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LAND SNAILS OF THE GENUS *COELOCENTRUM* FROM NORTHEASTERN MÉXICO

Fred G. Thompson[1] and Alfonso Correa[2]

ABSTRACT

Eleven species of *Coelocentrum* (GASTROPODA, PULMONATA, Urocoptidae) are recorded from northeastern México. Species recognition is most compatible with the evolutionary species concept. Three subgenera occur in the area (*Coelocentrum* s. s., *Ptychodonta* and *Crossostephanus*). The latter two subgenera are redefined; *Coelocentrum* (*Crossostephanus*) *palmeri* Dall and Bartsch, 1908 is described; *C. hinkleyi* Pilsbry, 1909 is transferred from *Coelocentrum* s. s. to *Crossostephanus* and is figured for the first time. The following new species are described: *Coelocentrum* (*s. s.*) *penion*, new species; *Coelocentrum* (*Ptychodonta*) *telescopium*, new species; *Coelocentrum* (*Ptychodonta*) *brachyacron*, new species; *Coelocentrum* (*Crossostephanus*) *affinis*, *new species*; *Coelocentrum* (*Crossostephanus*) *priosculpta*, new species; *Coelocentrum* (*Crossostephanus*) *paucinoda*, *new species*, and *Coelocentrum* (*Crossostephanus*) *torosum*, new species.

Key Words.– Biodiversity, speciation, México, Hidalgo, Querétaro, San Luis Potosí, Tamaulipas, landsnail, Gastropoda, Pulmonata, Urocoptidae, *Coelocentrum*.

RESUMEN

En el noreste de México se registran once especies de *Coelocentrum* (GASTROPODA, PULMONATA, Urocoptidae). El reconocimiento de estas especies es más compatible con el concepto evolutivo de especies. En el área existen tres subgéneros (*Coelocentrum s. s.*, *Ptychodonta* and *Crossostephanus*), de los cuales los dos últimos subgéneros son redefinidos: *Coelocentrum* (*Crossostephanus*) *palmeri* Dall and Bartsch, 1908 es descrita; *C. hinkleyi* Pilsbry, 1909 es descrita y dibujada por primera vez y tranferida de *Coelocentrum s. s.* a *Crossostephanus*. Las siguientes nuevas especies son descritas: *Coelocentrum* (*s. s.*) *penion*, especie nueva; *Coelocentrum* (*Ptychodonta*) *telescopium*, especie nueva; *Coelocentrum* (*Ptychodonta*) *brachyacron*, especie nueva; *Coelocentrum* (*Crossostephanus*) *affinis*, especie nueva; *Coelocentrum* (*Crossostephanus*) *priosculpta*, especie nueva;

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Coelocentrum (*Crossostephanus*) *paucinoda*, especie nueva, y *Coelocentrum* (*Crossostephanus*) *torosum*, especie nueva.

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INTRODUCTION

Recent field work in northeastern México reveals a rich radiation of urocoptoid land snails of the genus *Coelocentrum*. The area discussed in this study includes portions of Tamaulipas, San Luís Potosí, Querétaro and Hidalgo along the eastern fringe of the Sierra Madre Oriental (Fig. 1). This area contains numerous limestone mountain ranges with complex climatic patterns and vegetation zones that provide a myriad of diverse and isolated habitats. These conditions are favorable for speciation among organisms, such as *Coelocentrum*, that are obligate inhabitants of calcareous terrains and have very limited vagility. Supraspecific diversity is greater in this area of México than what we have encountered elsewhere throughout the range of the genus. The area represents the northern extent of *Coelocentrum* s. s. and it contains two locally endemic subgenera, *Ptychodonta* and *Crossostephanus*. Our results are an under-measure of the

species diversity in this area. Surely many additional species will be discovered with further exploration.

Coelocentrum species generally occur in colonies that are isolated by seemingly minor, but real, ecological or physiographic barriers. Such isolation has resulted in the evolution of numerous forms that have differentiated to varying degrees, depending on the extent to which they have been genetically independent from their nearest ally. Both the biological species concept (BSC) and the phylogenetic species concept (PSC) are difficult to apply to patterns of speciation such as occurs in *Coelocentrum* (Frost and Hillis, 1990). Both are testable only when related biparental forms occur in sympatry and reproductive isolation can be demonstrated. In the absence of sympatry they yield subjective and indecisive classifications. The only case we have encountered of sympatry in *Coelocentrum* involves species belonging to different subgenera. These are a new species described below of the subgenus *Coelocentrum* and *C.* (*Crossostephanus*) *palmeri*. We have collected *Coelocentrum* from numerous other localities in México, Guatemala and Belize, and all of these involve monotypic allopatry.

ACKNOWLEDGMENTS

We wish to thank Steven P. Christman and Charlotte M. Porter (both of the Florida Museum of Natural History), who have assisted us in the field. The following individuals loaned us specimens in their care: Rüdiger Bieler (Field Museum of Natural History); Robert Hershler (U. S. National Museum of Natural History). The distribution map of *Coelocentrum* in northeastern México (Fig. 1) was prepared by Anne V. Stokes. Photographs, including scanning electron micro graphs (SEM's) were prepared by Elizabeth L. H. Raiser. Judy L. Donley and Mary Lou Lyman assisted with the final preparation of the text. M. C. Juan R. Trevino Higuera (Director, Consejo Tamaulipeco de Ciencia y Tecnología (COTACYT) and Ing. Tomás Garza Wong (Director, Instituto Technologico de Cd. Victoria, Tamaulipas) provided economic support for the second author's participation in this project. We are grateful to all of these persons for their assistance.

METHODS

Taxonomic treatment of organisms that are allopatric and very restricted ecologically, such as *Coelocentrum*, is most compatible with the evolutionary species concept (ESC) as discussed by Frost and Hillis (1990). We have chosen to recognize as species those forms that are (1) morphologically distinct, (2) that have had an independent evolutionary history because of geographic and physiographic

isolation, and (3) that can be predicted to have an independent evolutionary trajectory because of physiographic barriers that preclude reestablished genetic contact with closely related taxa. The evolutionary species concept invokes some degree of subjectivity regarding the recognition of species based on the above criteria. The other concepts are more burdensome and yield interpretations that are equally or more subjective.

Earlier descriptions of decollate land snails sometimes are difficult to interpret because of ambiguity about what characterized the length and number of whorls in the adult shell. Some descriptions include all of the remaining whorls above the apical plug (Dall, 1908). The point at which the apical plug develops shows relatively little variation within a given species and it is an important parameter of the adult shell morphology. Most specimens also retain vestiges of the juvenile shell above the plug. The vestiges may be small fragments of the previous whorl, or they may be several complete whorls. Occasional adults retain the entire embryonic and juvenile shell, even though an apical plug is formed at an appropriate lower whorl. Unqualified measurements and counts of such shells provide data that erroneously represents a given species.

Measurements used in this study were determined as follow. The number of whorls includes only those from the upper end of apical plug to the aperture. The length of the shell is measured from the top of the apical plug to the base of the aperture. Portions of the juvenile shell that remained above the plug were removed to take this measurement. The width of the shell is the width of the spire and excludes the neck and aperture.

Data on embryonic and juvenile shell morphology are useful for showing species relationships. The embryonic shell and subsequent juvenile shell are conservative in size, rates of growth and sculpture. Species with similar embryonic and juvenile shells may differ strikingly as adults (*Crossostephanus*). Conversely, differences in juvenile shell characteristics may be highly significant for distinguishing species (*Ptychodonta*).

Genus *Coelocentrum* Fischer and Crosse, 1872

Subgenus *Coelocentrum* s. s.

TYPE SPECIES: *Cylindrella turris* Pfeiffer, 1856.

The typical subgenus, *Coelocentrum* s. s., includes about twenty species. A small group, which includes *C. tanydeira* Thompson, 1968 and the species described below, is found in northeastern México. Other species of *Coelocentrum s. s.* inhabit Veracruz, Tabasco, Chiapas, Belize and Guatemala.

The correct subgeneric assignment of the two species from northeastern México is uncertain. Typical *Coelocentrum* (*C. turris*) has relatively large, inflated, button-like embryonic whorls (Fig. 48), whereas *C. tanydeira* and the species

species described below have much narrower and relatively flattened whorls (Fig. 47). In both groups the embryonic sculpture consists of short segments of thread-riblets along the shoulders of the whorls below the suture.

