A NEW SPECIES OF *TURBINELLA* (MOLLUSCA:GASTROPODA) FROM THE PLIOCENE OF MEXICO, WITH A REVISION OF THE GEOLOGIC HISTORY OF THE LINE

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I. INTRODUCTION

In the 20 years since the writer reviewed the genus *Turbinella* in the New World (Vokes, 1964; 1966) there have been many changes in the age assignments of the formations in which the various species occur. Thus, in the table of distribution for the lineage of what was termed therein (1964, p. 40) the "*angulata*" group (in reference to *Turbinella angulata*,* the Recent Caribbean species), those forms shown as "middle Miocene" are now known to be mid-Pliocene (*T. scopula* Olsson, from the Rio Banano Formation of Costa Rica, and *T. magdalenensis* Weisbord, from the Tuberá Group of Colombia) or basal Pleistocene (*T. textilis* Guppy, from the Bowden Formation of Jamaica). In the Florida section what was in 1964 an "unnamed upper Miocene formation" is now the Pinecrest unit, of middle Pliocene age. The Caloosahatchee Formation is assumed to be late Pliocene, as it overlies the Pinecrest and underlies the early Pleistocene Bermont Formation (the "unnamed post-Caloosahatchee formation" of 1964).

With this new information it would appear that there are no members of the "*angulata*" lineage known between the lower Miocene Chipolan species (*T. chipolana* Dall and *T. dalli* Vokes) and the middle Pliocene ones. This is, in large measure, due to the fact that there are almost no geologic outcrops of this age available. For some unknown reason (late Miocene glaciation has been suggested, or perhaps a subsidence of activity along the mid-Atlantic Ridge), there are virtually no beds of late Miocene-early Pliocene age in tropical America.

One of the few exceptions to this is in the Cibao Valley of the Dominican Republic. Here we have a beautiful section ranging from extremely shallow water (Cercado Formation) to very deep water (Gurabo Formation). The lithologies range from conglomerates through sands to shales and coralline limestones. Somewhere in this array of environmental conditions one would assume that the representative of the "*angulata*" line would have lived. But the only examples of *Turbinella* present are either members of the "ancestral" lineage (a new species near *T. valida* Sowerby) or *T. praelaevigata* Vokes (= *T. praeovoidea* Maury *non* Vredenberg), a member of the smooth "*laevigata*" line.

Everywhere in the pre-Pleistocene fossil record of the Caribbean a representative of the "*laevigata*" line seems to predominate. In the early Miocene Cantaure Formation of Venezuela (TU 1269) specimens of *T. falconensis* (Hodson) litter the ground. In younger (Pliocene) beds of the same area (Panamá to Trinidad) we see other members of the line (*T. trinitatis*, *riosecana*, and *colinensis*). In the Florida Pinecrest beds *T. regina* Heilprin is almost ubiquitous.

Today, however, the sole member of the line, *T. laevigata* Anton, is confined to an area along the coast of Brazil, from Amapá to Espirito Santo (Rios, 1975, p. 108), or approximately from the Equator to the Tropic of Capricorn. Here it is found on sandy bottoms, in shallow water. This is the same ecologic niche now pre-empted by *T. angulata* in the Northern Hemisphere. Where this knobby interloper was hiding through the middle and upper Miocene still must remain a mystery. Perhaps, in time, additional localities will fill in the missing section but, for now, the mid-Pliocene sea comes in with a roar that makes the Noachian flood seem believable and brings with it a virtual "explosion" of the "*angulata*" line. In the southern Caribbean *T. angulata* appears (in the

*Complete references for all species mentioned will be found at the end of this paper.

guise of *T. magdalenensis)* in Colombia, and *T. scopula* is seen in Costa Rica. In addition, there is a new species, here described, in the Agueguexquite Formation of the Isthmus of Tehuantepec, Mexico, which is much nearer in shape to the almost smooth *T. scolymoides* of southern Florida than to the very knobby southern forms.

In Florida *T. scolymoides* is still confined to the late Pliocene Caloosahatchee and younger beds – no example has yet been discovered in the earlier Pinecrest beds. As was suggested in the 1966 paper, the absence of *T. scolymoides* from the Pinecrest is probably due to slightly cooler water during the Pinecrest deposition for, as Olsson noted in his original discussion of the Pinecrest fauna (*in* Olsson and Petit, 1964, p. 157), there is a large admixture of northern forms and the whole fauna has a "decidedly Chesapeake Miocene [*i.e.*, mid-Pliocene Yorktown Formation] aspect." This writer suggested that the change from the cooler water Pinecrest fauna to the more tropical Caloosahatchee fauna was brought about by the closing of the Isthmus of Panamá, with its resultant creation of the Gulf Stream bringing warmer waters across Florida (Vokes, 1966, p. 68).

