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STRATIGRAPHIC AND PALEOECOLOGIC SIGNIFICANCE OF A NEW DANIAN BRACHIOPOD SPECIES FROM TEXAS

By H. B. STENZEL, *Houston**)

With 5 figures

Herrn Prof. Dr. Dr. h. c. ERICH BEDERKE zum 70. Geburtstag gewidmet.

Zusammenfassung

An der Typ-Lokalität des Littig phosphorite-cobble paraconglomerate an der Basis der Midway group (Dan-Stufe) wurden drei Brachiopoden-Arten aufgefunden. Eine dieser drei Arten, ein hornschaliger inartikulater Brachiopode, hat wahrscheinlich dasselbe Alter wie das Konglomerat. Er wird nach den aufgefundenen Dorsalklappen als *Discinisca (Discradisca) littigensis* n. sp. bestimmt und ist die älteste Art von 4 Disciniscen, die vom Golf, der Atlantischen Küstenebene und der Karibischen Region bekanntgeworden sind.

Es wird vorgeschlagen, zwei neue Subgenera einzuführen: *Discinisca* s. s. und *Discradisca* n. subgen. Die letztere basiert auf der Typen-Art *D. antillarum* (D'ORBIGNY), die rezent von Kuba bis nach Brasilien vorkommt.

Die geographische Verteilung der Gattung in Süd-, Mittel- und Nordamerika und ihr bathymetrischer Bereich werden diskutiert. In beiderlei Hinsicht streuen jedoch die Beobachtungswerte so stark, daß sie sich paläoökologisch nicht auswerten lassen.

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Abstract

Three species of brachiopods are found at the type locality of the Littig phosphorite-cobble paraconglomerate at the base of the Midway group (Danian). One of the three, a chitinophosphatic inarticulate brachiopod, is probably contemporaneous with the conglomerate. It is described from upper valves as *Discinisca (Discradisca) littigensis* n. sp. and is the oldest of four Disciniscas known from the Gulf and the Atlantic Coastal Plains and the Caribbean region. Two subgenera are proposed: *Discinisca* s. s. and *Discradisca* n. subgen. The latter is based on the type species *D. antillarum* (D'Orbigny), which is found living from Cuba to Brazil. The geographic distribution of the genus in the Americas and its bathymetric range are discussed with the conclusion that both the distribution and the range are too widespread to be useful in paleoecological interpretation.

Résumé

Dans la localité — type du paraconglomérat de Littig à nodules de phosphorite, situé à la base du Midway group (Etage danien), on a trouvé trois espèces de brachiopodes. L'une, un brachiopode inarticulé à coquille cornée, a probablement le même âge que le conglomérat. D'après les valves dorsales trouvées il a été déterminé comme *Discinisca (Discradisca) littigensis* n. sp. et constitue l'espèce la plus ancienne des 4 Discinisées connues du Golfe, du littoral atlantique et de la région des Caraïbes.

Il est proposé d'introduire deux nouveaux sous-genres: *Discinisca* s. s. et *Discradisca* n. subgen. La dernière est basée sur l'espèce-type *D. antillarum* (D'Orbigny) qui se rencontre à l'époque récente depuis Cuba jusqu'au Brésil. L'auteur discute la répartition géographique de l'espèce en Amérique méridionale, septentrionale et centrale, ainsi que son milieu bathymétrique. Considérées toutefois sous ce double aspect, les valeurs observées présentent tellement d'écart que l'on ne peut pas en tirer de conclusions au point de vue paléoécologique.

Краткое содержание

Описан новый вид брахиопод — плеченогих —, найденный в Техасе. Дается их систематика и географическое распространение. Освещаются некоторые вопросы палеоэкологии.

