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MEXICAN FOSSIL ECHINI

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THE collection of fossil Echini reported upon in this paper was submitted to me for study by Dr. T. Wayland Vaughan. All types of new species described herein are in the United States National Museum except that of *Lovenia mexicana*, which is in the museum of the California Academy of Sciences, San Francisco.

I should express my warm appreciation to my friend Dr. Hubert Lyman Clark for his help in this work. His opinion is of great value, especially in the cidaroids and clypeastroids, for the indentification in these two groups is exceptionally difficult on account of the multiplicity of species, and Dr. Clark is a high authority on both groups. Assistance in stating precisely the localities and the geologic horizons has been kindly rendered by J. M. Muir and Thomas F. Grimsdale.

The regular Echini are represented by only two species of *Cidaris* and one of *Stomopneustes*. This last is of exceptional interest, as it is the first recorded occurrence of the genus as found fossil in America. Indeed, its previous occurrence as a fossil anywhere is somewhat doubtful. The clypeastroids, as usual in Tertiary collections, are rather abundant in species and individuals. Of spatangoids there are a number of species, and the specimens are in an exceptionally good state of preservation.

Table 1 shows the localities and the geologic horizons of the species found in the collection.

TABLE 1.—Localities and geologic horizons of species of Mexican fossil Echini recorded in this paper

Species	Localities	Horizon
<i>Cidaris loeni</i> Cotteau.....	Túxpan City, Veracruz.....	Miocene, Túxpan formation
<i>thouarsii</i> Agassiz and Desor.....	do.....	Do.
<i>Stomopneustes pristinus</i> , new species.....	Hacienda Tierra Amarilla, about 7 km NW. of town of Temapache, Veracruz.	Oligocene, Mesón formation.
<i>Clypeaster meridanensis</i> Michelin....	{ Hacienda Santa Fé, Topila Hills, Veracruz. Túxpan City, Veracruz.....	Do.
<i>marinanus</i> , new species.....	2.5 km SW. of Mesón Village; Topila; other localities.	Miocene, Túxpan formation
<i>topilanus</i> , new species.....	Hacienda Santa Fé, Topila.....	Oligocene, Mesón formation.
<i>Laganum leptum</i> , new species.....	8 km E. of town of Chinampa.....	Do.
<i>Scutella cazonesensis</i> Kew.....	La Cuesta, Soto la Marina River.....	Do.
<i>Agassizia clerei</i> Cotteau.....	Salitre Ranch.....	Not definitely known, Oligocene or Miocene.
<i>Schizaster cristatus</i> Jackson.....	8 km E. of town of Chinampa and other localities.	Oligocene, Mesón formation.
<i>Eupatagus mexicanus</i> , new species....	Hacienda Santa Fé, Topila.....	Do.
<i>Loenia dumblei</i> Kew.....	10 km E. of town of Chinampa.....	Do.
<i>mexicana</i> , new species.....	2.5 km SW. of Mesón Village.....	Do.

Dickerson and Kew have published a paper¹ in which Kew, who is the author of the echinoid portion, recognized 12 species of Echini, four of which were described as new. Merle C. Israelsky² described six new species of Echini from Mexico and recorded in all 13 species from that region. Errors in localities as cited by Israelsky are corrected in a book by J. M. Muir.³ Additional fossil Echini from Mexico are included in a paper by the veteran echinologist M. Jules Lambert,⁴ who had only a limited amount of material, some 12 specimens, which he referred to eight species, three of which were described as new.

In the material on which the present paper is based 13 species are recorded, six of which are new. In all, 32 species have been recorded from Mexico, 18 of which were described as new.

¹ The fauna of a medial Tertiary formation and the associated horizons of northeastern Mexico. Proc. California Acad. Sci., ser. 4, vol. 7, no. 5, pp. 125-156, pls. 17-26a, 1917.

