OBSERVATIONS ON *TURBINELLA SCOLYMOIDES* DALL, WITH DESCRIPTION OF A NEW SPECIES OF *TURBINELLA*

EMILY H. VOKES
TULANE UNIVERSITY

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I. ABSTRACT

Turbinella scolymoides Dall (Mollusca, Gastropoda), described from the Pliocene of Florida, has been discovered in the Recent fauna of Yucatán. It is suggested that the common Recent species *T. angulata* (Solander *in* Lightfoot) developed independently in the Miocene of the southern Caribbean and subsequently invaded the indigenous northern *T. scolymoides* population, virtually replacing it except in the asylum of the Yucatán area. The lower age limit of *T. scolymoides* is tentatively fixed at the Miocene-Pliocene boundary, possibly due to a warming trend in water temperatures at the end of the Miocene.

II. DISCUSSION

The molluscan fauna of Yucatán, Mexico, is of considerable interest, for some elements are more akin to the Plio-Pleistocene fauna of southern Florida than those of any other western Atlantic area. Many of the Caloosahatchee and post-Caloosahatchee fossils are most closely related to forms presently living off Yucatán. In the summer of 1964, the writer and her husband, Dr. Harold E. Vokes of the Geology Department of Tulane University, spent some time in Yucatán collecting Recent mollusks in the company of Dr. E. Wyllys Andrews, Tulane's archaeologist in residence in Mérida and an accomplished amateur malacologist. By means of a small fishing boat much of the northwestern coast of the peninsula was covered and, for other localities not visited, Dr. Andrews generously shared his personal collection in order to provide the Tulane Geology Department with a suite of Yucatecan Mollusca. Among the specimens in the possession of Dr. Andrews were three unusual representatives of the genus *Turbinella* from Isla Holbox on the northeastern tip of Quintana Roo. The shells are full grown, smooth in outline, and bear almost no trace of the shoulder nodes of the typical *T. angulata* (Solander *in* Lightfoot), so common in the Yucatán region. These specimens appeared to verify the statement made in an earlier study of the genus *Turbinella* (Vokes, 1964, p. 62) to

the effect that it is possible the Florida Pliocene species *T. scolymoides* is still living today off Yucatán. Here indeed were three specimens of the Florida fossil. Dr. Andrews was prevailed upon to part with his "oddities" and they were brought back to Tulane for further study.

The discovery of these Recent specimens of *T. scolymoides* led to a detailed study of the relationship between *T. scolymoides* and *T. angulata.* This study was enhanced by the addition of numerous specimens of Recent *T. angulata* from various Yucatecan localities which proved to be invaluable for comparative purposes. The primary result of the study was to demonstrate that *T. scolymoides* is much closer to *T. angulata* than was previously believed. Dall, in his original description of *T. scolymoides* (1890, p. 98), stated that although the two were similar, *T. scolymoides* was distinguished by "having a more elongated and acute spire and canal, with two more whorls to the same diameter in the young shell." This statement is not borne out by a suite of specimens. Fifty shells, perfect to the apex, were measured at an arbitrary diameter of 20 mm. The specimens which were identifiable as *T. scolymoides* had exactly the same number of whorls as did the *T. angulata* group. The entire lot was remarkably consistent in having five whorls at the diameter of 20 mm. The maximum variation was from 4½ to 5½ whorls with 80% of the specimens having five. In fact, at a total height of less than 80 mm the two forms are indistinguishable. As the size of the shell increases the degree of divergence is more noticeable. At heights of more than 120 mm there is no question of separation. This presents a serious problem to the field geologist, for most specimens found are of a small size and are not truly distinctive. Plate I shows a growth series of both species in which it can be seen that the large shells are readily distinguishable but with decreasing size the differences dwindle. Apparently *T. angulata* and *T. scolymoides* are the end members of two lines which diverged sometime during the Miocene. But the entire *Turbinella* group is so very conservative that little change has taken place in either line since the original separation. For this reason the two species still bear a marked resemblance to each other, a resemblance which is in actuality a resemblance to their common ancestor whatever it may have been. There is a species of *Turbinella* in the Chipola Formation of northwestern Florida, *T. dalli* Vokes, which is the earliest known North American representative of the *T. scolymoides* type. The nature of the ornamentation on the early whorls of this lower (or possibly middle) Miocene species is identical with that of *T. scolymoides,* although the adults differ considerably.