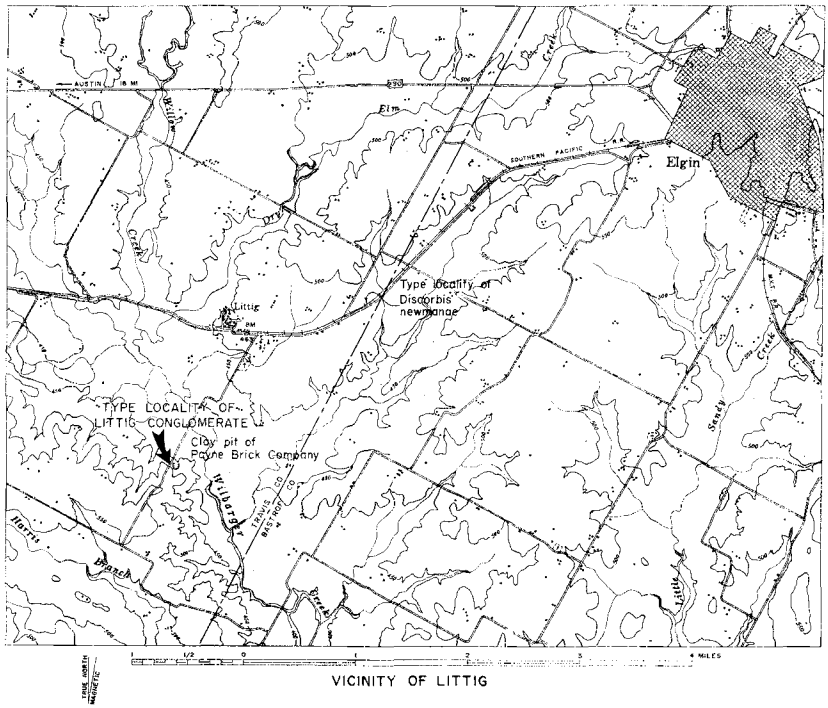
Introduction

A recent investigation of the Littig conglomerate (= Littig glauconite member of Plummer, 1933, p. 536), at its type locality, resulted in the discovery of the remains of three species of brachiopods in the conglomerate, which is a phosphorite-cobble paraconglomerate forming the base of the Midway group (Danian = basal Paleocene) in central and eastern Texas and lies with a well-recognized regional disconformity on strata of the Navarro group (Maastrichtian, Upper Cretaceous).

The fossil remains in the Littig conglomerate come from two sources: (1) indigenous remains of animals that lived contemporaneously with the deposition of the conglomerate and (2) extraneous remains eroded from the underlying Cretaceous beds and incorporated in the conglomerate as more or less abraded pebbles (= remaniement of the French literature). Among the former are a *Gryphaeostrea*, as yet undescribed, and *"Cypraea?*

species" of Gardner (1935, pp. 264—265, pl. 24, figs. 10—11). Among the latter are *Exogyra costata* Say, 1820, and *Baculites* sp. The last two species listed are undoubtedly of Cretaceous age and are also found in the beds underlying the Littig conglomerate.

As can be seen from these data, whether a fossil contained in the Littig conglomerate is of Cretaceous or Paleocene age may be quite dif-



Text-Fig. 1. — Map of the vicinity of Littig, Travis County, Texas, based on the Elgin Quadrangle, Texas, 15 minute series (topographic), *U. S. Geol. Survey*, edition 1950.

ficult to determine. This quandary is apparent with respect to the remains of the three brachiopod species. One of the three, represented by only one abraded internal phosphorite mold, is possibly the *Terebratulina noackensis* STEPHENSON (1941, pp. 70—71, pl. 3, figs. 10—12), a species which was originally found by STEPHENSON in the Kemp clay, locally the highest formation of the Navarro group, only 18½ miles from the Littig type locality. Both its identification and abraded condition suggest a Cretaceous age for this specimen.

The second species is represented by three abraded internal phosphorite molds of an articulate brachiopod. Neither the deltidial plates nor the brachidia can be analyzed satisfactorily, but the specimens appear to be-

long to a new species and a new genus. Their abraded condition and the fact that no part of the original shell material is preserved make it likely that the second species is also derived from the Cretaceous strata beneath the Littig conglomerate.

The third species is represented by 30 dorsal valves. Although they are somewhat chipped, many of them are not abraded and show very fine sculptural detail in the costae and growth lines. The largest is smoothed by abrasion. The fine preservation of surface features on most of the individuals is an indication of the Paleocene age of the third species, but does not furnish incontrovertible proof of its age.