² Notes on some echinoids from the San Rafael and Túxpan beds of the Tampico region, Mexico. Proc. California Acad. Sci., ser. 4, vol. 13, no. 8, pp. 137-145, pls. 2-4, 1924.

³ Geology of the Tampico embayment, xix+280 pp., illus. American Association of Petroleum Geologists, 1936.

⁴ Note sur quelques Echinides recueillis par Mr. Walter Staub dans le Néogène de l'Est du Mexique. Ecol. geol. Helv., vol. 21, no. 1, pp. 272-283, 6 figs., 1 pl., 1928.

Order CIDAROIDA Duncan

Family CIDARIDAE Gray

Genus CIDARIS Leske

CIDARIS LOVENI Cotteau

Cidaris loveni COTTEAU, Kongl. Svenska Vet.-Akad. Handl., vol. 13, no. 6, p. 10, pl. 1, figs. 11-14, 1875.—JACKSON, Carnegie Inst. Washington Publ. 306, p. 19, pl. 1, figs. 8-10, 1922.

A fragment consisting of an interambulacral area and a half-ambulacral area appears referable to this species, although it is considerably larger than the type, which is from the Eocene of St. Bartholomew, West Indies. The Mexican specimen measures 29 mm in height, width of the interambulacrum at the midzone 22 mm, width of the half-ambulacrum at the same zone 3 mm. This, of course, indicates 6 mm as the width of the ambulacral area. This species is recorded qualifiedly as *Cidaris* cf. *loveni* by Kew and also by Israelsky as from Tuxpan, based apparently on the same specimen here considered.

Miocene, Tuxpan formation, Tuxpan, Veracruz, Mexico; Dumble and Cummins, collectors, 1908, California Academy of Sciences, locality X 14, one specimen.

CIDARIS THOUARSII Agassiz and Desor

Cidaris thouarsii AGASSIZ and DESOR, Catalogue Raisonné, Ann. Sci. Nat., ser. 3, vol. 6, p. 326, 1846.

A specimen somewhat crushed but otherwise fairly well preserved is referred to this species. It measures 17 mm in height, width of an ambulacrum at the midzone about 3 mm, width of an interambulacrum at the same zone 14 mm. *Cidaris thouarsii* occurs in the Recent fauna of the Pacific off the west coast of Mexico. It is of interest that it is found also in the fossil state in Mexico. *C. tribuloides*, which is abundant in the Recent West Indian fauna, has been found fossil in Cuba.

Miocene, Tuxpan formation, Tuxpan, Veracruz, Mexico; Dumble and Cummins, collectors, 1908, California Academy of Sciences, locality X 14, one specimen.

Order CENTRECHINOIDA Jackson

Suborder STIRODONTA Jackson

Family STOMOPNEUSTIDAE Mortensen

Genus STOMOPNEUSTES Agassiz

STOMOPNEUSTES PRISTINUS, new species

PLATE 12, FIGURE 1

Test low, dome-shaped, ambitus below the midzone, slightly pentagonal in horizontal outline, the ambulacral areas coinciding with

the apices of the pentagon, flattened dorsally, slightly reëntrant about the peristome, otherwise very nearly flat ventrally. Ambulacra wide, measuring about 25 mm in width at the ambitus, ambulacral plates composed of three elements, but this species, like the Recent *S. variolaris* (Lamarck), has a peculiar arrangement in that every fourth ambulacral plate bears a large primary tubercle that has grown over four plates and hides their sutures. This, with other important details in regard to the Recent species, is considered by Dr. H. L. Clark.⁵ Interambulacra with two vertical rows of primary tubercles in each half-area. Diameter of the specimen 81 mm, height 38 mm.

The single known specimen (U.S.N.M. no. 496275) of this new and interesting echinoid is much worn and shows structural detail only in parts of the test. The peristome and periproct are not preserved, or are not visible. The test is thick and solid and gives no evidence of flattening or other distortion.