Coelocentrum penion, new species

DESCRIPTION (Figs. 2-6).-- The shell is moderately small, about 20.0-27.0 mm long and 6.3-7.7 mm wide. Moderately stocky, about 0.23-0.35 times as wide as long. The shell is ovate-cylindrical in shape, and resembles a small spool of twine in appearance. It is widest near the middle and tapers toward both ends. The first whorl at the apical plug is 3.0-3.7 mm wide and is broadly perforate. The umbilicus is imperforate. The aperture has a long slender descending neck that is slightly longer than the diameter of the last whorl (Figs. 3, 5). The neck is rounded but dorso-ventrally compressed. The aperture is obovate in shape and is wider than long. It is small, being about 0.41-0.56 times the width of the shell. The peristome is uniformly narrow and reflected. The periostracum is light yellow-brown in color and shiny. The peristome and the interior of the aperture are white. Adult shells have 13.3-18.7 whorls below the apical plug. The whorls are rounded at the periphery and are sculptured with narrow recurved axial ribs that are about 1/5-1/7 the width of their intervals; 46-56 ribs on penultimate whorl, 49-63 on fifth and 45-58 on tenth whorl. The ribs on the neck are more crowded and completely encircle the neck. The forward face of the ribs are slightly concave. Their lower ends are expanded and knobby at the suture; their upper ends are forked just below the upper suture producing a thinner, forward-directed branch that partially coalesces with the next rib to produce a spiral subsutural thread. The interspaces have occasional-numerous impressed spiral line-segments. The axis is about 0.33-0.43 times the diameter of the shell and is concave in outline between the septa (Fig. 5). The axis is sculptured with about 15 oblique riblets that are separated from the bottom septum to form a narrow spiral channel. The riblets bear several small pointed knobs which may combine to form short combs. Measurements of adult shells are given in Table 1. The juvenile shell remains unknown.

TYPE LOCALITY.-- Sierra de Cucharas, 7 km by road west of Gómez Farías, TAMAULIPAS (23°03'20"N, 90°10'21"W); 730 m alt. HOLOTYPE: UF 190974; collected 25 June 1991 by Alfonso Correa. PARATYPES: UF 193540 (2); same data as the holotype. PARATYPES: UF 193541 (4), ITCVZ 1005 (3); the same general area at 430 m alt. (23°01'24"N, 99°09'42"W). The type locality is on the east slope of the Sierra de Cucharas at the second bend of the road ascending to San Jose,. The area was covered with a dense second-growth thicket of mountain rain forest. Live snails were found in holes and pits perforating the limestone. The locality at 430 m is not as wet as the type locality, but otherwise it is similar ecologically.

TABLE 1.– *Coelocentrum penion*,, new species. Measurements in mm for the holotype and seven paratypes. L = length; W = width; ApH = aperture height; ApW = aperture width; Wh = whorls; RP = ribs on penultimate whorl; R5 = ribs on fifth whorl; R10 = ribs on tenth whorl.

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	27.0	6.3	2.6	3.0	18.7	52	51	45
paratype	23.3	7.0	2.7	3.2	15.0	56	49	45
paratype	20.0	6.9	2.6	3.3	13.3	49	65	51
paratype	26.8	7.1	2.9	3.4	18.2	48	58	43
paratype	26.6	6.4	3.2	3.6	17.8	50	50	52
paratype	25.1	6.8	2.9	3.3	17.2	46	54	57
paratype	25.4	7.7	3.0	3.2	15.2	47	63	57
paratype	25.7	6.6	3.0	3.3	16.0	48	-	-

TABLE 2.– *Coelocentrum tanydeira* Thompson, 1968. Measurements in mm for the holotype (UF 19040) and seven paratypes (UF 19042). Abbreviations as in Table 1.

Specimen	L	W	ApH	ApW	Wh	RP	R5	R1
holotype	27.3	6.1	3.4	3.5	16.0	64	58	54
paratype	29.8	6.4	3.3	3.6	16.4	54	62	61
paratype	28.4	6.0	3.4	3.6	16.3	53	60	68
paratype	27.4	6.0	3.2	-	16.2	-	-	-
paratype	27.3	6.2	3.2	-	15.3	54	57	67
paratype	26.8	6.0	3.2	3.6	15.1	55	64	50
paratype	26.0	5.0	3.4	3.5	15.7	57	60	61
paratype	25.5	6.0	3.2	3.5	15.3	54	70	50

DISTRIBUTION.-- Known only from the area about the type locality.

REMARKS.-- *Coelocentrum penion* is most closely related to *Coelocentrum tanydeira* Thompson, 1968, a species found near Xilitla, San Luís Potosí. Meristic data for *C. tanydeira* are given in Table 2. The two snails are similar in size and appearance. Both species have a long neck projecting forward from the last whorl, and both have broken incised spiral line-segments in the interspaces between the ribs. *C. tanydeira* differs from *C. penion* by having a more slender, nearly cylindrical shape, a relatively shorter and rounded neck (Fig. 7), a larger aperture, its costate sculpture, and its columellar sculpture. In *C. tanydeira*, the aperture is 0.56-0.60 times the width of the shell; in *C. penion*, it is only 0.41-0.56 times the width. In *C. tanydeira*, the ribs on the surface of the shell are closer, being about a third of the width of their interspaces and are connected by a heavier subsutural spiral cord that crosses over the upper ends of the ribs. The anterior face of the ribs slopes forward in contrast to the concave face in *C. penion*. The riblets on the columella of *C. tanydeira* are sculptured with minute granules along their edges, unlike the pointed irregular knobs in *C. penion*. *C. tanydeira* differs also by having an imperforate apical whorl in adult shells, in contrast to the broad perforation in *C. penion*.

ETYMOLOGY.-- The species name *penion* is derived from the Classical Greek *penion*, a spool. It alludes to the resemblance of the shell to a small spool of twine.

Subgenus *Ptychodonta* Bartsch, 1906

TYPE SPECIES: *Coelocentrum astrophorea* Dall, 1897.

The subgenus consists of a small group of species from northwestern Hidalgo and eastern Querétaro. It is characterized by having moderate-sized embryonic whorls that bear numerous, close, complete thread-riblets (Fig. 46), and by having a sharp, turgid, spiral ridge on the columella. The ridge bears a row of short radial spines. The ridge is a hollow evagination of the columellar wall, and is not a solid lamellar blade such as occurs in other genera (e. g. *Oligostylus, Anisospira* and *Holospira*).

Coelocentrum astrophorea Dall, 1897

Coelocentrum astrophorea Dall, 1897. Nautilus, 11: 62.-- Bartsch, 1906; Proc. U. S. National Museum, 31: 118; text figs. 5-6.-- Pilsbry, 1903; Manual of Conchology, Ser. II, 15: 45.
Coelocentrum acanthophorea Martens, 1901. Biologia Centrali-Americana: 634. (Amendment for *astrophorea* ?).

TYPE.-- Holotype USNM 134696 (lost).

TYPE LOCALITY.-- Encarnacion, Hidalgo, México.

DISTRIBUTION.-- Known only from the type locality.

REMARKS.-- Dall (1897) gives no indication about the number of specimens that comprise the type series. Bartsch (1906) gives measurements for the type and three paratypes. Recently, none of the type specimens could be located in the USNM collection, and presumably they are lost.

Coelocentrum telescopium, new species

DESCRIPTION (Figs. 8-11, 46, 50).-- The shell is cylindrical with the upper third tapered and the last whorl slightly narrowed. Robust, 0.21-0.28 times as wide as high. Shell large, adults about 46.0-54.1 mm long, and 10.8-13.0 mm wide. Apical whorl 4.1-4.5 mm wide and narrowly perforate. Umbilicus rimate. Aperture on a short neck that projects forward for about a fourth of the diameter of the last whorl (Fig. 9). Neck weakly constricted behind aperture, triangular-ovate in cross-section; base obtusely rounded, without basal keel. Aperture broadly triangular in shape, highly variable in relative height and width; generally about 0.55-0.60 times the width of the shell; plane of aperture moderately prosocline (Fig. 9). Peristome blunt-edged and weakly reflected. Interior of aperture grayish-white. Adult shells with about 17-20 whorls below apical plug. Suture moderately impressed; whorls weakly arched and with a narrow sharp shoulder that is accentuated by a weak, nearly obsolete spiral cord so that the whorls appear to be telescoped. Ground color yellow-brown. Surface of whorls sculptured with regularly spaced, low, retractively arched, flat-topped whitish ribs that are about half as wide as their interspaces; ribs tending to become narrower and more crowded on lower whorls; 80-110 ribs on penultimate whorl, 67-98 on fifth whorl and 63-79 on tenth whorl above aperture (holotype 87, 74, 60); ribs continue around base into umbilicus. Interspaces between ribs with occasional segments of

TABLE 3.– *Coelocentrum telescopium*, new species. Measurements in mm for the holotype and seven paratypes. Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	51.4	12.2	7.0	7.3	20.3	87	84	79
paratype	54.1	11.8	7.6	7.1	20.3	87	77	76
paratype	52.8	11.1	7.3	6.5	19.8	108	86	74
paratype	49.9	11.8	7.9	6.6	18.2	88	73	67
paratype	49.7	10.9	6.0	7.0	19.0	89	74	60
paratype	47.6	10.8	6.7	6.5	19.8	110	98	77
paratype	46.0	13.0	7.2	5.5	17.5	79	-	-

low rounded spiral cords. Axis hollow and spindle-shaped; about two-thirds the width of the shell near the middle and about a third of the width in the penultimate whorl; surface smooth but with a strong spiral ridge just below the center; ridge bearing flattened forward-directed short radial spines (Fig. 11); ridge present throughout length of shell from first whorl below apical plug; spines begin on fifth whorl below plug, and become reduced to irregular knobs in penultimate whorl; about 20 spines present on ridge within antepenultimate whorl. Measurements for seven adult shells are given in Table 3.