The shell of the third species, which is described here as *Discinisca littigensis* STENZEL, n. sp., is composed of brown, somewhat glossy, semitransparent phosphorite. This material is so transparent in some specimens that, at the bosslike rounded apex of the dorsal valve, where the surface is smooth and free of costae, one can see through the valve wall and discern the opaque phosphorite (francolite) filling of the interior. The interior of the conical, limpetlike dorsal valve of all specimens is completely filled with brown, opaque phosphorite that has filled the valve flush to the level of its base. The flat surface of the phosphorite filling is somewhat glossy and minutely botryoidally knobby. The filling makes the interior features of the dorsal valve inaccessible. As is usually the case with fossil Discinisca, the fragile ventral valves have not been found.

Diagenesis has severely affected the remains of the fauna of the Littig conglomerate. The only remains that have endured this process and remained intact were those composed originally of calcite or phosphate; in contrast, all aragonitic shells have been destroyed. The calcitic valves of *Anomia* and oysters, the outer calcitic layer in the shells of the gastropod familiy Epitoniidae, and the chitinophosphatic shells of inarticulate brachiopods, such as *Discinisca,* have remained intact. Species of gastropods other than those of the family Epitoniidae and species of bivalves other than *Anomia* and other than oysters are not represented by their shells in the Littig conglomerate; they are represented only by rather scarce internal phosphorite molds.

The Littig conglomerate in central Texas consists of two layers:

1) Upper layer — hard, moderate yellowish-brown to light olive-brown (10 YR 5/4 to 5 Y 5/6, when wet, on the Rock-Color Chart distributed by the Geological Society of America, 1951), unbedded-appearing, rough fracturing, glauconitic, phosphorite-pebble-bearing, very impure, conglomeratic limestone or calcareous paraconglomerate somewhat concretionary in outline.

2) Lower layer — friable, slightly cemented, crumbly, dark yellowish-orange to moderate yellowish-brown (10 YR 4/6 to 10 YR 5/4, when wet), green-speckled with glauconite pellets, unbedded-appearing, marly, fossiliferous phosphorite-cobble paraconglomerate extending down into the underlying Kemp clay of the Navarro group (Maastrichtian) in the form of more or less vertical, approximately cylindrical burrow-hole fillings of about 1 foot length and about 1 inch diameter.

In central Texas, these two layers are less than a foot thick. At the type locality of the Littig conglomerate, the following thicknesses were measured by the writer: upper layer, 0.4 to 0.6 foot; lower layer, 0.3 to 0.5 foot; total Littig conglomerate, 0.9 foot. A detailed description of the complete stratigraphic column exposed at the Littig type locality will be published later (manuscript by STENZEL and BARKER in preparation).

Acknowledgments

The writer wishes to express his thanks to Mr. JOHN Q. BURCH of Los Angeles for information concerning commensalism of living Discinisca (letter of April 16, 1960), Dr. G. ARTHUR COOPER for permission to study specimens of *Discinisca* at the U. S. National Museum, Mr. Otto MAJEWSKE and Dr. BOB PERKINS of Shell Development Company for critical reading of the manuscript, Dr. HELEN M. MUIR-WOOD of the British Museum (Natural History) for separates of her articles, and Mr. JESSE POGUE, formerly of Shell Development Company, for information about brachiopods from the coasts of Florida. A lot of 15 dorsal valves was collected by Mr. BOB H. SLAUGHTER of the Shuler Museum of Palaeontology at Southern Methodist University, Dallas, Texas, and generously donated to the author.

The three drawings of the holotype were made by Mrs. MERLE A. COBB of Houston.

Description

Phylum	Brachiopoda CUVIER in DUMÉRIL, 1806
Class	Inarticulata HUXLEY, 1869
Order	Neotrematida (*nomen correctum ex* Neotremata BEECHER, 1891, to conform with the uniform endings proposed by STENZEL, 1950)
Family	Discinidae GRAY, 1840
Genus	*Discinisca* DALL, 1871

Author. — DALL, W. H. (1871), Report on the Brachiopoda obtained by the United States Coast Survey Expedition, in charge of L. F. DE POURTALÈS, with a revision of the Craniidae and Discinidae: Mus. Comp. Zoology Bull., v. 3, no. 1, pp. 37, 41 (May).