The genus *Stomopneustes* is known from the Recent species *S. variolaris* (Lamarck) from the southern Pacific Ocean. According to Duncan,⁶ a species has been found in the Tertiary of Java, but he queried the statement.

Oligocene, Mesón, Hacienda Tierra Amarilla, about 7 km northwest of the town of Temapache, Canton Tuxpan, Veracruz, Mexico; Corona collection, no. 29 (=H176), one specimen.

Order EXOCYCLOIDA Jackson

Suborder CLYPEASTRINA Gregory

Family CLYPEASTRIDAE Agassiz

Genus CLYPEASTER Lamarck

CLYPEASTER MERIDANENSIS Michelin

Clypeaster meridanensis MICHELIN, Rév. et Mag. Zool., ser. 2, vol. 2, p. 240, 1850; Mém. Soc. Geol. France, ser. 2, vol. 7, p. 136, pl. 14, figs. 1a-f, 1861.

Of the species *Clypeaster meridanensis*, described by Michelin from the Tertiary of Merida, Yucatan, there is a fine series of extremely well preserved specimens from Tuxpan, Tampico, and Hacienda Santa Fé, Topila, Mexico. The largest specimen, from a small quarry in the town of Tuxpan, collected by D. R. Semmes, no. 82, measures 160 mm in length, 142 mm in width at the widest part through ambulacra II and IV, and 27 mm in height.

There are 12 specimens of this species from the Miocene of Tuxpan, Veracruz, Mexico, and two from the Oligocene Mesón formation of Hacienda Santa Fé, Topila, Veracruz. Also there is a 4-rayed specimen and a fragment from 1 mile north of Tampico and on the opposite

⁵ Mem. Mus. Comp. Zool., vol. 34, no. 2, 1912.

⁶ Revision of the genera and great groups of the Echinoidea. Journ. Linn. Soc. London, Zool., vol. 23, pp. 1-311, 1889.

side of Laguna del Carpintero from it; California Academy of Sciences, locality X 34. A specimen with petals broader and poriferous areas wider than is usual in the species as a variant is from Tuxpan, Veracruz, California Academy of Sciences, locality X 14.

Lambert ⁷ also records this species from Tuxpan.

CLYPEASTER MARINANUS, new species

PLATE 12, FIGURE 2; PLATE 13, FIGURE 1

Test elongate, low, subpentagonal in outline, very thin on the borders, center only slightly elevated, ventrally nearly flat, slightly reëntrant around the mouth. Ambulacral petals relatively short, slightly curved, open at the tips, nearly flush with the surface of the test, poriferous areas not sunken. Apical disk slightly anterior to the center. Periproct near the posterior end; in a specimen 72 mm long the periproct is 6 mm from the border. Tubercles are small dorsally and closely associated; ventrally they are larger and more deeply sunken.

There is a rather large series of specimens of this species from several localities. The specimen selected as the type, H 120 (U.S.N.M. no. 496276), from Chamal on the north side of Soto la Marina River, measures 102 mm in length, 94 mm in width, and about 20 mm in height. Another specimen, from Hacienda Santa Fé, Topila, measures 116 mm in length, 98 mm in width, and about 17 mm in height.

Clypeaster marinanus approaches in character nearest to *C. rogersi* Morton but differs from that in having the test flatter and being much thinner at the margin and less deeply reëntrant around the mouth. Also the ambulacral petals are shorter, narrower, and less curved, and the poriferous areas are narrower in *rogersi*. *C. marinanus* differs from *C. staudi* Lambert, which also occurs east of Soto la Marina, in that the test of *marinanus* is much less conically elevated and much less pentagonal in outline than *staudi*.