In the post-Caloosahatchee beds, presumably Pleistocene is age, of southern Florida there is a third species which seems to be an offshoot of the *T. angulata* stock. This new species, *T. hoerlei,* is described at the end of this paper. Known from a few localities in western Palm Beach County, it may be only a variant of *T. angulata.*

The close relationship of *T. scolymoides, T. angulata,* and *T. hoerlei,* n. sp., might seem to cast some doubt on the ancestry of the Recent *T. angulata.* It was suggested in the earlier *Turbinella* study that *T. angulata* was apparently more closely related to certain South and Central American species than to the Floridian *T. scolymoides.* In a paper which preceded the writer's 1964 study, although only seen subsequently, another new species of *Turbinella* was described from the Miocene Pirabas Limestone of Pará, Brazil.

PLATE I

TOP ROW: *Turbinella angulata* (Solander *in* Lightfoot), left to right:

(1) Recent, R-68 (4) Pleistocene, TU 727 (7) Pleistocene, TU 201
(2) Recent, R-68 (5) Pleistocene, TU 731 (8) Recent, R-52
(3) Recent, R-75 (6) Recent, R-75

BOTTOM ROW: *Turbinella scolymoides* Dall, left to right:

(1) Pliocene, TU 79 (4) Pliocene, TU 539B (7) Pliocene, TU 79
(2) Recent, R-92 (5) Recent, R-92 (8) Pliocene, TU 539B
(3) Recent, R-92 (6) Pliocene, TU 536