Presumably *T. regina* was able to last for a period of time but was gradually eliminated by the more aggressive(?) "*angulata*" forms and, thus, diasppeared from the Northern Hemisphere by the end of the Pliocene, with the Pleistocene completely dominated by "*angulata*" species: *T. scolymoides, hoerlei*, and *angulata*, in Florida; *T. textilis* in Jamaica; and an undescribed species, presumably a descendant of *T. scopula*, in the Moín Formation of Costa Rica. (See Table 1 – a revised distribution chart for the "*angulata*" lineage.)

The origin of the entire *T. angulata* complex seems to lie with *T. dalli* Vokes from the lower Miocene Chipola Formation. All share virtually identical juvenile shells having an extremely large (ca. 5 mm in diameter) protoconch and strong nodes on all of the teleoconch whorls. The Chipolan contemporary of *T. dalli, T. chipolana* Dall, also has a large protoconch but loses the strong teleoconch nodes after a few whorls. The only other form with this type of development is the early Pleistocene *T. textilis* (Guppy), which when adult resembles the weakly shouldered *T. scolymoides*. However, *T. scolymoides* has strong nodes until approximately the sixth teleoconch whorl, at which point it begins to smooth out; *T. textilis* is just the opposite, the intermediate whorls are almost smooth until about the sixth whorl when it redevelops weak shoulder nodes (an adult of *T. textilis* has been figured by Pilsbry, 1922, pl. 25, fig. 5, as *T. textilis jamaicensis*).

In the 1966 study it was suggestsed that the Brazilian species *T. tuberculata* (Ferreira) was closely related to *T. angulata*

PLATE 1

Figures

1-3. *Turbinella hermani* E. H. Vokes, n. sp.
1. (× 1) USNM 375457 (holotype); height 113 mm, diameter 44.2 mm.
2. (× 2) USNM 375458 (paratype A); height 17.3 mm, diameter 8.8 mm.
3. (× 1) USNM 375459 (paratype B); height 72 mm, diameter 30.9 mm.
Locality of all: TU 638, Agueguexquite Formation, Mexico.

4. *Turbinella angulata* (Solander *in* Lightfoot).
(× 2) USNM 838039; height 16.4 mm, diameter 10 mm (shell removed from an egg-capsule, showing "adult" sculpture on "embryonic" shell).
Locality: TU R-75, Sisal, Yucatán, Mexico.

5. *Turbinella hoerlei* Vokes
(× 2) USNM 375460; height 23.3 mm, diameter 11.7 mm.
Locality: TU 201, Bermont Formation, Florida.

6. *Turbinella scolymoides* Dall
(× 2) PRI 26917a; height 32 mm, diameter 15 mm.
Locality: TU 519, Caloosahatchee Formation, Florida.