Originally proposed as a subgenus of "*Discina* Lam".

Type species. — *Orbicula lamellosa* BRODERIP, 1834 = *Orbicula lamellata* BRODERIP, *in* D'ORBIGNY, 1846 (with *O. lamellosa* in synonymy) = *Discina lamellosa* (BRODERIP), *in* DAVIDSON, 1853 = *Discina (Discinisca) lamellosa* (BRODERIP), *in* DALL, 1871 = *Discinisca (Discinisca) lamellosa* (BRODERIP).

Type designation. — Original. DALL (1871, p. 37) designated the type species as follows: "Type *Discina lamellosa* BROD. Rve., Conch. Icon.,

pl. i, fig. 4, 1862". (The "fig. 4" is evidently an error and should be "fig. 3"; fig. 4 is *Discina laevis* SOWERBY.)

First description of type species. — BRODERIP, W. J. (1834 a), Descriptions of some new species of Cuvier's family of *Brachiopoda:* Zool. Soc. London Proc., pt. 1, 1833. p. 124, not figured. (Pages 117—148 were published on March 12, 1834.) Described as *Orbicula lamellosa* n. sp.

BRODERIP, W. J. (1834 b), Descriptions of some new species of Cuvier's family of *Brachiopoda:* Zool. Soc. London Trans., v. 1, article 17, pp. 142—143, pl. 23, fig. 2. (The whole volume is dated 1835, but pages 91—194 were published in July 1834. The same plate [23] was used to illustrate BRODERIP's article and the succeeding article by RICHARD OWEN; fig. 2 was used in BRODERIP's article, and figs. 3—13, on the anatomy of the species, were used in OWEN's article.)

Type locality and horizon of type species. — "*Hab.* ad Peruviae oras." (Iquiqui. — Bay of Ancon.)

"This species was found by Mr. CUMING in groups, the individuals being in many instances piled in layers one over the other on a sandy bottom, at a depth ranging from five to nine fathoms. At Ancon they were found attached to dead shells and also clinging to the wreck of a Spanish vessel of about 300 tons, which went down in the bay about twelve years ago. The sunken timbers (for the sheathing was gone to decay,) were covered with these shells, much in the same way that beams on land are sometimes invested with flat parasitic *Fungi.* At Iquiqui they were taken adhering to a living *Mytilus.* — W. J. B." (BRODERIP, 1834 a, p. 124.)

The coastal town of Iquique, Province of Tarapacá, is now in northern Chile, at about 20° South Latitude; the coastal town of Ancón is about 25 miles northwest of Lima, Peru, at about 12° South Latitude (see text-fig. 2).

Generic description. — An excellent generic decription was given by J. ALLAN THOMSON (1927, pp. 131—132). The description given below is intended to aid in the recognition of paleontological material.

Shell small, to 35 mm long and 15 mm high, inequivalve. Dorsal valve, the larger one of the two, conical; apex subcentral to subposterior (58—94 percent of length), the slopes convex in nearly all species (a few individuals may have the apex directly above the posterior valve margin or even beyond, overhanging it, at 100 to 111 percent of length, and in these, the posterior slope is concave in the mature and old growth stages). Outline orbicular to oval (width is 102 to 83 percent of length); height generally low (17 to 60 percent of length of valve). Ventral valve smaller, flattened, concave or depressed, thinner and more fragile than dorsal valve. Shell walls chitinophosphatic and minutely tubulous. Surface of dorsal valve concentrically lamellate and either devoid of costae or with radial threadlike costae that may become papillose. Ventral valve has a small longitudinal septum, nearly centrally located; behind it is an impressed disk, externally concave and internally elevated, perforated by a

longitudinal fissure extending from a short distance behind the septum nearly to the posterior margin.