Oligocene, Mesón formation, at the following localities: Chamal, Soto la Marina River, Tamaulipas, Mexico, Corona collection, six specimens including the holotype; Mesón, Hacienda Santa Fé, Topila, Veracruz, six specimens; Lot 214 Hacienda Chinampa, 10 km east of town of Chinampa, Canton Tuxpan, Veracruz, just above the main *Lepidocyclina gigas* beds, top of Mesón formation, three small immature specimens; east of Ozuluama, one specimen; Mesón formation, Aguila Colony, about 4 km northwest of the cathedral, Tampico, Mexico, one specimen; north of Arbol Grande, between 3,700 and 4,300 feet north of Arbol Grande station, near Tampico, Mexico, several fragments; cut on street railway between Dona Cecilia and Tampico, Mexico, one fragment, California Academy of Sciences, locality X 118.

⁷ *Op. cit.*, p. 272.

CLYPEASTER TOPILANUS, new species

PLATE 13, FIGURES 2, 3

Clypeaster sp. *a* Kew, Proc. California Acad. Sci., ser. 4, vol. 7, no. 5, table facing p. 128 (for localities listed), pp. 130, 131, pl. 23, fig. 2; pl. 24, fig. 2, 1917.

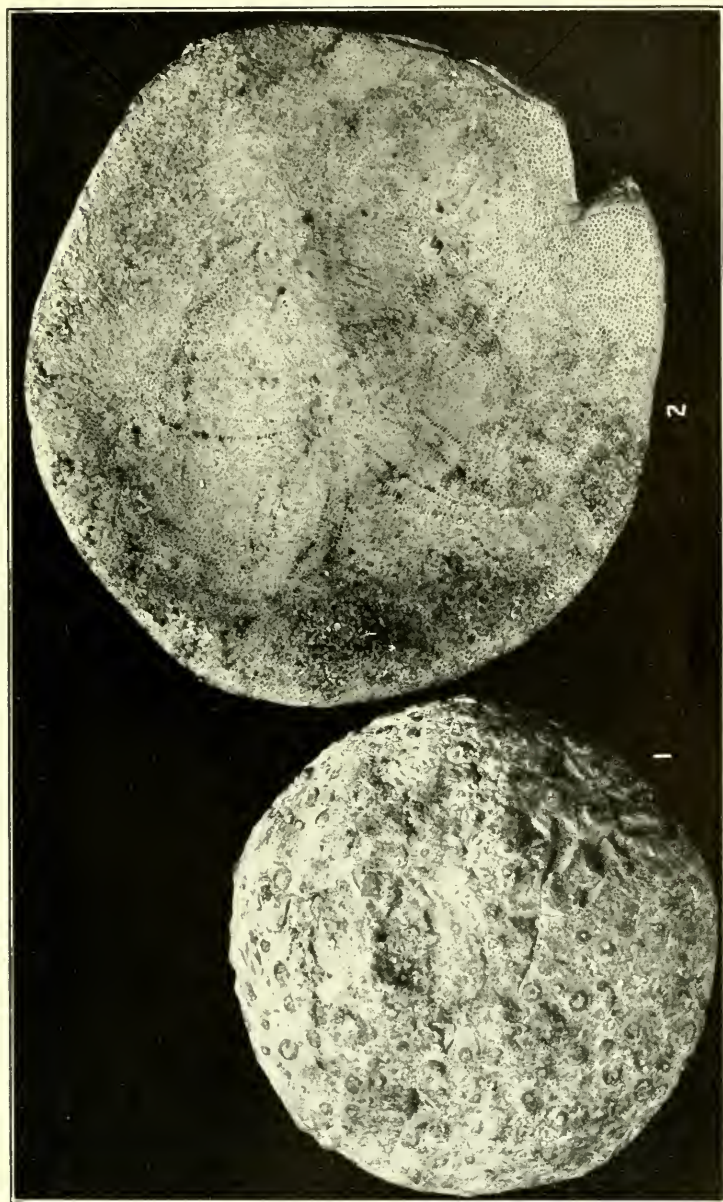
Clypeaster sp. ISRAELSKY, Proc. California Acad. Sci., ser. 4, vol. 13, no. 8, p. 140, 1924.