Juvenile shell attenuate (Fig. 50); rates of growth indicate that about 18 whorls are lost above apical plug. Embryonic shell cylindrical (two specimens examined), containing 7 whorls about 1.45 mm in diameter; first 1.5 whorls smooth; remaining embryonic whorls with fine, close axial riblets that grade into the sculpture of the postembryonic shell (Fig. 46).

TYPE LOCALITY.-- QUERÉTARO, 7 km southwest of El Lobo; 2100 m alt. El Lobo is located on the road from Xilitla to Querétaro (Hwy. 120) and is about 10 km southwest of Ahuacatlán, San Luís Potosí. Snails were collected from along the microtower road that turns to the west about 5 km SW of El Lobo. The area was forested with sparse oaks on a limestone hillside. Snails were found under boulders and crawling in the open after a rain from the previous night. HOLOTYPE: UF 34493; collected 25 September 1970 by Fred G. Thompson and Russell Parks. PARATYPES: UF 193539 (6), Instituto Tecnológico Ciudad Victoria ITCVZ 1003 (3); same data as the holotype. UF 34331 (3); paratopotypes.

REMARKS.-- This species is compared to *Coelocentrum astrophorea* Dall, 1897, because of similar sculpture on the columella and the lack of a palatal lamella. Eight adult specimens were examined. None shows a trace of a palatal lamella on the interior of the shell. It differs from *C. astrophorea* by its much larger size and larger number of whorls (Table 3). Bartsch (1906) states that *C. astrophorea* is 26.8-29.8 mm long, 7.3-7.7 mm wide and has 13-15 whorls, and his figure indicates that *C. atrophorea* has a more deeply impressed suture than does *C. telescopium.* A more detailed comparison is not possible because the type specimens of *C. astrophorea* are lost.

Another species closely related to *C. telescopium* occurs in the region of Tres Lagunas. It differs primarily by being shorter, by having closer and more numerous ribs, by having a strong palatal lamella within the middle of the shell and by having a more abbreviate juvenile shell with only five embryonic whorls. Overlap in size and ribbing occurs between the two taxa, but other characters are sufficiently distinct as to warrant separate taxonomic status. This second species is described below.

ETYMOLOGY.-- The name *telescopium* is from the Latin, and alludes to the appearance of the shell at the suture.

Coelocentrum brachyacron, new species

DESCRIPTION (Figs. 12-15, 51).-- Medium-sized, about 35.1-41.4 mm long 9.6-11.5 mm wide; about 0.23-0.33 times as wide as high. Cylindrical and stocky in shape with the upper third of shell tapered. Umbilicus rimate; apical whorl narrowly perforate. Whorl at apical plug 3 mm wide. Last whorl with a short neck that extends forward for about 2 mm; neck ovate-triangular in cross-section and not noticeably constricted. Aperture broadly ovate-triangular in shape; about 0.52-0.65 times the width of the shell; interior whitish. Peristome narrowly and nearly uniformly reflected. Adult shell with 14.5-19.0 weakly arched whorls. Shoulder of whorls narrow and bounded along the top of the ribs by a thin spiral cord. Whorls sculptured with close thin riblets that are about half as wide as their interspaces; riblets/whorl about equal throughout cylindrical portion of spire and becoming more widely spaced higher up; 105-150 riblets on penultimate whorl, 103-134 on fifth whorl and 59-99 on tenth whorl above aperture; riblets continuing around base and into umbilicus. Base generally imperforate and without basal keel. Columella about 0.38-0.44 times width of shell; slightly wider in middle of shell than below, and tapered above; with a broad spiral ridge in its middle that bears about 13-18 spines per whorl; spines reduced to knobs in the last whorl. Interior of shell with a strong palatal lamella 1-2 whorls in length in the 5-7 whorls above aperture (Fig. 15); at upper end lamella winds along basal septum and becomes

TABLE 4.-- *Coelocentrum brachyacron*, new species. Measurements of the holotype and twelve paratypes. Abbreviations as in Table 1 (page).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	39.9	10.6	6.2	6.3	17.9	136	137	83
paratype	41.4	9.6	6.1	6.2	17.8	123	-	-
paratype	40.7	10.3	6.7	6.5	16.3	132	134	75
paratype	38.0	11.0	6.3	6.4	15.0	-	-	-
paratype	37.5	10.7	5.6	5.3	14.6	122	123	85
paratype	37.3	10.0	5.9	6.0	16.2	-	-	-
paratype	36.8	9.7	6.1	6.0	14.8	150	110	80
paratype	36.7	10.1	5.8	6.0	15.3	146	-	86
paratype	35.1	10.8	6.0	5.8	15.2	117	-	74
paratype	34.4	11.5	6.1	6.0	14.5	105	103	59

located in the middle of the outer wall at its lower end. Measurements of adult shells are given in Table 4.

Rates of growth of five juvenile shells indicate that 13.5-15.0 whorls are lost above apical plug. Juvenile shell with a relatively short and rapidly expanding spire (Fig. 51). Embryonic shell cylindrical, consisting of five whorls; first whorl 1.45 mm in diameter, smooth; following four whorls with fine, close, vertical riblets that grade into sculpture of postembryonic shell.

TYPE LOCALITY.-- QUERÉTARO, 1 km southeast of Tres Lagunas; 2600 m alt. Tres Lagunas is reached by a graded road 8 km NNW from Highway 120 and 4.5 km SW of the San Luís Potosí - Querétaro State line. Snails were found under slabs of limestone in an open oak-juniper forest. HOLOTYPE: UF 159627; collected 15 January 1990 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 193542 (10 adults and 6 juvs.), ITCVZ 1004 (2 adults, 1 juv.); same data as the holotype.

OTHER LOCALITIES.-- QUERÉTARO: 2 km SE of Tres Lagunas, 2600 m alt. (UF 159609. 6 adults and 6 juvs.).

REMARKS.-- This species and *Coelocentrum telescopium* are closely related, and they are similar in general appearance. The shorter embryonic shell,

the abbreviate juvenile shell, the narrower columella and the palatal lamella readily differentiate *C. brachyacron* from *C. telescopium.*

The palatal lamella develops after adult growth is completed. It is present in ten adults from the type lot and absent in five. Those that lack the lamella also are thin-shelled, indicating that they have not reached definitive development. All adults from the locality 2 km SE of Tres Lagunas have a lamella. The late ontogenetic development of the palatal lamella in *Coelocentrum brachyacron* is similar to the development of this feature in *Holospira* which typically has four lamellae in the last whorl; a columellar, parietal, basal and palatal. Ontogenetically they develop in that order upon completion of shell growth. The palatal lamella may be absent or weakly developed in sub-adult specimens of *Holospira* that normally have four lamellae.

ETYMOLOGY.-- The name *brachyacron* is from the Classical Greek *brachys*, short and *akron*, spire, referring to the abbreviate juvenile shell of this species.

Coelocentrum endolophus Pilsbry, 1953

Coelocentrum endolophus Pilsbry, 1953. Proceedings of the Academy of Natural Sciences of Philadelphia, 105: 134-135; pl. 3, figs. 4-5b.

TYPE LOCALITY.-- Unknown; stated to be "between Chilpancingo and a small town nearby called Mazatlán, Guerrero". This is doubtful. HOLOTYPE: ANSP 190964.

The description of *Coelocentrum endolophus* was based on two specimens which reportedly came from near Mazatlán, Guerrero (Pilsbry, 1953: pl. 3, figs. 5-5a), and a single specimen collected by Maxwell Smith at Km 251 on the highway from Cd. México to Cd. Valles (Hwy. 85) (Pilsbry, 1953; pl. 3, figs. 4-4a). The second locality is about 15 km SSW of Jacala, Hidalgo. It is near Encarnación, the type locality of *C. astrophorea* Dall, 1897 and is within the known range of other *Ptychodonta*. The Guerrero locality is remote from there. The geographic distribution of other *Pychodonta* adds doubt to the origin of the holotype of *C. endolophus*. Other *Pychodonta* are known only from a relatively small area in northwestern Hidalgo and adjacent Querétaro, a geologically isolated region of Cretaceous limestones, which is parted in the middle by the Rio Moctezuma. *Coelocentrum astrophorea* and *C. endolophus* occur south of the Rio Moctezuma; *C. telescopium* and *C. brachyacron* occur north of the river. Considering that all other known species of *Coelocentrum* have very restricted distributions it is not plausible that *C. endolophus* could be so widely distributed as to occur in Guerrero and Hidalgo. The type locality given in Pilsbry (1953: 134) is considered by us to be incorrect. Conversely, there is no apparent reason to doubt the reliability of the record from Km. 251, Hidalgo.

Subgenus *Crossostephanus* Dall, 1908

TYPE SPECIES: *Coelocentrum palmeri* Dall and Bartsch, 1908.