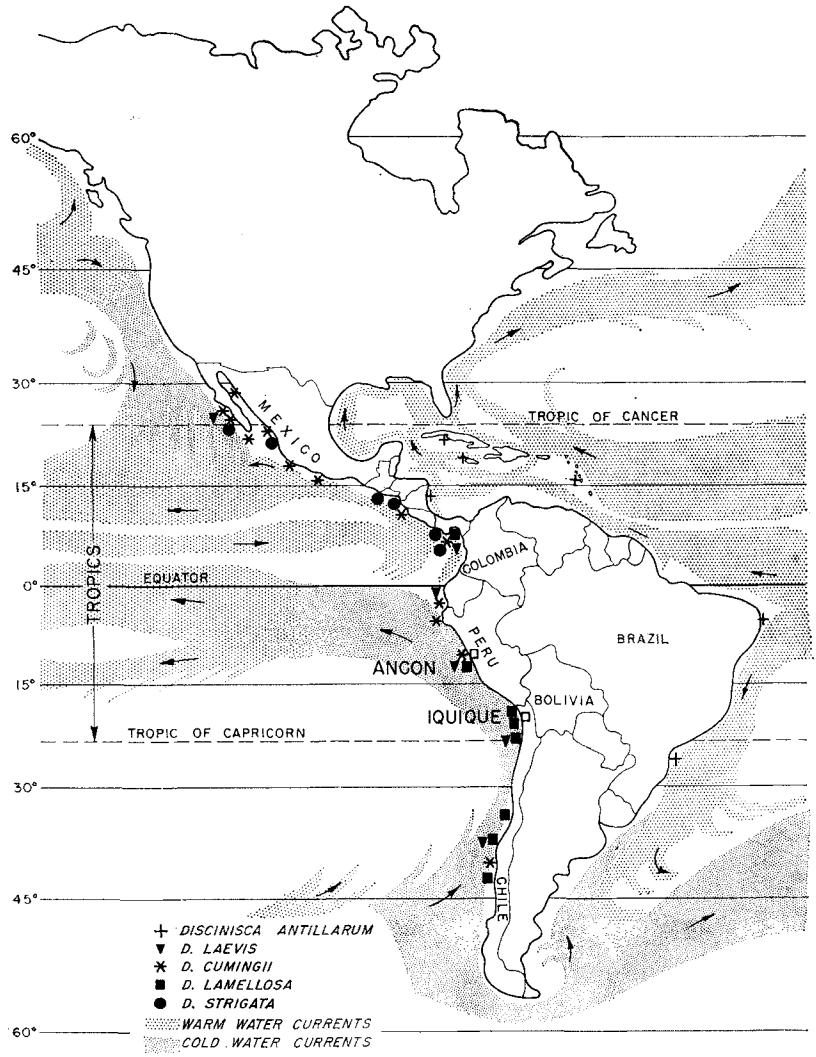
Stratigraphic range of the genus. — One of the earliest species of this genus appears to be *? Discinisca forrierensis* MAILLIEUX (1910) from the Coblenzian, Early Devonian, of Belgium. Other Devonian species possibly referable to *? Discinisca* are mentioned by MUIR-WOOD (1929, p. 467). A late Carboniferous species, *Discinisca tayoensis* REED (1935), was described from Tayò, Santa Catarina, Brazil. Several Jurassic species are mentioned and definitely assigned to the genus by H. M. MUIR-WOOD (1929, p. 467), and two Jurassic species from England were described at a later date (MUIR-WOOD, 1936, pp. 473—476). The genus seems to have persisted essentially unchanged from the Devonian to today.

Geographic distribution. — Living species of *Discinisca* are widely distributed in tropical and temperate regions. They are reported from Bombay, India; Ceylon; the East Indies; the Philippine Islands; Hong Kong; the China Seas; and Japan, as far north as Tokyo. Other living species inhabit the west coasts of the Americas from Chiloé Islands, Chile, in the south, to Punta San Hipólito and Punta Abreojos on the west coast of Baja California and to the head of the Golfo de California in the north. On the Atlantic side, one species, *D. antillarum* (D'ORBIGNY), is found living from southern Florida and Cuba to Brazil. A species has been described from Cape Palmas, west Africa.