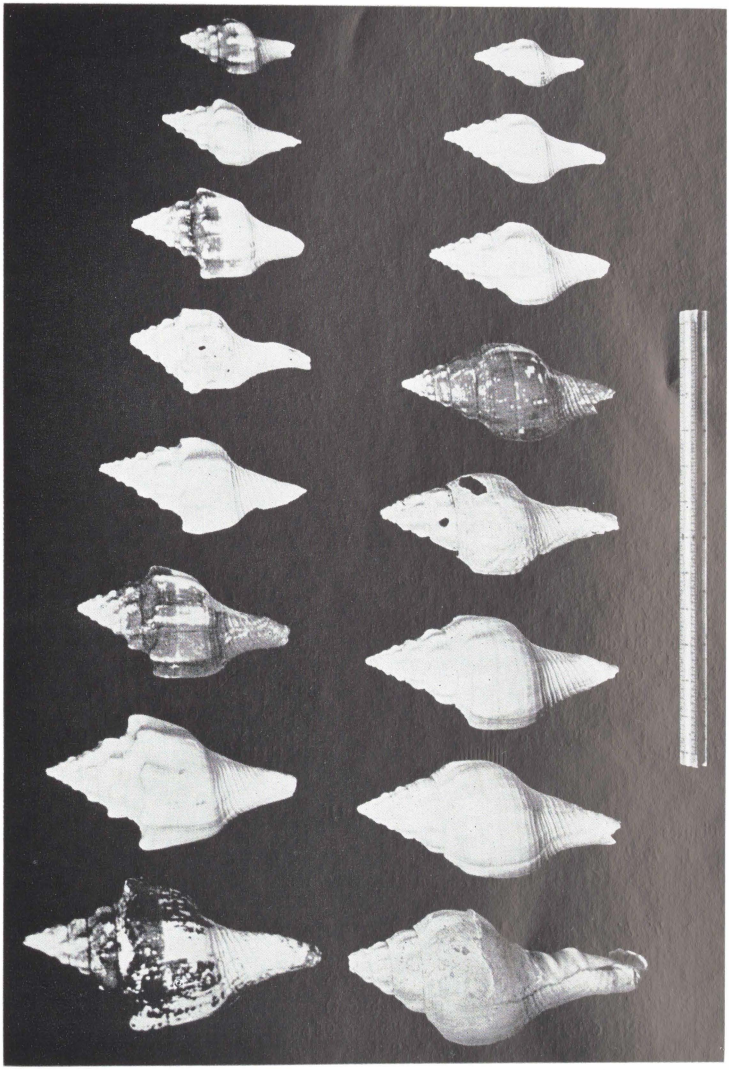

PLATE I

This new species, *T. tuberculata* (Ferreira) (see description below), is almost identical with the Recent *T. angulata.* In the same Pirabas beds there is another *Turbinella, T. brasiliana* (Maury), which was based on a juvenile specimen. By analogy with the young of *T. angulata,* which *T. brasiliana* strongly resembles, it is not improbable that the new species is simply the adult of Maury's juvenile. An absolute decision must await better material.* The discovery of this new species, if indeed it be such, together with the two middle Miocene species, *T. magdalenensis* (Weisbord) from Colombia and *T. scopula* (Olsson) from Costa Rica, tends to confirm the original suggestion that the Recent *T. angulata* has had a separate history in the southern Caribbean, for it is impossible not to consider these forms as directly ancestral to the Recent species. *T. magdalenensis,* especially, is so close to *T. angulata* that it is probably conspecific. It was originally separated because it had fewer nodes (five) and an additional columellar fold. Examination of comparably sized specimens from the Caribbean off northern South America and Panama show that five nodes are to be expected in large specimens as is the addition of a fourth columellar plication. This latter criterion is always unreliable for most large specimens develop an additional fold whatever the locality. Thus we have *T. angulata* existing in the Miocene of northern Colombia with near relatives in Costa Rica and Brazil. At the same time in the more northern reaches of the Caribbean, we find *T. textilis* (Guppy) in the Bowden Formation of Jamaica and a closely related form in the middle Miocene of Santo Domingo. The latter was figured by Pilsbry (1922, pl. 25, fig. 3) for *T. valida* Sowerby, but is not that species as was demonstrated in the *Turbinella* study (p. 48). *T. scolymoides* would almost certainly seem to be a descendant of the more northern form both on geographic and morphologic grounds. It is concluded that *T. scolymoides* represents a side branch on the family tree developing independently from the southern *T. angulata* line. The northern population was invaded by the more vigorous southern form at some post-Miocene time. A few remnants of the *T. scolymoides* line seem to have found asylum off the Yucatán Peninsula.†

* There is a previous *Turbinella tuberculata* named by Broderip in 1833 which would preoccupy Ferreira's usage of the name should his species prove to be valid. In view of the dubious nature of the species, it does not seem wise to rename it without further comparison with *T. brasiliana.* There is, however, also a previous *Turbinella brasiliana* named by d'Orbigny in 1841 so that in any event one new name is necessary, and, possibly, two will prove to be indicated.

† Abbott, in his monograph on the genus *Xancus* (1950, pl. 90) figured three specimens of *T. angulata.* The shell shown in fig. 2 was said to be from Yucatán, and that in fig. 3 from the Bahamas. The resemblance of his fig. 3 to our Yucatán shells, combined with the stated reduction in the plate and his comment (p. 206) that "the spiral threads on the whorls are prominent in some shells, especially two specimens from Yucatán, Mexico," lead one to suspect that his figures are reversed.

PLATE II

Figures Page

1. *Turbinella hoerlei* E. H. Vokes, n. sp. 68
   USNM 645135; height 172 mm, diameter 77 mm.
   Unnamed post-Caloosahatchee formation, TU 201.

2. *Turbinella scolymoides* Dall 64
   USNM 676940; height 195 mm, diameter 85 mm.
   Recent, Isla Holbox, Quintana Roo, Mexico. R-92.

3. *Turbinella angulata* (Solander *in* Lightfoot) 64
   USNM 676941; height 183 mm, diameter 96 mm.
   Recent, Cayos Arcas, Mexico. R-68.

(NOTE: The periostracum has been removed from the Recent specimens to show the sculpture of the underlying surface.)