This subgenus is characterized by the sculpture of the embryonic whorls and by having a turgid evagination on the columella which bears various solid ornate knobs and scallops. The embryonic whorls are moderate-sized and bear coarse riblets below the suture. The riblets are discontinuous across the whorls, but are weakly expressed along the base (Fig. 49). The evagination and its sculpture become enlarged in the lower whorls. In the less specialized species the evagination is low and bears a few coarse nodes. In the most elaborately evolved species, such as *C. palmeri*, the evagination is greatly extended as a pendulant fold, and the knobs consist of large forward-directed overlapping leafs or plates. Intermediate stages occur in other species. Within a given sample there may be considerable individual variation in the degree of sculpturing on the columella. Some specimens are nearly devoid of any tuberculation. This is correlated with incomplete definitive growth. These are individuals that have definitive development of the outer shell, but have not yet completed development internally.

Crossostephanus is known only from southeastern Tamaulipas and immediately adjacent San Luís Potosí. The species inhabit a variety of vegetational zones on limestone strata, including submesic scrub, mesic oak and pine forests and mountain rain forests. Species appear to be numerous. The area within the known range of the subgenus is poorly explored for mollusks, and large areas of seemingly suitable habitat to the west and north remain completely unexplored.

Coelocentrum hinkleyi Pilsbry, 1909

Coelocentrum hinkleyi Pilsbry, 1909. Nautilus, 22: 138-139.

This species has not been illustrated previously (Figs. 20, 21, 33, 42-43). The sculpture on the columella relates it to the following three species. As with other *Crossostephanus* some individuals are devoid of nodular sculpture on the columella; others may be quite rugose. Measurements of ten shells selected to show variation are given in Table 5.

TYPE LOCALITY.-- SAN LUÍS POTOSÍ: highest mountain on south side of river at Mecos Falls. Holotype in the ANSP.

DISTRIBUTION.-- Recorded only from the type locality and San Dieguito, San Luís Potosí, México.

TABLE 5.-- *Coelocentrum hinkleyi* Pilsbry, 1909. Shell measurements of ten paratypes (UF 50153). Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
paratype	38.9	8.2	5.7	5.6	12.5	58	59	57
paratype	37.1	8.3	5.1	5.1	12.5	52	58	47
paratype	37.1	8.0	5.2	5.5	11.8	54	57	47
paratype	36.6	8.1	5.0	5.4	12.0	53	55	45
paratype	36.4	7.9	5.3	5.4	13.7	63	62	56
paratype	35.0	8.0	4.8	5.2	11.3	50	49	50
paratype	34.7	8.0	5.6	5.6	12.2	52	54	43
paratype	34.6	7.7	4.9	5.1	11.9	55	47	44
paratype	34.1	7.2	4.5	5.0	13.3	65	64	54
paratype	33.2	7.6	4.6	5.0	12.4	59	60	52

Coelocentrum affinis, new species

DESCRIPTION (Figs. 16-19, 40).-- Medium-sized, about 38-44 mm in length and about 9.2-10.4 mm wide; 0.22-0.26 times as wide as long. Shell tapered or cylindric-tapered in shape with the upper half tapering and the lower half nearly cylindrical; the last whorl is only slightly narrower than the penultimate whorl. Periostracum dull brown in color; the interior of the aperture tinged brown, becoming nearly white around the peristome. The umbilicus and the apical whorl are imperforate. Adult shells have 12.2-14.2 moderately arched whorls that are narrowly shouldered below the suture. The last whorl has a short neck, the length of which is about 1/6-1/4 the diameter of the last whorl (Figs. 17-18). The neck is slightly compressed dorso-ventrally and has a rounded base lacking any trace of a basal crest. The suture is moderately impressed and is accentuated by a thin, wavy spiral thread bounding the shoulder of the whorl. The whorls are sculptured with thin low riblets that are about 1/6-1/10 the width of their interspaces; 52-69 riblets on penultimate whorl; 55-81 on fifth whorl; 47-59 on tenth. The interspaces have irregularly spaced and coarser short segments of spiral threads. The aperture is wider than high and is about 0.62-0.71 times the width of the shell. It is variable in shape but usually is ovate or triangular-ovate in shape with a slightly concave parietal wall. A distinct angle occurs at the posterior corner. The peristome is

TABLE 6.– *Coelocentrum affinis*, new species. Shell measurements of the holotype (UF 159634) and ten paratypes (UF 193543). Abbreviations as in Table 1 (page).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	40.6	9.6	6.5	6.7	12.0	52	56	47
paratype	43.7	10.1	7.1	6.8	12.3	71	62	54
paratype	43.0	9.8	5.7	6.5	14.7	64	70	47
paratype	42.5	9.6	6.2	6.4	14.2	65	62	51
paratype	42.1	9.2	6.4	6.4	13.7	69	62	52
paratype	41.5	9.4	5.9	6.4	13.6	69	66	53
paratype	41.5	9.2	6.4	6.5	13.3	69	81	59
paratype	41.4	9.5	6.7	6.5	13.3	80	77	59
paratype	39.7	10.4	7.2	6.8	12.2	64	-	45
paratype	38.0	9.5	6.5	5.9	12.6	62	74	54
paratype	37.6	9.2	6.5	6.6	12.2	56	55	49

slightly thickened and rounded and is nearly uniformly and narrowly expanded around the aperture. The columella is relatively narrow, being about 0.18-0.28 times the width of the shell. It gradually increases in diameter down to the penultimate whorl and then becoming narrower in the last whorl (Fig. 40). The middle of the columella between septa has a slight spiral bulge that is sculptured in the last 3-4 whorls with about 8-10 sparse, oblique white bars or elongate nodes. Measurements for adult shells are given in Table 6. The juvenile shell remains unknown.

TYPE LOCALITY.– Sierra Tamalave, 7 km west-southwest of Adolfo Lopéz Mateos, Tamaulipas; 350 m altitude. HOLOTYPE: UF 159634; collected 17 January 1990 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 193543 (16 complete shells plus 5 fragments)), ITCVZ 1006 (10 adult shells); same data as the holotype.

The Sierra Tamalave is a low limestone range with a north-south axis. The type locality is in a steep ravine on the east slope of the sierra along the highway from El Limón to Tula. The ravine was forested with a dense xeric scrub thicket. Snail shells were found in the leaf litter and under boulders.

DISTRIBUTION.– Known from the Sierra Tamalave at the type locality, and at 12 km WSW of Adolfo Lopéz Mateos, 450 m alt. (UF 159664).

REMARKS.-- This species is most similar in appearance to *Coelocentrum hinkleyi* Pilsbry. The latter species occurs at about 30 km to the southwest in the Sierra Grande. The Sierra Tamalave and the Sierra Grande are separated by a dry alluvial basin. *Coelocentrum affinis* differs from *C. hinkleyi* primarily by its larger size (see Table 5), and by having a less constricted last whorl. Other aspects of the shell including external sculpture and the columella are alike.

ETYMOLOGY.-- The species name *affinis* is from the Latin, meaning related to, in allusion to its close affinity to the following species.

Coelocentrum priosculpta, new species

DESCRIPTION (Figs. 22-27, 52).-- Adult shell small; about 21-29 mm long and about 0.22-0.24 times as wide as long. Shell tapered, slightly convex in outline. Color light brown becoming whitish behind the peristome; interior of aperture tan. Apical whorl and umbilicus imperforate. Adult shell with 10.8-13.3 moderately arched whorls. Base of last whorl with a nearly obsolete spiral ridge along outer edge. Aperture extended forward on a short rounded neck that lacks a basal ridge (Fig. 23); length of neck about a fourth the width of the last whorl; flattened above and strongly angular in front of suture. Aperture about 0.63-0.71 times the width of the shell; obovate in shape; angular at posterior corner and less so at parietal-columellar corner. Peristome slightly thickened and narrowly reflected; slightly wider along base and columellar margin; narrowest along parietal margin and upper outer lip. Suture deep; whorls with a narrow but abrupt nearly horizontal shoulder that is accentuated by a wavy spiral thread connecting upper ends of ribs. Whorls sculptured with low, rounded, recurved riblets that are 1/3-1/5 the width of their interspaces; 47-62 riblets on penultimate whorl; 48-64 on fifth whorl; 38-54 on tenth whorl. Bases of riblets expanded and flattened, tending to be forked. Interspaces between riblets with numerous irregular rather course segments of spiral striations. Columella rather slender, about 0.16-0.22 times the width of the shell (Fig. 24, 27); uniformly tapered to the penultimate whorl; columella with a low swelling in center of each whorl. The swelling may be nearly smooth throughout the length of the columella (Fig. 24), or it may bear a few scattered small nodes in the last two or three whorls (Fig. 27). Measurements of adult shells are given in Table 7.

The rate of growth of juvenile shell indicates that about 21 whorls are lost above the point of decollation. Embryonic whorls 5, button-like in appearance; first slightly higher but narrower; next three nearly cylindrical, 1.4 mm wide; fifth slightly constricted. Sculpture and form of embryonic and juvenile shell similar to *C. penion*.