The distribution of *Discinisca* in the Americas is of considerable interest (see text-fig. 2). Only one living species is known from the Atlantic side. In contrast, four species are living on the Pacific coasts — *D. cumingii* (BRODERIP), *D. laevis* (SOWERBY), *D. lamellosa* (BRODERIP), and *D. strigata* (BRODERIP). On the Atlantic side, the geographic range is from about 26° South Latitude to about 24° North Latitude; on the Pacific coasts, the geographic range is more impressive — from 43° South Latitude to 31° North Latitude. The species living on the Atlantic side is a tropical form. On the Pacific coasts of the Americas, only the northern part of the geographic range can be called tropical, but at the south, in Chile, the Disciniscas range far beyond the tropics and arid belts well into temperate regions, as they also do in Japan.

In view of its geographic distribution today, *Discinisca* can hardly be regarded as a sure indication of tropical or subtropical waters in paleoecological interpretation as MUIR-WOOD (1939, p. 150) suggested.

Bathymetric distribution. — Living Disciniscas have been collected intertidally on one of the islands in Panama Bay. L. G. HERTLEIN collected *Discinisca strigata* (BRODERIP) in 3—9 fathoms off Taboga Island (HERTLEIN and GRANT, 1944, p. 37). The literature contains many references to the occurrence of living *Discinisca* in depths up to 9 fathoms; other references indicate 10, 15, and 18 fathoms. DALL (1920, p. 279) gave detailed information on *Discinisca indica* DALL collected by the U. S. Bureau of Fisheries from the Philippine Islands and listed the following depths: 28, 37, and 180 fathoms. These figures demonstrate a very considerable depth range for this genus, although the living species are



Text-Fig. 2. — Geographic distribution of the brachiopod genus *Discinisca* in the Americas, based on literature records and specimens at the U. S. National Museum.

abundant at very shallow depth (intertidal to 9 fathoms). JOHN Q. BURCH (letter dated April 18, 1960) reported that "many of a species of this genus are commensal on large gastropods such as *Fascioloria princeps*".

In paleoecological interpretation extreme caution is indicated. In fact, *Discinisca* furnishes sure indication only for marine waters of normal salinity to the exclusion of brackish waters.

Remarks. — DALL (1920, p. 275) pointed out that the living species of the genus *Discinisca* "are naturally divided into three groups as follows:

A. Large, lamellose, flexible, without radiating sculpture.
Examples: *D. lamellosa, D. laevis.*

B. Large, less lamellose, with feeble irregular radiations, more solid.
Examples: *D. strigata, D. cumingi.*

C. Small, with regular radiating sculpture, not lamellose, solid.
Examples: *D. stella, D. antillarum.*

"Groups A and B are confined to the western coasts of the Americas; group C to the east coast of Asia and associated islands and the shores of the Tropical Atlantic."

MUIR-WOOD (1939, p. 156) distinguished two groups among the living and fossil species — species having radial costae on the dorsal valve and species lacking costae; that is, she combined groups B and C of DALL, both of which have radial costae, and placed them in juxta-position to the noncostate group (group A of DALL). HERTLEIN and GRANT (1944, p. 26) also distinguished betwenn costate and noncostate species as the major division of the genus. These two groups very probably have not only different geographic distributions, as concerns the living species, but also form separate phyletic branches of the genus. The radial ribs have a structural significance in that they stiffen the upper valve; hence, they probably have phyletic significance. For this reason, the two divisions of the genus should be named as separate subgenera of *Discinisca*, as shown below.

Subgenus *Discinisca* s. s.

Subgeneric description. — Shell large for the genus (to 35 mm long). Dorsal valve lamellate, flexible, lacking radial sculpture.

Stratigraphic range of the subgenus. — Devonian (?) to today.

Subgenus *Discradisca* n. subgen.

Type species. — *Orbicula antillarum* D'ORBIGNY, 1846 = *Discina (Discinisca?) antillarum* (D'ORBIGNY), *in* DALL, 1871 = *Discinisca antillarum* (D'ORBIGNY), *in* DALL, 1920 = *Discinisca (Discradisca) antillarum* (D'ORBIGNY).

