassalense* (Karakasch) than like any species of *Leopoldia*.

Localities.—The specimens illustrated by Figs. 1 & 14 of Pl. 1, were collected from the lowest exposed Taraises Formation in the head of the Rincón de Pelilla, Sierra Gomas, near Potrero, western Nuevo León, Mexico. They were found in the same bed as *Olcostephanus* sp. cf. *atherstoni* (Sharpe), *O.* sp. cf. *baini* (Sharpe), and *Acanthodiscus* sp. cf. *magnificus* Imlay. The specimen illustrated by Fig. 16 of Pl. 1, was collected from 300 m below the top of the Taraises Formation, southern end of Sierra Minas Viejas, Nuevo León, Mexico.

Karakaschiceras biassalense victoriense (Imlay 1938)

Pl. 1, Fig. 3

1938 *Leopoldia victoriensis* Imlay, pp. 581-582, pl. 12, figs. 1-4.

Leopoldia flexuosa Imlay, p. 582, pl. 11, figs. 5, 6.

?1964 *Leopoldia victoriensis* Imlay. - Peña-Muñoz, p. 28, pl. 9, figs. 1, 2, 6.

The only significant differences between *Karakaschiceras biassalense biassalense* and *K. biassalense victoriense* (Imlay) is that in Imlay's subspecies the ribs are slightly more widely spaced around a diameter of 60 mm, and the umbilical bullae extend into greater diameters before fading out. Ribs fade out on the flanks as in *K. biassalense biassalense* (Karakasch). It will require a larger number of specimens than now available to determine if these minor differences will allow continued recognition of the two subspecies. Kemper, Rawson & Thieuloy (1981) suggest that if more specimens were available, there might be fewer species because of the discovery of greater specific variation. The same is true of the Mexican forms.

If the flexuosity of ribbing should turn out to be unimportant, then *Karakaschiceras flexuosum* (Imlay 1938) would become a synonym of *K. biassalense victoriense* (Imlay 1938). The flexuosity of ribbing of "*Leopoldia*" *victoriense* (Imlay) in Peña-Muñoz (1964, pl. 9, figs. 1, 2, 6) is greater than in Imlay's holotype (1938, pl. 12, figs. 1-4) and is more like the flexuosity of *K. flexuosum* (Imlay).

The specimen from Chihuahua (Pl. 1, Fig. 3) compares favorably to Imlay's holotype.

Localities.—Imlay (1938) reported his specimens from the lower part of the upper unit of the Taraises Formation in the Sierra de Parras, southern Coahuila. He also reported the species from the Barril Viejo Shale in the Barril Viejo Anticline near Cuatro Ciénegas, Coahuila (Imlay 1940). Although he thought the fossils to be Lower Hauterivian, their occurrence with *Olcostephanus atherstoni* and *Bochianites* indicates that they are Late Valanginian. Peña-Muñoz (1964) reports her specimens from the Taraises Formation, sierra de San Pedro, eastern Durango, not far from Böse's (1923) locality for species of *Olcostephanus* in the Sierra de Symon.

The specimen illustrated in Pl. 1, Fig. 3 is from northern Chihuahua, and is from one of a few small inliers on the west side of the highway from Juárez to Ciudad Chihuahua, and just north of the Sierra Samalayuca, Chihuahua, Mexico. The inliers are illustrated as Lower Cretaceous in Berg (1969, fig. 1). This inlier should

not be confused with the Jurassic inlier near to and on the east side of the same highway and just east of the north side of Sierra de Samalayuca (Diaz 1956, stop 2, pp. 27-28, fig. 3).

Acknowledgments

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