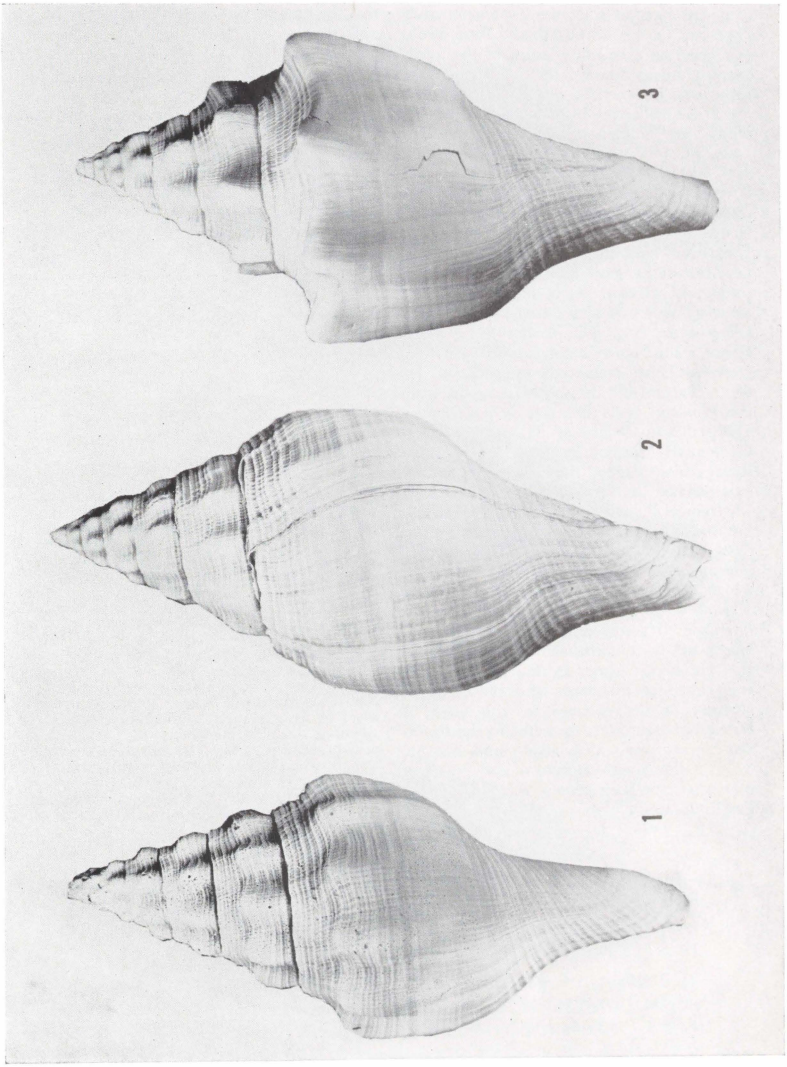

PLATE II

In the interval since the *Turbinella* study appeared, Olsson (*in* Olsson and Petit, 1964) published an excellent account of the stratigraphic differentiation of the upper Miocene beds in southern Florida, now termed the Pinecrest Beds. At none of the localities which are unequivocally upper Miocene (*e.g.,* TU localities 200, 520, 523, 525, 581, 728, 729, 730) are there any specimens of *T. scolymoides.* However, specimens are found at a few localities where the Pinecrest is overlain by the Pliocene Caloosahatchee Formation. As almost all collecting is of necessity from spoil banks, the faunas are frequently mixed. Such localities include those along the Miami Canal south of Lake Okeechobee (*e.g.,* TU locality 541) where Olsson states "both Caloosahatchee and Pinecrest fossils are commonly intermixed." (p. 517). Presumably the specimens come from the Pliocene beds, but this is not certain. The striking absence of *T. scolymoides* at the known Miocene localities suggests that the species is a good index fossil to the Caloosahatchee and post-Caloosahatchee beds. The typical Pinecrest assemblage has a number of "northern" forms giving the fauna, as Olsson says, "a decidedly Chesapeake aspect." Perhaps this indicates slightly cooler water which served to exclude the more tropical *T. scolymoides.* One conjecture which might be made to account for the more tropical aspect of the Caloosahatchee fauna is that the previously open Isthmian passage(s) was closed at this time, and the resultant changes in the currents of the Gulf of Mexico brought warmer water to the southern Florida area. As Olsson points out (p. 522), a significant number of the Pinecrest mollusks have their closest relatives on the Pacific Coast of tropical America, implying that the passage was open during upper Miocene time.