Type designation. — Herewith; that is, original.

First description of type species. — D'ORBIGNY, Alcide (1853?), *in* Ramon de la Sagra, Histoire physique, politique et naturelle de l'île de Cuba: Paris, ARTHUS BERTRAND, p. 368, pl. 28, figs. 34—36. Or in the Spanish edition of the same work, p. 371, pl. 28, figs. 34—36.

Type locality and horizon of type spezies. — The type species was described from Cuba, and it is a living species. " . . . fixée sur un madrépore provenant de l'île de Cuba" (D'ORBIGNY, 1853, p. 368).

Subgeneric description. — Shell small for the genus in many of the species (nevertheless, some species reach a length of 35 mm).

Dorsal valve not much lamellate, not greatly flexible; radial threadlike costae, well developed except around the apex, which is a smooth round boss.

Stratigraphic range of the subgenus. — The oldest species of this subgenus are from the Portlandian and Kimeridgian, Late Jurassic, of England (compare MUIR-WOOD, 1929, p. 468). The type species is living today.

Discinisca (Discradisca) littigensis STENZEL, n. sp.

Description. — Dorsal valve small, conical, low. Outline oval to circular; in the oval ones, the anterior margin is more narrowly rounded than the posterior margin, and the maximal width is about 95 percent of the length and situated subposteriorly at the latitude of the apex. Apex subposterior at approximately three-fifths of length of valve. Slopes of cone slightly convex, including the slope from the apex to the posterior margin. Shell wall, apparently impunctate and semitransparent.

Apex is a small, smooth, and well-rounded boss; it has neither threadlike costae nor spiral volutions. About 1 millimeter from the apex, the slopes begin to show many low, rounded radial threads that grow larger and wider from faint beginnings as they somewhat sinuously descend the slope. Costae and their interspaces about equal in size and cross section. Some costae are added by intercalation during growth. Concentric growth wrinkles slightly raised and irregular.

The smooth apical part of the valve is lighter in color than the costate slopes, which are either uniformly dark brown or have darker brown concentric bands. The darker brown concentric bands coincide with areas in which the growth wrinkles are crowded together; the color of the valve is lighter in areas in which growth wrinkles are spaced wider apart. There are 3—4 such darker concentric color bands on the larger individuals.

Dimensions — Holotype (text-figs. 3—5): length 6.9 mm., maximal width 6.6 mm., height 2.8 mm. Paratype: length 7.4 mm., maximal width 7.2 mm., height 3.1 mm. Paratype: length 6.0 mm., maximal width 5.5 mm., height 1.9 mm. Largest paratype: length 8.8 mm., maximal width 9.1 mm., height 4.8 mm.

Remarks. — Inasmuch as no ventral valves have been found in spite of extended search and the dorsal interiors are inaccessible because of the phosphorite filling, which cannot be removed, one might suppose that the shells belong to limpetlike gastropods instead of brachiopods. The following reasoning led to the conclusion that the specimens are upper valves of brachiopods of the class Inarticulata.

The facts that the apex shows neither a foramen nor traces of spiral volutions and that the posterior slope from the apex to the margin is not concave eliminate many, though not all, limpetshaped gastropods from consideration. However, more weight is attached to the fact that the well-preserved valves are composed of phosphorite. In the Littig conglomerate, several hundred gastropod remains have been found, and this number could easily be increased by extended collecting. These remains represent

many diverse gastropod genera and families, nearly all of which are known to secrete shells composed of aragonite. All the remains, except those of the family Epitoniidae, are merely internal phosphorite molds of shells, proving that gastropod shells composed of aragonite were destroyed by the diagenesis of the conglomerate after they had been filled with phosphorite.