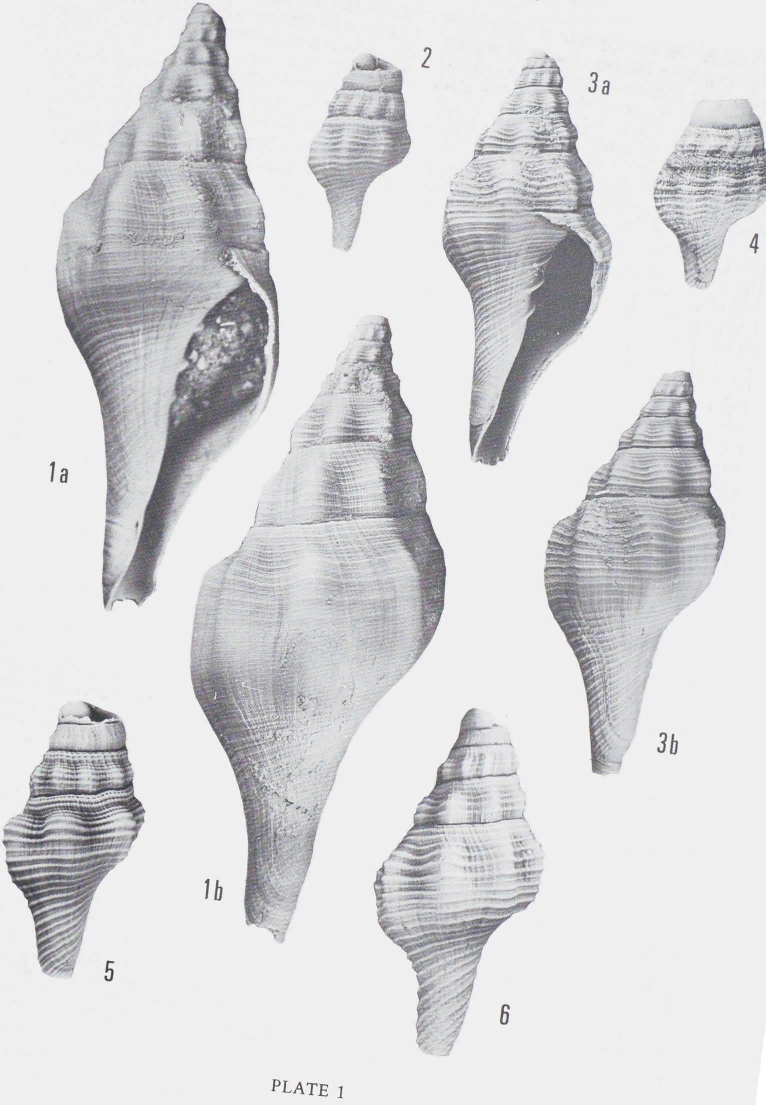

PLATE 1

and might be ancestral to it. However, since that time Ferriera has supplied the writer with plaster casts of *T. tuberculata* and it can be seen that the Brazilian species is more closely allied with the Dominican *T. valida*, and presumably is another member of the "ancestral" lineage, those species with a relatively small protoconch and extremely nodose shells. On the basis of comparative material sent by Ferriera, it is more likely that *T. tuberculata* is the adult of *T. grata* (Maury).

In addition to the changes seen in the history of the "*angulata*" lineage discussed herein, there are, not unexpectedly, many comparable changes in the other two groups previously discussed – the "ancest-

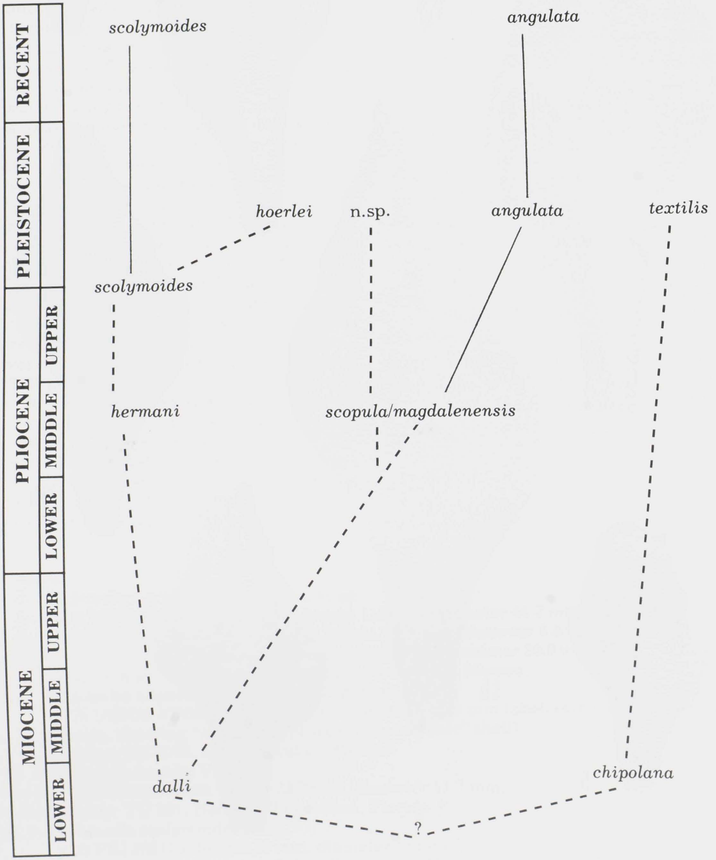

TABLE 1. GEOLOGIC DISTRIBUTION (REVISED) OF THE "*ANGULATA*" LINEAGE OF THE GENUS *TURBINELLA*, IN THE NEW WORLD.

ral" and *"laevigata"* lineages. However, these will be covered in a future paper on the genus *Turbinella* in the Dominican Republic, where there are representatives of both of the other groups.

II. SYSTEMATIC DESCRIPTION

Superfamily VOLUTACEA Rafinesque, 1815

Family TURBINELLINAE Swainson, 1840

Subfamily TURBINELLINAE Swainson, 1840

Genus TURBINELLA Lamarck, 1822

TURBINELLA HERMANI E. H. Vokes, n. sp.
Plate 1, figs. 1-3.