Test moderately high, pentagonal, elongate anteriorly, truncate posteriorly, with thick rounded margin, dorsally elevated into a low dome, ventrally reëntrant to the moderately sunken peristome. Apical disk small, a little anterior to the center of the test. Periproct near the posterior border of the test, 5 mm from it in the type, which measures 96 mm in length. Ambulacral petals open at the tips, poriferous areas narrow, moderately depressed, nonporiferous areas only moderately elevated.

There is a rather large number of specimens of this species. The one selected as the type (U.S.N.M. no. 496278) measures 96 mm in length, 80 mm in width, and 25 mm in height. With all the species assigned to the genus *Clypeaster*, it is annoying to make still another, but these specimens cannot be made to fit into any species known. *C. topilanus* is nearest to *C. planipetalus* Cotteau, but it differs from that in having shorter petals and being less open at the tips; also the petals are straighter and the poriferous areas are narrower than they are in *planipetalus*. *C. topilanus* is more massive and more strongly pentagonal in outline than *C. sanrafaelensis* Israelsky, which is from the Tampico region.

The species that Kew figured as *Clypeaster* species *a* is evidently the same as that described here as new. Kew did not give any description of his species *a*, but it is listed in his table of species from the "San Fernando formation and associated beds." As noted on page 125 (footnote) of Dickerson and Kew's paper, the name "San Fernando" being preoccupied, the name "San Rafael" was proposed as a substitute by Prof. E. T. Dumble. That name has now been dropped, as it was a synonym of the Mesón formation. Kew gave as localities for his species *a*: Salitre Ranch, Tamaulipas; and hill at extreme north of La Puerta Range, Hacienda Santa Fé, Topila, Veracruz.

In the material at hand there is a fine series from the Mesón formation at abandoned Corona camp, Hacienda Santa Fé, Topila, Veracruz, Mexico, 16 specimens. One specimen without locality is marked locality X 83a, California Academy of Sciences.



1, *Stomopneustes pristinus*, new species, Oligocene, Mesón formation, Hacienda Tierra Amarilla, Mexico, Corona collection no. 29, holotype, dorsal view, U.S.N.M. no. 496275; 2, *Clypeaster marinus*, new species, Mesón formation, Chamal on north side of Soto la Marina River, Corona collection no. H120, holotype, dorsal view, U.S.N.M. no. 496276. (Five-sixths natural size.)



1, *Clypeaster marinannus*, new species, Mesón formation, Hacienda Santa Fé, Topila, Mexico, locality M19V, paratype, ventral view, U.S.N.M. no. 496277; 2, *C. topilanus*, new species, same formation and locality, holotype, dorsal view, U.S.N.M. no. 496278; 3, *C. topilanus*, same formation and locality, Corona collection no. 14, paratype, ventral view, U.S.N.M. no. 496279; 4, *Laganum leptum*, new species, Mesón formation, on line of Transcontinental Railroad, lot 145, Hacienda Chinampa, 8 km east of town of Chinampa, Canton Tuxpan, Veracruz, at the first cut examined November 28, 1920, holotype, dorsal view, U.S.N.M. no. 496280. (Five-sixths natural size.)



Eupatagus mexicanus, new species, Mesón formation, Hacienda Santa Fé, Topila, Mexico, Corona collection no. 1, holotype, dorsal view, U.S.N.M. no. 496281. The figure is slightly foreshortened. (Five-sixths natural size.)



1. *Eupatagus mexicanus*, new species, Mesón formation, Hacienda Santa Fé, Topila, Mexico, Corona collection no. 1, holotype, ventral view of same specimen as pl. 14; 2. *Loreoia mexicana*, new species, Rancho Nuevo, 2.5 km W SW. of Mesón, Canton Tuxpan, Veracruz, W. F. Cummins collector, Calif. Acad. Sci., locality X62, holotype, dorsal view; 3. *L. mexicana*, same locality and collector, paratype, ventral view of a larger specimen than fig. 2. (Five-sixths natural size.)