Now that the general stratigraphic succession is becoming understood in southern Florida, it is important to establish marker fossils which will serve to distinguish the various units. As was stated in the author's previous *Turbinella* study, (1964, p. 55), *T. regina* Heilprin is confined to the Pinecrest and Caloosahatchee formations and is never found in the "Unit A" of Olsson. On the other hand, *T. scolymoides* is confined to the Caloosahatchee and later beds. Therefore, a bracketing process is possible. *T. regina* alone would imply Pinecrest; *T. regina* and *T. scolymoides* together would indicate Caloosahatchee; and finally, *T. scolymoides, T. hoerlei* or *T. angulata,* singly or together would mark the "Unit A" horizon.

III. Systematic Descriptions

Turbinella hoerlei E. H. Vokes, n. sp.

Plate II, fig. 1; Plate III, fig. 1

Diagnosis: Shell biconic; body whorl and canal two-thirds of the total height. Nine whorls in the adult shell including the nucleus which consists of slightly less than one completely smooth whorl. Ornamentation begins faintly with about 13 axial nodes on the first post-nuclear whorl, gradually increasing in size and decreasing in number to between six and eight on each of the next four whorls. These axial nodes then increase to about nine on the penultimate whorl and to eleven on the adult body whorl. The nodes are small and rounded and are separated from the suture by a pre-sutural band or constriction. This band is a conspicuous feature beginning at the earliest post-nuclear whorls. The spiral ornamentation consists of alternating coarse and fine threads. On the first ornamented whorl there are about eight of the coarse primary threads and this number remains constant

PLATE III

Figures

1. *Turbinella hoerlei* E. H. Vokes, n. sp. 68
USNM 645135; height 172 mm, diameter 77 mm.
Unnamed post-Caloosahatchee formation, TU 201.

2. *Turbinella scolymoides* Dall 64
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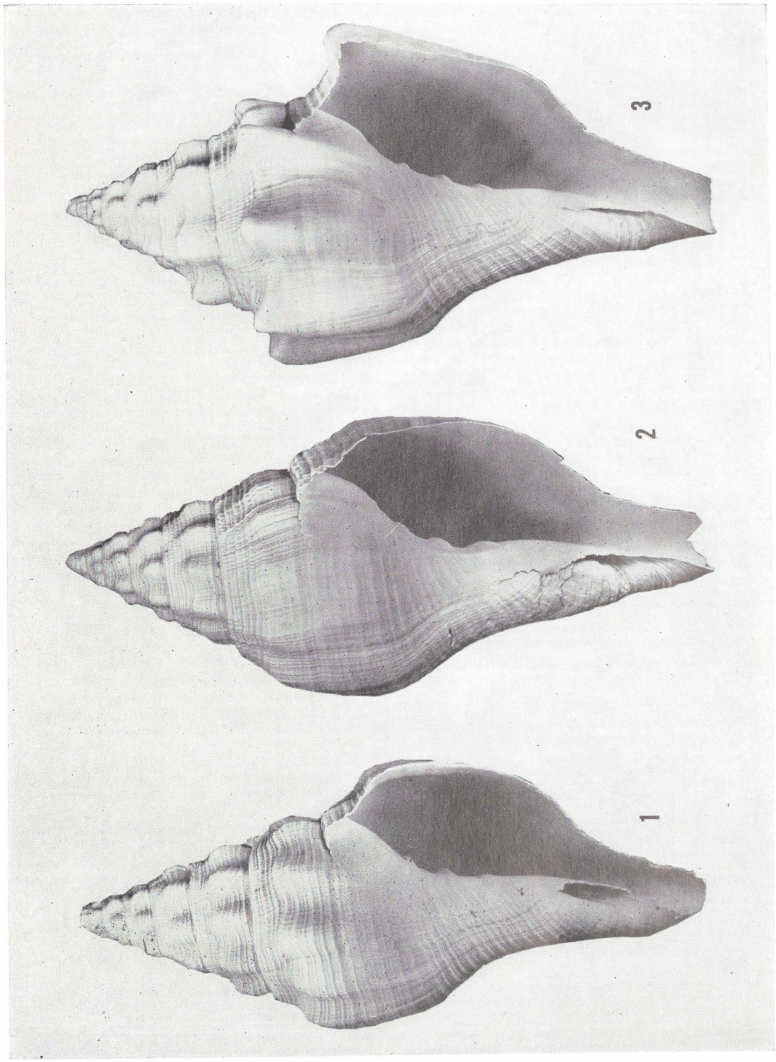