TABLE 7.– *Coelocentrum priosculpta*, new species. Shell measurements of the holotype (UF 159672) and ten paratypes (UF 193538). Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	27.9	6.3	4.4	4.5	13.0	56	54	51
paratype	28.5	6.3	4.2	4.1	13.3	50	59	47
paratype	28.1	6.6	4.3	4.6	13.6	47	52	45
paratype	28.1	6.6	4.0	4.2	12.6	57	55	46
paratype	27.6	6.7	4.5	4.7	10.8	55	56	-
paratype	27.5	6.0	4.1	4.1	13.0	62	50	54
paratype	26.7	6.0	4.1	4.1	13.6	57	48	46
paratype	26.2	6.0	4.1	4.0	12.0	57	64	44
paratype	25.9	6.3	4.0	4.0	12.5	53	50	45
paratype	23.8	5.8	3.9	4.0	11.6	49	51	38
paratype	21.8	5.3	3.5	3.6	12.2	54	60	44

TYPE LOCALITY.– TAMAULIPAS: Sierra Grande, 2 km west of Santa Maria de Guadalupe, 21 km west of Ocampo; 1100 m alt. HOLOTYPE: UF 159672; collected 18 January 1990 by Fred G. Thompson. PARATYPES: UF 193538 (15), ITCVZ 1007 (9); same data as the holotype. The type locality is in a submesic limestone ravine that was forested with slender tall oaks (*Quercus* sp.). No understory was present. Snail shells were common in the leaf-litter. Live specimens were found under large boulders.

DISTRIBUTION.– This species is known from Tamaulipas and immediately adjacent San Luís Potosí at an altitude of 1000-1100 m in submesic habitats.

OTHER LOCALITIES.– SAN LUÍS POTOSÍ: hwy. from Naranjos to Cd. El Maíz (22°29'06" N, 99°25'00"W), 1000 m alt. UF 193537).

REMARKS.– *Coelocentrum priosculpta* is distinguished from other species of *Crossostephanus* by its small size, its costulate sculpture with the lower ends of the riblets flattened and expanded to form short inverted Y's and its simple, nearly smooth columella with only a few small nodes in the lower whorls. It is most similar to *C. hinkleyi* Pilsbry, 1909 in the latter two characters. *C. hinkleyi* is a

much larger and relatively more attenuate species, and has a relatively longer neck on the last whorl.

ETYMOLOGY.-- The species name is from the Latin, *prior* meaning early, and *sculpta*, a carving, in reference to the primordial stage of sculpture on the columella.

Coelocentrum paucinoda, new species

DESCRIPTION (Figs. 28-32).-- Moderately large and stocky; about 33-40 mm long and 8.8-10.6 mm wide; about 0.25-0.28 times as wide as high. Spire nearly cylindrical; last whorl narrower; upper half tapered. Color light brown and nearly lusterless. Adult shell with 11.3-12.7 whorls. Apical whorl imperforate; 4.9-6.1 mm wide. Umbilicus very narrowly perforate or rimate. Base of last whorl rounded; with a weak ridge along outer margin. Aperture extended forward on a short rounded neck (Fig. 29). Aperture broadly ovate in shape; parietal wall flattened and forming a weak angle internally with the outer lip. Width of aperture 0.57-0.66 times the width of the shell. Peristome narrowly and uniformly reflected. Whorls moderately arched and shouldered below the suture; shoulder accentuated by a thin wavy spiral thread connecting the upper ends of the axial riblets. Sculpture consisting of narrow, recurved, rounded riblets that are about 1/5-1/7 the width of their interspaces; penultimate whorl with 55-75 riblets; fifth whorl, 65-84; tenth whorl, 45-61. Located between the riblets are irregular, fine, spiral thread-segments. In most specimens these are quite numerous, although they may be reduced or absent on the lower whorls in some individuals. Columella tapered, 0.28-0.33 times the width of the shell at penultimate whorl (Fig. 30). Columella with a low turgid spiral ridge which in the penultimate and antipenultimate whorls bears about 7-9 white nodes per whorl; nodes round or slightly elongate; length of nodes about equal to or less than the width of the spiral swelling. External sculpture and other adult shell features are similar to *C. torosum*. The juvenile shell is unknown. Measurements and other meristic data are given in Table 8.

TYPE LOCALITY.-- TAMAULIPAS: limestone escarpment 3 km east of and ascending to the village of Gómez Farías (23°01'21" N, 99°08'00"W); 300 m alt. HOLOTYPE: UF 193544; collected 31 August 1991 by Alfonso Correa. PARATYPES: UF 193545 (3), UF 193547 (20), ITCVZ 1008 (10); same data as the holotype.

DISTRIBUTION.-- This species is known for certain only from the type locality. We have before us a dead shell (UF 193546) collected from along the Rio

Frio, a few kms NE of the type locality (22°07'48"N, 99°04'24"W). Its point of origin is uncertain.

REMARKS.-- This species differs from the following species by its larger size, its cylindric-tapered shape, its narrowly perforate umbilicus, and its wider columella with sparser, more nearly rounded nodose sculpture. Although the two taxa are quite similar, they differ sufficiently to warrant specific recognition. This is supported by their geographic and ecological isolation. The ranges of the two are separated by the Río Guayalejo Basin, and by a distance of about 60 km. Both species occupy upland limestone habitats, whereas the lowlands of the Guayalejo Basin consists of alluvial and metamorphic deposits that are uninhabitable to *Coelocentrum*.

ETYMOLOGY.-- The name *paucinoda* is derived from the Latin *paucus*, few, and *nodus*, a knot or swelling, in reference to the columellar sculpture.

TABLE 8.-- *Coelocentrum paucinoda*, new species. Shell measurements of the holotype (UF 193544) and ten paratypes (UF 193545). Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	38.5	10.5	6.2	6.2	11.7	67	76	51
paratype	39.7	9.9	6.7	6.4	12.7	67	80	55
paratype	38.4	10.0	6.6	6.2	12.5	64	84	61
paratype	37.6	10.6	6.0	6.3	12.8	64	68	56
paratype	35.7	9.7	6.3	6.1	12.0	62	70	45
paratype	35.3	8.8	5.4	5.6	12.7	70	77	49
paratype	35.2	9.9	5.5	5.7	11.9	62	65	72
paratype	35.1	9.5	5.8	5.6	12.5	61	70	57
paratype	34.6	9.3	6.1	6.0	11.6	75	89	53
paratype	34.2	9.1	5.8	6.0	12.1	64	74	58
paratype	33.2	9.7	6.6	6.4	11.3	55	65	4

Coelocentrum torosum, new species

DESCRIPTION (Figs. 34-37, 41).– Adult shell medium sized, about 26.8-32.7 mm long and 8.0-9.0 mm wide; about 0.26-0.31 times as wide as high. Club-shaped; upper 1/3 - 1/2 of spire tapered; top whorl at apical plug 4.2-5.5 mm wide; lower portion of spire nearly cylindrical. Umbilicus and apical whorl imperforate. Last whorl with an obsolete angle along periphery and ending with a short neck about 1 mm long behind the aperture (Fig. 35). Color brown with a whitish peristome and aperture; umbilical wall gray. About 8.8-11.6 whorls below apical plug; whorls weakly convex; with conspicuous shoulders that are margined and accentuated by a light-colored spiral thread. Suture moderately impressed. Whorls sculptured with fine, recurved riblets that are about 1/4 - 1/5 the width of their interspaces; 61-86 riblets on penultimate whorl, 62-86 on fifth and 43-65 on tenth whorl above aperture; riblets connected at their upper ends by a narrower, lighter-colored, wavy, spiral thread. Aperture rounded with a weak posterior angle; usually wider than high and relatively large; about 0.6-0.7 times the width of the shell. Peristome slightly thickened and moderately reflected. Columella slender; about a tenth the width of the whorl near the apex, becoming enlarged in the lower third of shell so that the sculptured columella is about 0.23-0.28 the width of the whorl; axis with a slight spiral swelling that becomes enlarged in the lower whorls; swelling with 6-8 large, elongate, white knobs per whorl in lower part of shell; knobs about twice as long as wide; knobs usually confined to penultimate whorl; occasionally on previous two whorls (Figs. 40). Measurements of adult shells are given in Table 9.

Embryonic shell consisting of six whorls. First whorl rounded but not conspicuously enlarged (in contrast to *C. penion*). Next two whorls gradually increase in width to about 1.5-1.6 mm; following three whorls narrower. First embryonic whorl smooth; next five whorls smooth but with coarse denticles along the shoulder that crenulate the suture. Postembryonic whorls forming an attenuate, weakly concave spire; sculptured with fine regularly spaced riblets, which by about the twentieth whorl become connected along the upper suture by a thin spiral thread. Rate of growth of juvenile shell indicates that about 19-21 whorls are lost above apical plug.

TYPE LOCALITY.– Sierra de Tamaulipas, 7 km northwest of Piruli, Tamaulipas, México; 350 m alt. (23°34'27"N, 98°33'50"W). HOLOTYPE: UF 189695; collected 8 February 1991 by Alfonso Correa and Fred G. Thompson. PARATYPES: UF 193525 (75 adult shells and numerous fragments), ITCVZ 1009 (25); same data as the holotype. The type locality lies in a deep ravine near the top of a limestone ridge. This locality is on the highway from Cd. Victoria to Soto La Marina, and is about 54 km west of Soto La Marina. Snails were found under dead leaves, logs and stones near the bottom of the ravine.