Family LAGANIDAE Desor

Genus LAGANUM Gray

LAGANUM LEPTUM, new species

PLATE 13, FIGURE 4

Test very nearly circular, very flat and thin. Apical disk central, peristome probably the same, but invisible. Ambulacral petals short, wide, obovate. Poriferous areas wide. Periproct very near to, being only 2 mm from, the posterior border of the test.

The single known specimen (U.S.N.M. no. 496280) measures 38 mm in length, 35 mm in width, and about 5 mm in height. This species approaches perhaps nearest to *Laganum johnsoni* Twitchell, from the Eocene of Alabama. It differs from *johnsoni* in the extreme thinness of the test and in the shortness and obovate form of the petals in *leptum*.

L. leptum was collected by Dr. T. W. Vaughan in the Oligocene Mesón formation on the line of the Transcontinental Railroad, lot 145, Hacienda Chinampa, 8 km east of the town of Chinampa, Canton Tuxpan, Veracruz, Mexico, at the first cut examined, November 28, 1920.

Family SCUTELLIDAE Agassiz

Genus SCUTELLA Lamarck

SCUTELLA CAZONESSENSIS Kew

Scutella cazonesensis KEW, Proc. California Acad. Sci., ser. 4, vol. 7, p. 132, pl. 19, fig. 1, 1917.

This species is represented by a fragmentary but very well preserved specimen of an individual almost exactly the same size as the one figured by Kew.

The specimen here considered is from La Cuesta, Soto la Marina River, Corona collection, no. 28. The geologic horizon is not definitely known, but is either upper Mesón or Tuxpan.

Suborder SPATANGINA Jackson

Family HEMIASTERIDAE H. L. Clark

Genus AGASSIZIA Valenciennes

AGASSIZIA CLEVEI Cotteau

Agassizia clevei COTTEAU (pars), Kongl. Svenska Vet.-Akad. Handl., vol. 13, no. 6, p. 33, pl. 6, figs. 2-8, 1875.—JACKSON, Carnegie Inst. Washington Publ. 306, p. 71, pl. 12, figs. 5-7, 1922.

Not *Agassizia clevei* KEW, Proc. California Acad. Sci., ser. 4, vol. 7, pl. 17, figs. 1a, 1b, 1917.

Two specimens are referred to this species. The larger of the two as a variant shows considerable resemblance to *A. inflata* Jackson.

Kew figures a specimen as *A. clevei* as noted above. This specimen Israelsky⁸ makes the type of a new species, *A. regia*, and compares this with *A. inflata* Jackson, which by error he calls *A. elevata* Jackson. *A. clevei* differs from *A. regia* in being proportionately narrower laterally and less expanded anteriorly.

Mesón, Salitre Ranch, Mexico; Cummins and Sands, collectors, 1909; California Academy of Sciences, locality X 24, two specimens.

Genus SCHIZASTER Agassiz

SCHIZASTER CRISTATUS Jackson

Schizaster cristatus JACKSON, Proc. U. S. Nat. Mus., vol. 53, p. 499, pl. 68, figs. 2-4, 1917.

S. cristatus differs from *S. dumblei* Israelsky⁹ in being more compressed laterally and more highly carinate posteriorly.

The species *cristatus*, described from Brazil, Costa Rica, is represented by a number of excellent specimens from Mexico:

Oligocene, Mesón, localities: Horizon "M", Transcontinental Railroad, lot 145 Hacienda Chinampa, 8 km east of the town of Chinampa, Canton Tuxpan, Veracruz; also in lot 214, Hacienda Chinampa, D. R. Semmes, collector, June 1920, one specimen; station 49, Transcontinental Railroad, east of construction camp, just below large *Lepidocyclina* bed, D. R. Semmes, 1920, one specimen; Huasteca Railroad cut, Km 10, Hacienda San Miguel, 7.5 km south of Dos Bocas Crater, Canton Ozuluama, Veracruz, Dr. T. W. Vaughan, collector, 1920, one specimen.