PLATE III

up to the body whorl. As the shell increases in size a few tertiary threadlets are intercalated; on the body whorl of the adult the secondary threads attain the same size as the primaries and these tertiaries become the alternating fine threads. The body whorl of the adult shell is marked by a relatively smooth spiral band about one inch in width. Between this area and the suture there are approximately 12 strong spiral threads with the usual alternating finer secondaries. Anterior to the band, on the siphonal canal, there are about 15 primary threads with secondaries and occasionally a few tertiaries. The axial ornamentation, in addition to the nodes, consists of myriad small growth lines which, crossing the spiral threads, give rise to a marked reticulate pattern, especially in the area of the presutural constriction. The anterior canal is long, and straight, with a large fasciole. The columella bears three strong plaits with sometimes a faint fourth anterior plait.

Dimensions of holotype: height 172 mm, diameter 77 mm.

Holotype: USNM 645135

Type locality: TU 201, pits on Florida Highway 80, just south of Belle Glade, Palm Beach County, Florida. Paratype material from TU localities no. 580 (?), 725, and 733.

Discussion: This new species is an offshoot of the typical *T. angulata* line and it is virtually impossible to differentiate the juvenile shells of the two species. However, the adults are so consistently different that the separation of the species seems to be justified.* The specimen figured in the author's *Turbinella* study (1964, pl. 3, fig. 1b) as a young *T. scolymoides* is probably this species as the locality from whence it came is in the geographic area of *T. hoerlei* and the other fauna is comparable. Unfortunately there have been no adults collected at this locality (TU 580) so that positive identification must wait.

The adult *T. hoerlei* is distinguishable from the adult *T. angulata* by the smaller, more numerous axial nodes. It differs from the adult *T. scolymoides* in having a more slender outline and in the retention of the axial nodes in the adult. Plates II and III show adult specimens of the three different species for comparison. The juveniles of the three species are virtually indistinguishable.

This new species [pronounced "hurl-i"] is named in honor of Mr. Robert C. Hoerle, of West Palm Beach, Florida, who collected the type specimen.

* Druid Wilson, of the U. S. Geological Survey, expresses doubt as to the validity of this species. He is reluctant to agree that three distinct but closely related species could be recovered from nearby localities of similar age. However, there is other evidence of ecologic differences in the Belle Glade area and the exact nature of the ecologies represented must await further study.

In order to keep the catalogue of the New World *Turbinella* complete, herewith is given the description of *T. tuberculata* (Ferreira).

TURBINELLA TUBERCULATA (Ferreira)

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

Diagnosis: Shell very large, heavy, fusiform, with 7 to 8 slightly elevated whorls, having on top of each whorl 8 pointed tubercules, suture poorly defined. The last whorl, rather inflated, corresponds to 2/3 of the total length of the shell, including the siphonal canal. The ornamentation consists only of axial lines well visible on the end of the last whorl. Siphonal canal rather long, not twisted. Columella with 3 deep sulcations, whose interspaces are wider than the sulcations. Umbilicus poorly defined, behind the anterior labium.

The characteristic marks of the new *Xancus* are its strong and pointed tubercules which in combination give the aspect of a crown to the first turns and also, the slight elevation of those turns. (Ferreira, 1964, *translated.*)

Dimensions of holotype: Height 185 mm, diameter 97 mm.