TABLE 9.– *Coelocentrum torosum*, new species. Shell measurements of the holotype (UF 189695) and ten paratypes (UF 193525). Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
holotype	32.1	9.0	6.2	6.3	10.2	68	71	55
paratype	32.7	8.9	5.5	5.9	11.3	61	66	52
paratype	32.7	8.4	5.2	5.6	12.3	73	86	64
paratype	32.3	8.7	6.1	6.1	11.6	76	76	54
paratype	30.2	8.0	5.1	5.2	11.2	64	64	49
paratype	28.7	8.1	5.3	5.5	10.2	86	75	65
paratype	28.6	8.0	4.9	5.3	11.6	67	62	43
paratype	28.0	8.1	4.9	5.6	10.1	79	76	45
paratype	27.5	8.0	5.1	5.3	10.3	66	63	48
paratype	27.4	8.6	5.2	5.1	10.4	74	75	50
paratype	26.8	8.3	5.5	5.5	8.8	77	77	-

DISTRIBUTION.-- This species appears to be widely distributed within the Sierra de Tamaulipas. It is known from 50-480 m altitude, and is common within subcaducifolias forests.

OTHER SPECIMENS.-- TAMAULIPAS. Sierra de Tamaulipas: Rancho El Carrizo, Soto La Marina, 50 m alt. (UF 193526); El Moro, km 69, on road from Cd. Victoria to Soto La Marina; 480 m alt., 23°34'10"N, 98°32'56"W (UF 193528, UF193529); El Sabinito, km 97, on road from Cd. Victoria to Soto La Marina, 300 m alt. (UF 193527); 2 km W of El Sabinito, 27 km SW of Soto La Marina, 260 m alt. (UF 189715).

REMARKS.-- *Coelocentrum torosum* is distinguished from other *Crossostephanus* by its relatively small club-shaped shell, its relatively slender columella bearing only a few elongate knobs or scallops in the lower 2-3 whorls, and its imperforate umbilicus and apical whorl. As with other *Coelocentrum* some populations differ significantly in shell features. Specimens from 2 km west of El Sabinito attain a length of 30.4-35.8 mm, and the columella has scalloped nodes within the lower four whorls. Other population samples we have examined are very similar to the type series.

ETYMOLOGY.-- The species name *torosum* is from the Latin *torosus*, meaning bulging, and refers to the knobby protuberances on the axis.

Coelocentrum palmeri Dall and Bartsch, 1908

Coelocentrum palmeri Dall and Bartsch, 1908. in Dall, 1908. Proceedings of the United States National Museum, 35: 177-178; pl. 29, figs. 2, 5.-- Solem, 1954; Nautilus, 68: 7.

The original description was based on only a few specimens. Additional material collected during recent years adds significantly to our knowledge of the species and provides a basis for its redescription.

DESCRIPTION (Figs. 38, 39, 44, 45, 49).-- This species is characterized by its large stocky size and the sculpture on the columella. Color brown. Club-shaped and stocky, being about 0.25-0.32 times as wide as high. Shell about 42-63 mm long; normally about 12.2-14.7 mm wide; apical whorl about 5.0-6.9 mm wide. Aperture with a short neck the length of which is about a fifth the diameter of the last whorl (Fig. 39). Base rounded and without a basal keel. Umbilicus imperforate or narrowly rimate; apical whorl narrowly rimate. Aperture ovate-triangular in shape; about 0.53-0.66 times the width of the shell. Peristome slightly thickened and narrowly expanded. Whorls 11.3-13.5; separated by a moderately impressed suture that is accentuated by a conspicuous wavy, spiral thread bounding a narrow shoulder on the whorls. First whorl 4.9-6.9 mm wide; subsequent whorls gradually increasing in size to the lower quarter of the shell, and then the remaining 2-3 whorls becoming narrower. Whorls sculptured with low, narrow, protracted, concave riblets that are about 1/5 the width of their interspaces; 62-85 riblets on penultimate whorl, 58-81 on fifth whorl and 39-52 on tenth whorl above the aperture. Upper ends of riblets connected at the shoulder by a wavy, spiral thread. Occasional specimens have sparse spiral striations between the riblets (most conspicuous in weathered shells and hardly distinguishable in fresh specimens). Axis (Figs. 44, 45) hollow, slightly less than half the width of the shell; with a wide evaginated ridge that begins at about 2-3 whorls below apical plug; ridge increasing in size and overhanging to become deeply concave along its lower wall in the last 3-4 whorls; ridge sculptures initially with indistinct ripples which in lower whorls gradually form into nodes and forward-directed overlapping leaves. Adult shell measurements are given in Table 10.

The rate of growth of juvenile shells indicates that about 21-23 whorls are lost above the axial plug of the adult shell. Embryonic shell consisting of about 5.0 whorls. First whorl smooth, large and bulbous; next whorl slightly wider but lower, 1.6 mm wide; subsequent three whorls slightly shorter between

TABLE 10.– *Coelocentrum palmeri* Dall and Bartsch, 1908. Shell measurements of fourteen specimens from the Sierra de Cucharas, west of Gómez Farías, Tamaulipas at 430 m alt. (UF 193531), and of the LECTOTYPE (USNM 198083) and a LECTOPARATYPE (FMNH 62392). Abbreviations as in Table 1 (page 146).

Specimen	L	W	ApH	ApW	Wh	RP	R5	R10
UF 193531	63.3	12.5	8.0	7.6	17.0	62	66	50
	51.3	13.9	7.6	8.2	13.0	67	64	39
	50.0	12.5	7.0	8.2	13.0	68	80	49
	49.8	12.8	7.8	7.6	11.3	59	79	46
	47.2	12.8	7.6	7.8	12.8	69	81	45
	46.7	12.4	7.2	7.0	12.7	85	58	39
	46.6	13.8	7.7	8.5	11.8	-	-	43
	46.5	12.5	7.0	7.5	13.0	81	71	43
	46.5	12.3	7.0	7.1	12.8	63	64	51
	44.6	13.0	7.0	7.4	12.8	72	64	50
	42.8	12.2	6.7	7.3	11.5	65	66	39
	42.0	13.5	8.7	8.4	11.0	74	89	52
	-	17.0	9.5	9.0	-	-	-	-
Lectotype	51.1	14.7	9.0	8.2	13.0	82	70	50
Paratype	47.4	13.4	7.1	7.8	11.8	77	68	45

sutures and narrower in diameter; following whorls gradually increase in size to form a slightly concave spire. Second whorl with fine radial striations along upper suture. Sculpture on third and fourth whorl consisting of low but coarse growwrinkles along the upper suture. Subsequent juvenile whorls with fine, regularly spaced riblets that grade into the adult sculpture.

TYPE LOCALITY.– Dall and Bartsch (in Dall, 1908) give Tamaulipas, México as the type locality. The original label accompanying the lectotype states that it was collected at Gómez Farías, Tamaulipas by Edward Palmer; 14-15 April 1907. The type series consisted of five specimens, but no holotype was designated. LECTOTYPE by present designation: USNM 198083. This is the specimen figured by Dall and Bartsch (1908: pl. 29, fig. 2). Two LECTOPARATYPES are in the Field Museum of Natural History (FMNH 62392). Other type specimens cited by Dall and Bartsch could not be located.

DISTRIBUTION.– Known only from the Sierra de Cucharas, west of Gómez Farías, Tamaulipas, from 350-730 m altitude. This is a small mountain range that has an area of approximately 900 km sq. and lies due west of Gómez Farías and north of Ocampo. The range rises to a rolling plateau at about 1800 m with numerous isolated hills and peaks as high as 2200 m. The range is inhabited by several species of *Coelocentrum* representing two subgenera, *Coelocentrum s. s.* and *Crossostephanus*.

SPECIMENS EXAMINED.– TAMAULIPAS. Sierra de Cucharas: Gómez Farías, 350 m alt. (UF 189680, UF 193534); east slope of Sierra de Cucharas W of Gómez Farías, 470 m alt. (23°01'43"W, 99°09'24"W) (UF 193531); 7 km by road W of Gómez Farías, 730 m alt. (23°03'20"N, 99°10'21"W) (UF 190972); road from Gómez Farías to Rancho El Cielo (Alta Cimas), 430 m alt. (UF 193535); Gómez Farías (USNM 198083, LECTOTYPE; FMNH 62392, LECTOPARATYPES).

REMARKS.– This is the largest known species of *Crossostephanus*, and it columella is the most ornately sculptured of the subgenus. The measurements given in Table 10 encompass most of the variation we have seen in other samples.