Miocene: Quarry, Tuxpan, Mexico, D. R. Semmes, collector, no. 77, U.S.N.M., two specimens.

Family SPATANGIDAE Gray

Genus EUPATAGUS Agassiz

EUPATAGUS MEXICANUS, new species

PLATE 14; PLATE 15, FIGURE 1

Test massive, elongate, ovate, high, rounded, dome-shaped, truncate anteriorly, elongate-ovate posteriorly. Steeply rounded from the apical disk to the anterior border of the test. Ventrally nearly flat except the plastron, which is strongly elevated. The anterior furrow is lacking except for a moderate depression ventrally close to the peristome. The paired ambulacra are flush, wide, petaloid, the anterior pair II and IV curving somewhat forward. The anterior

⁸ Proc. California Acad. Sci., ser. 4, vol. 13, p. 142, 1924.

⁹ Proc. California Acad. Sci., ser. 4, vol. 13, p. 141, 1924. The species *dumblei* was figured as *Schizaster scherzeri* Gabb by Kew, Proc. California Acad. Sci., ser. 4, vol. 7, no. 5, pl. 18, fig. 2, pl. 19, fig. 2, and pl. 20, fig. 2, 1917.

ambulacrum III is narrow, straight, inconspicuous, but widening as it approaches the peristome. The posterior pair of ambulacra I and V extend backward in almost a straight line and are widely divergent from the anterior pair. The pores of the paired ambulacra are dorsally very much alike, the inner pores being rounder and the outer pores elongate. The interambulacra are very wide and are highly rounded in the medium line. Dorsally there are numerous perforate primary tubercles, widely spaced with secondary tubercles and miliaries between them. Ventrally the primary tubercles are larger, more crowded, and with numerous smaller tubercles between them. In the best-preserved specimen the peripetalous fasciole is in part visible. The apical disk is small, with five small ocular and four small genital plates situated at the highest point of the test, which is eccentric anteriorly. The periproct is large, situated posteriorly and just not visible in dorsal view, clearly visible on the posterior slope when viewed ventrally. The peristome is large, situated far anteriorly. The plastron is prominent, elongate, elevated, and relatively narrow.

The holotype (U.S.N.M. no. 496281), which is the smallest of the three known specimens, is selected as such because it is the most perfectly preserved. It measures 127 mm in length, 116 mm in width, and 58 mm in height; the distance from the center of the apical disk to the anterior margin is 27 mm (pl. 14 is slightly foreshortened). The largest specimen measures 152 mm in length, 139 mm in width, and 71 mm in height. This magnificent species is represented by three specimens in remarkably perfect condition of preservation. The tests are not at all compressed or distorted and show surface characters exceptionally well, especially the smallest one of the three.

E. mexicanus approaches nearest to *E. vaughani* Jackson,¹⁰ from the Oligocene of Antigua, West Indies. It differs from *vaughani* in being higher and more steeply rounded anteriorly, in outline more truncate anteriorly, and more elongate-ovate posteriorly. In *mexicanus* the peristome is situated farther anteriorly, and the plastron is narrower and less elevated posteriorly than in *vaughani*.

Lambert (*op. cit.*) records a specimen of *E. vaughani* under the name *Antillaster vaughani* (Jackson) from near Topilla. His specimen, as stated and figured, is incompletely preserved, and it is quite possible that it may be referable to the new species *E. mexicanus*.

Mesón formation, former Corona camp site, at southern end of Cerro La Puerta, Hacienda Santa Fé, Topila, Canton Ozuluama, Veracruz; Corona collection, three specimens, nos. 1-3.

¹⁰ Carnegie Inst. Washington Publ. 306, p. 96, pl. 17, fig. 2; pl. 18, figs. 1, 2, 1922.