Holotype: No. 4841-I, Coll. Inv. Foss., Dept. Geol., Museu Nacional, Rio de Janeiro.

Type locality: Castelo, ilha de Fortaleza, baía de Pirabas, São João de Pirabas, Município de Salinópolis, Pará, Brazil.

IV. LOCALITY DATA

79. Caloosahatchee Fm., Ortona Locks, Caloosahatchee River (Sec. 27, T42S, R30E), Glades Co., Florida.
200. Pinecrest Beds, borrow pits about one mile south of Acline, (Sec. 29, T41S, R23E), Charlotte Co., Florida.
201. Unnamed post-Caloosahatchee formation, spoil banks at pits just south of Belle Glade, Palm Beach Co., Florida.
519. Caloosahatchee Fm., Harney Pond Canal spoil banks, northwest side of Lake Okeechobee, (NW ¼ Sec. 18, T40S, R33E), Glades Co., Florida
520. Pinecrest Beds, spoil banks, canal 0.9 mile east of Brighton, (Sec. 25, T37S, R32E), Highlands Co., Florida.
523. Pinecrest Beds, Harney Pond Canal spoil banks, six miles northwest of Florida Highway 78, Brighton Indian Reservation (NW ¼ Sec. 22, T39S, R32E), Glades Co., Florida.

525. Pinecrest Beds, U. S. Highway 41, at "Forty-mile Bend," Dade Co., Florida.
536. Caloosahatchee Fm., south bank of Caloosahatchee River, about one mile east of La Belle, (Sec. 3 & 4, T43S, R29E), Hendry Co., Florida. [Note: this locality is same as that designated by Olsson (1964, Olsson and Petit, p. 519) as type locality of the Caloosahatchee Fm.]
539B. Caloosahatchee Fm., lower beds Shell Creek, about eight miles east of Cleveland, (Sec. 30, T40S, R25E), Charlotte Co., Florida.
541. Caloosahatchee Fm. and Pinecrest Beds, Miami Canal spoil banks, two miles north of pumping station at Broward county line, Palm Beach Co., Florida.
580. Unnamed post-Caloosahatchee formation, North New River Canal spoil banks, one mile south of South Bay, Palm Beach Co., Florida.
581. Pinecrest Beds, U. S. Highway 41, about five miles west of "Forty-mile Bend," pits at Collier-Dade county line, Collier Co., Florida.
725. Unnamed post-Caloosahatchee formation, North New River Canal spoil banks, three miles south of South Bay, Palm Beach Co., Florida.
727. Unnamed post-Caloosahatchee formation, 2.2 miles east of U. S. Highway 27, 15 miles south of South Bay, Palm Beach Co., Florida.
728. Pinecrest Beds, spoil banks west side of Kissimmee River at U. S. Corps of Engineers Structure 65-D, (Sec. 28, T63S, R33E), Highlands Co., Florida.
729. Pinecrest Beds, spoil banks west side of Kissimmee River, approximately ¼ to ½ mile south of Structure 65-D (TU 728), (Sec. 33, T36S, R33E), Highlands Co., Florida.
730. Pinecrest Beds, Railroad embankment fill, Seaboard Air Line, from ¼ to ½ mile east of Ft. Basinger Station, (NW ¼ Sec. 20, T36S, R33E), Highlands Co., Florida.
731. Unnamed post-Caloosahatchee formation, spoil banks West Palm Beach Canal, at junction of U. S. Highways 441 and 98, 7 miles west of Loxahatchee, Palm Beach Co., Florida.
733. Unnamed post-Caloosahatchee formation, North New River Canal spoil banks, one mile north of South Bay, Palm Beach Co., Florida.

The following are Recent localities:

R-52. Isla Carmen, Bay of Campeche about one mile west of Aguada, Campeche, Mexico.
R-68. Cayos Arcas, reef approximately 100 miles west of Campeche, Mexico.
R-75. Sisal, northwestern Yucatán Peninsula, Yucatán, Mexico.
R-92. Isla Holbox, northeastern Yucatán Peninsula, Territory of Quintana Roo, Mexico.

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