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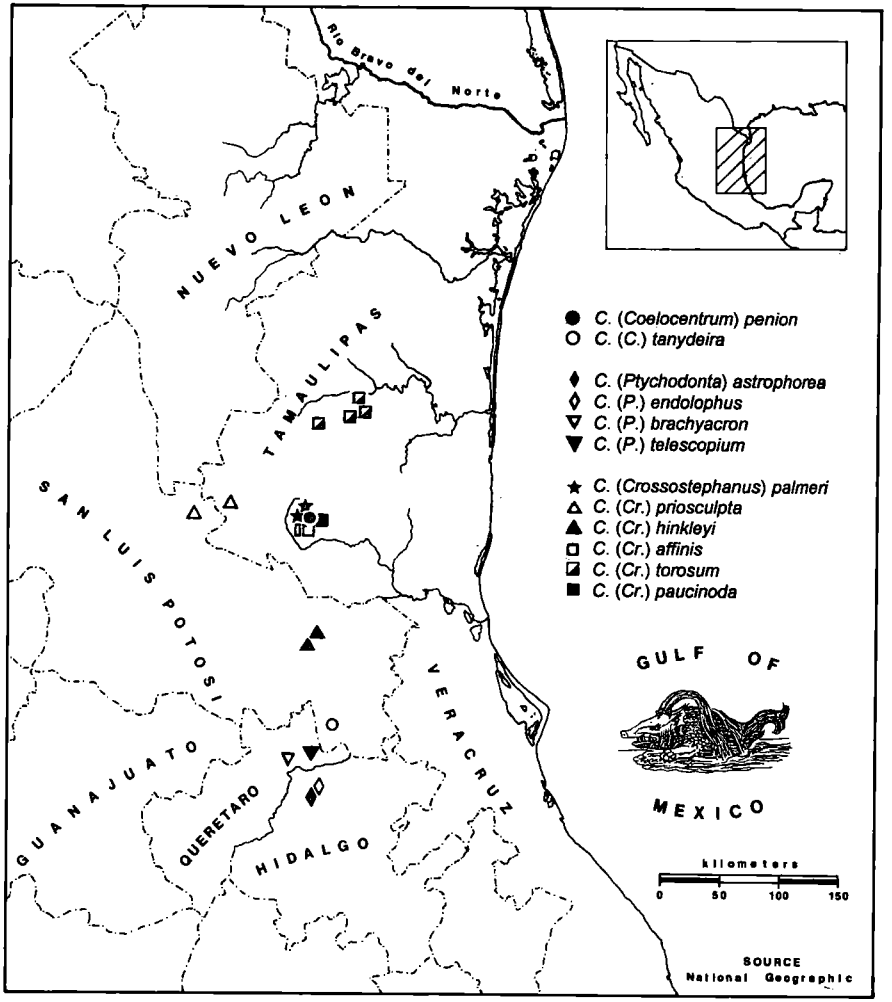
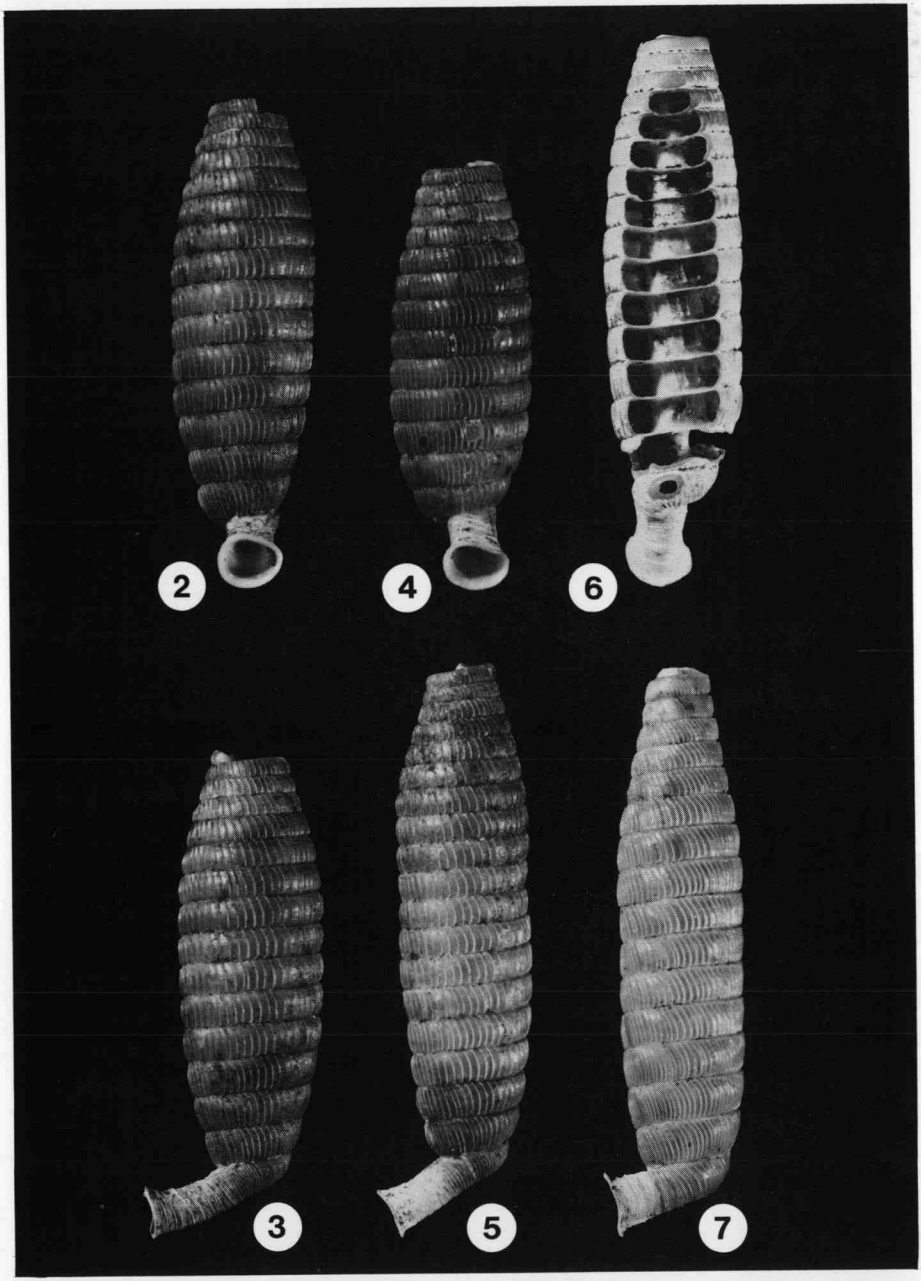
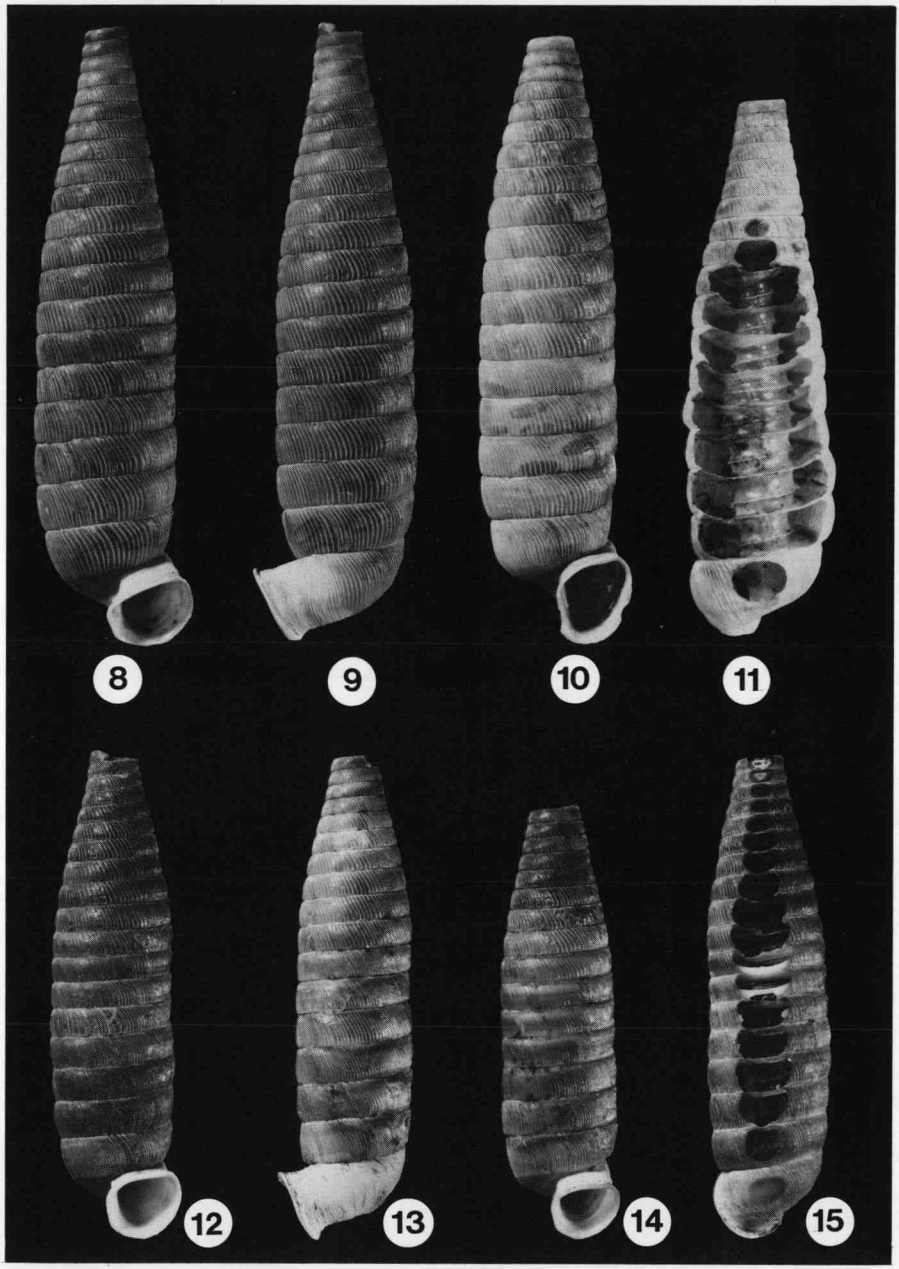


Figure 1.– The distributions of *Coelocentrum* s. s. *Pychodonta* and *Crossostephanus* in Northeastern México.