Description: Shell biconic; seven whorls in holotype; protoconch large, probably of four cylindrical whorls, usually truncated and plugged. Ornamentation beginning faintly with initially one median cord, others gradually appearing; by onset of axial ornamentation approximately seven spiral cords; this number remaining constant thereafter; smaller cords intercalated and increasing in size, with adult spiral ornamentation consisting of alternating major and minor cords, separated by tertiary threads; medial portion of adult whorl less ornamented, almost smooth. Axial ornamentation beginning on second or third teleoconch whorl with about ten narrow, sharply elongate ridges, decreasing in number to seven on third and subsequent whorls. First two or three ornamented whorls with moderately strong subsutural band, but subsequently evanescing and not especially conspicuous on adult whorls. Axial ridges continuing as elongate ribs, not elevated at shoulder, with interspaces appearing "pinched-in." Aperture elongate, siphonal canal long and straight; columellar wall bearing three strong plaits.

Holotype: USNM 375457; height 113 mm, diameter 44.2 mm.

Type locality: TU 638, Agueguexquite Formation, road cut, pipeline cut, and quarry, on Mexico Highway 180, 14 miles east of junction with side road into Coatzacoalcos, Veracruz, Mexico.

Figured specimens: Fig. 1, USNM 375457 (holotype). Fig. 2, USNM 375458 (paratype A); height 17.3 mm, diameter 8.8 mm. Fig. 3, USNM 375459 (paratype B); height 72 mm, diameter 30.9 mm. All from locality TU 638. Other occurrence: locality TU 1046.

Discussion: Separation of the various members of the *"angulata"* lineage is almost impossible with a juvenile, as they are all very much alike, but it is simple with an adult shell. Thus, the adult of *T. hermani* may be distinguished from its more southern contemporaries, *T. scopula* and *T. magdalenensis*, by the lack of the strong "knobs" at the shoulder. However, its neighbor to the north, *T. scolymoides*, although similar in being weakly noded, is a more inflated shell with the nodes confined to the shoulder area of the whorl. The younger *T. hoerlei* is also closely related to *T. hermani* , but differs in having more numerous nodes, which also are confined to the shoulder area. Unlike both of these forms, *T. hermani* has the nodes developed from the shoulder to the base of the body whorl, with a deep concavity between these nodes extending across the smooth band encircling the main portion of the body whorl. One might say it has a rather emaciated appearance in contrast to the "plump" Florida species.

Given the stratigraphic constraints presently accepted, we assume that *T. hermani* is ancestral to *T. scolymoides*, which in turn gave rise to *T. hoerlei*, the three forms representing a completely different branch of the *"angulata"* lineage from the typical knobby forms, which began farther south and only moved into the Gulf area with the advent of warmer water, as discussed above.

Although the type material is relatively small, fragments in the type lot indicate an adult of a least 200 mm in height, as large as any of the other species of *Turbinella*. The species is moderately uncommon; the entire type lot consists, in addition to the figured specimens, only of broken columellas, or other pieces, and one additional juvenile.

This new species is named in honor of George Herman, Shell Oil Company. New Orleans, long time friend and "field-assistant," who collected the type specimen at great risk to life and limb.

III. REFERENCES FOR SPECIES CITED

angulata, Voluta SOLANDER *in* LIGHTFOOT, 1786, Portland Cat., p. 76.

chipolana, Turbinella DALL, 1890, Wag-

ner Free Inst. Sci., Trans., v. 3, pt. 1, p. 97, pl. 10, fig. 7.

colininsis, Xancus H. K. HODSON, 1931, Bulls. Amer. Paleont., v. 16, no. 59, p. 40, pl. 21, fig. 4.

dalli, Turbinella E. H. VOKES, 1964, Tulane Stud. Geol., v. 2, no. 2, p. 59, pl. 2, fig. 2.

falconensis, Xancus H. K. Hodson, 1931, Bulls. Amer. Paleont., v. 16, no. 59, p. 40, pl. 22, figs. 1, 3.

gratus, Xancus MAURY, 1925, Serv. Geol. Min. Brasil, Mon. 4, p. 152-153, pl. 7, fig. 4.

hoerlei, Turbinella E. H. VOKES, 1966, Tulane Stud. Geol., v. 4, no. 2, p. 68, pl. 2, fig. 1; pl. 3, fig. 1.

laevigata, Turbinella ANTON, 1839, Verzeichniss der Conchylien, Halle, p. 71.