In contrast to the gastropod shells, the limpetlike valves of *Discinisca* are well preserved, as is evidenced by the fine surface detail and the semi-

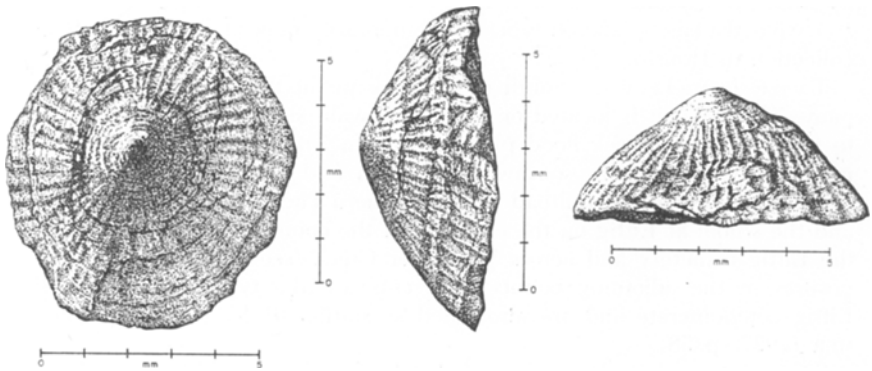


Fig. 3. Fig. 4. Fig. 5.

Text-Fig. 3—5. — *Discinisca (Discradisca) littigensis* STENZEL, n. sp. Top view, side view, and back view of the upper valve; holotype.

transparency of the shell wall, which differs from the common, opaque, and somewhat earthy phosphorite (francolite) composing the internal molds in the Littig conglomerate. The valves must have been phosphatic originally. No limpets are known to produce shells composed of phosphate, but some brachiopods of the class Inarticulata have shells composed of chitin and phosphate, and such shells would readily survive the diagenetic processes that destroyed the aragonitic gastropod shells of the conglomerate. Among the Inarticulata of the Cenozoic, only two genera of the family Discinidae of the order Neotrematida (= Neotremata) have limpetlike and corneous, or chitinophosphatic, shells.

The following species of *Discinisca* are known from the east coast of the Americas and from the Tertiary beds of the Gulf and the Atlantic Coastal Plains:

Discinisca (Discradisca) antillarum (D'ORBIGNY, 1846) living, recorded from Sao Francisco do Sul, Santa Catarina, Brazil (U. S. Nat. Mus.); Goianna, Brazil (U. S. Nat. Mus.); Wounta Haulover, Nicaragua (U. S. Nat. Mus.); Kingston, Jamaica (U. S. Nat. Mus.); Port Royal, Jamaica (U. S. Nat. Mus.); Cuba (D'ORBIGNY); Martinique (DALL, 1889, p. 31); and Fernandina, Florida (DALL, 1889, p. 30).

D. (Discradisca) lugubris (CONRAD) (1834, p. 143, described as *Capulus lugubris;* 1845, p. 75, pl. 43, figs. 2 and 3, described as *Orbicula lugubris*

and *O. multilineata)* from the Calvert, Choptank, and St. Marys formations of Maryland.

D. (Discinisca) aldrichi GARDNER (1928, pp. 239—240, pl. 36, figs. 21—22) from Shoal River formation (Miocene) of the Shoal River, Florida.

D. (Discradisca) littigensis STENZEL from the Littig phosphorite-cobble paraconglomerate, Midway group (Paleocene, Danian) near Littig, Texas.

The Disciniscas of the Cenozoic of western North America have been described in detail by HERTLEIN and GRANT (1944), and those of England by Miss MUIR-WOOD (1929 and 1939).

Type data. — The 30 types are temporarily deposited in the writer's collection in Houston, Texas.

Type locality. — South rim of clay pit of the Payne Brick Company. The clay pit is located on the valley wall, sloping down northward to the Wilbarger Creek flood plain in eastern Travis County, Texas, approximately 6 air miles southwest of Elgin and about 1.52 road miles south-southwest of the railroad track (Southern Pacific Lines), the church, and the school at Littig on the east side of the county road that runs past the Littig cemetery and across Wilbarger Creek (see text-fig. 1). The exposures in the adjoining county road cuts are the type locality of the Littig conglomerate and are also listed as station 61 by Mrs. H. J. PLUMMER (1927, p. 58).

Stratigraphic horizon. — Littig phosphorite-cobble paraconglomerate at base of Midway group, Danian.

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