Genus *LOVENIA* Desor*LOVENIA DUMBLEI* Kew

Lovenia dumblei KEW, Proc. California Acad. Sci., ser. 4, vol. 7, p. 136, pl. 17, figs. 2a-c, 1917.—ISRAELSKY, Proc. California Acad. Sci., ser. 4, vol. 13, p. 145, 1924.

The genus *Lovenia* is not recorded by Clark and Twitchell as occurring in the United States, and so far as known it is thus far found in America only in Mexico. Lambert (*op. cit.*) describes as a new species *Vasconaster jeanneti* from near Tuxpan, Mexico. This type is nearly allied to *Lovenia*.

A number of fine specimens of *L. dumblei* occur in the collection from several localities of Oligocene age in Mexico:

Transcontinental Railroad, a little east of Km 5, lot 214 Hacienda Chinampa, 10 km east of the town of Chinampa, Canton Tuxpan, Veracruz, from main *Lepidocyclina gigas* bed, Mesón formation, collected by Vaughan, Weaver, and Semmes, 1920, three specimens, no. M.30V; another specimen was collected from the same locality by the same geologists but just above the *Lepidocyclina gigas* bed, no. M.29V; station 49, Transcontinental Railroad, east of construction camp, Mesón formation just below large *Lepidocyclina* bed, D. R. Semmes, collector, one specimen, no. 57. Vaughan and Semmes collected from the Eocene, probably the Tantoyuca formation, on Arroyo Zarco, south side of Peregrina Hill, Hacienda Tamemaz, 9 km southeast of the town of Tempoal, Veracruz, north of road from El Cristo to Dos Caminos, Mexico, from just above the *Venericardia* bed (M.110b V), several fragments of a species of *Lovenia* that resemble *L. dumblei* Kew.

LOVENIA MEXICANA, new species

PLATE 15, FIGURES 2, 3

Test low, cordiform, elongate, truncate anteriorly with a moderately deep anterior furrow, ovately elongate posteriorly. Nearly flat dorsally, flattened and moderately reëntrant about the peristome ventrally. Anterior ambulacrum III narrow, inconspicuous in the moderately deep anterior furrow. Paired ambulacra slightly sunken dorsally, wide, triangular near the apical disk; they narrow toward the ambitus. Interambulacra broad, rounded, bearing dorsally rather small perforate primary tubercles, widely spaced, with secondary and miliary tubercles. There are a number of primary tubercles on the posterior interambulacrum 5, as well as on the other four interambulacral areas. Ventrally the primary tubercles are more crowded. Neither the internal fasciole nor the subanal fasciole could be made out in either specimen, though these characters are quite clear in some of the specimens of *L. dumblei*. In *L. mexicana* the apical disk

is small, situated a little posterior to the center of the test. Peristome transversely oval, situated on the posterior face, just not visible in dorsal view. Peristome wide, sunken, near the anterior border. Plastron very narrow, highly elevated into a rostrum, near the labrum in the center line.

There are two specimens of this new species, the smaller, which is more perfectly preserved, being selected as the holotype (in museum of California Academy of Sciences). It measures 49 mm in length, 45 mm in width, and 15 mm in height. The larger specimen, which is less well preserved in surface characters yet undoubtedly the same species, measures 65 mm in length, 58 mm in width, and 21 mm in height. *L. mexicana* differs from *L. dumblei* in having the posterior interambulacrum 5 carinate. The apical disk is posterior to the center instead of anterior, the primary tubercles are smaller and occur on interambulacrum 5 as well as other interambulacral areas, whereas they are lacking in area 5 in *dumblei*. In *mexicana* the plastron is narrower and at the same time more strongly keeled than in *dumblei*.

Mesón formation, Rancho Nuevo, 2.5 km west-southwest of Mesón, Canton Tuxpan, Veracruz, Mexico, a few miles northeast of Tepezintitla, between Mesón and Cerro Azul, Veracruz; W. F. Cummins, collector, two specimens, California Academy of Sciences, locality X 62.