magdalenensis, Xancus WEISBORD, 1929, Bulls. Amer. Paleont., v. 14, no. 54, p. 46(278), pl. 7(42), fig. 1.

praelaevigata, Turbinella E. H. VOKES, 1964, Tulane Stud. Geol., v. 2, no. 2, p. 52 (*n.n. pro Xancus praeovoideus* Maury *non Turbinella praeovoidea* Vredenberg).

praeovoidea, Turbinella VREDENBERG, 1916, Mem. Indian Mus., v. 6, p. 123.

praeovoideus, Xancus MAURY, 1917, Bulls. Amer. Paleont., v. 5, no. 29, p. 83(247) [as *proavoideus*, corrected in errata], pl. 14(40), fig. 18.

regina, Turbinella HEILPRIN, 1887, Wagner Free Inst. Sci., Trans., v. 1, p. 74, pl. 3, fig. 5.

riosecanus, Xancus H. K. HODSON, 1931, Bulls. Amer. Paleont., v. 16, no. 60, p. 12(106) as *X. praeovoideus riosecanus*, pl. 11(35), fig. 1; pl. 12(36), fig. 1.

scolymoides, Turbinella DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 98, pl. 3, figs. 2, 5.

scopulus, Xancus OLSSON, 1922, Bulls. Amer. Paleont., v. 9, no. 39, p. 111(283), pl. 11(14), fig. 1.

textilis, Fasciolaria GUPPY, 1873, Sci. Assoc. Trinidad, Proc., v. 2, p. 80; 1874, Geol. Mag. (Decade 2) v. 1, p. 410, pl. 16, fig. 5.

textilis jamaicensis, Xancus PILSBRY, 1922, Acad. Nat. Sci. Phila., Proc., v. 73, p. 307, 343, pl. 25, figs. 5, 6.

trinitatis, Xancus MAURY, 1925, Bulls. Amer. Paleont., v. 10, no. 42, p. 208(360), pl. 39(50), fig. 1.

tuberculatus, Xancus FERREIRA, 1964, Mus. Paraense Emilio Goeldi, Bol., (n.s.) Geologia, no. 10, p. 1, pls. 1, 2.

validus, Turbinellus SOWERBY, 1850, Geol. Soc. London, Quart. Jour., v. 6, p. 50.

IV. LITERATURE CITED

OLSSON, A. A., and R. E. PETIT, 1964, Some Neogene Mollusca from Florida and the Carolinas: Bulls. Amer. Paleontology, v. 47, no. 217, p. 509-574, pls. 77-83.

PILSBRY, H. A., 1922, Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo: Acad. Nat. Sci. Phila., Proc., v. 73, p. 305-435, pls. 16-47.

RIOS, E. C., 1975, Brazilian Marine Mollusks Iconography. Museum Oceanográfico, Rio Grande, RGS, Brazil. 331 p., 91 pls.

VOKES, E. H., 1964, The genus *Turbinella* (Mollusca:Gastropoda) in the New World: Tulane Stud. Geol., v. 2, no. 2, p. 39-68, pls. 1-3, 1 text fig., 1 table.

VOKES, E. H., 1966, Observations on *Turbinella scolymoides* Dall, with description of a new species of *Turbinella*: Tulane Stud. Geol., v. 4, no. 2, p. 63-71,2 pls.

V. LOCALITY DATA

201. Bermont Fm., spoil banks at pit just south of Belle Glade (at Belle Glade Camp), Palm Beach, Co., Florida.

519. Caloosahatchee Fm., Harney Pond Canal spoil banks, at Florida Highway 78, northwest side of Lake Okeechobee (NW ¼ Sec. 18, T40S, R33E), Glades Co., Florida.

638. Agueguexquite Fm., roadcut, pipeline cut, and quarry on Mexico Highway 180, 14 miles east of junction with side road into Coatzacoalcos, Veracruz, Mexico.

1046. Agueguexquite Fm., roadcuts on both sides of Mexico Highway 180, 7.5 miles east of junction with side road into Coatzacoalcos, Veracruz, Mexico. (This locality is that described in Perrilliat Montoya, 1960, Paleontologia Mexicana, no. 8, p. 5.)

1269. Cantaure Fm., series of arroyos about 500 yards south of "Casa Cantaure" [which is literally one house and which is about 400 yards south of older, now abandoned, house that was the "Casa Cantaure" of Jung, 1965, and others], 14 km (by road) west of Pueblo Nuevo, Paraguaná Peninsula, Venezuela.

R-75. Beach at Sisal, northwest corner of Yucatán Peninsula, Yucatán, Mexico.

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