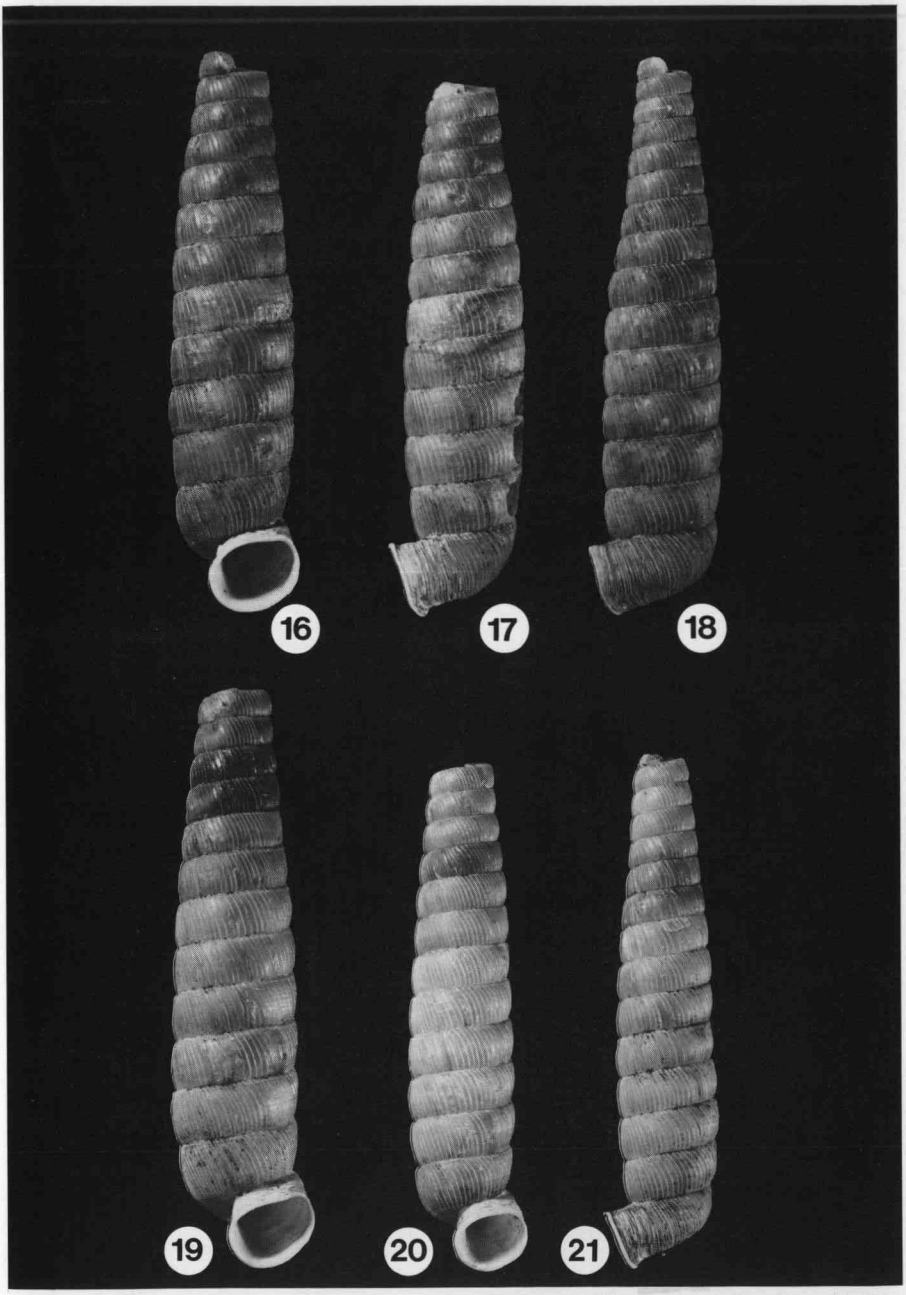
Figures 2-6.-- *Coelocentrum penion*, new species. **Figures 2-3.**-- Holotype, front and side (UF 190974). **Figures 4-5.**-- Paratypes, front and side (UF 193540). **Figure 6.**-- Paratype, opened shell showing axis (UF 193541).

Figure 7.-- *Coelocentrum tanydeira* Thompson, 1968. Holotype, side view (UF 19040).



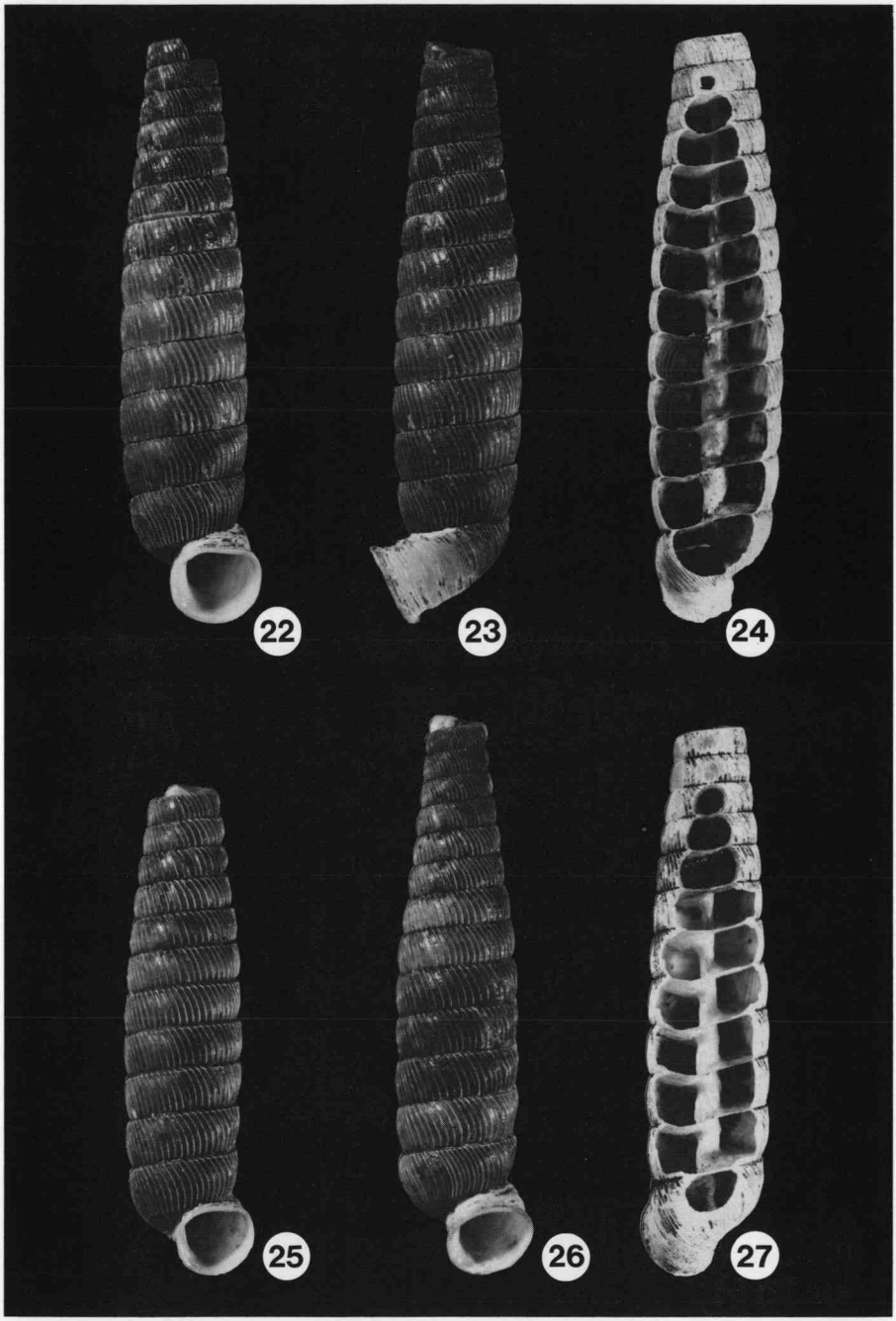
Figures 8-11.-- *Coelocentrum telescopium*, new species. **Figures 8-9.**-- Holotype, front and side views (UF 34493). **Figures 10-11.**-- Paratypes, (UF 193539).

Figures 12-15.-- *Coelocentrum brachyacron*, new species. **Figures 12-13** - Holotype, front and side views (UF 159627). **Figures 14-15** - Paratypes (UF 193542).

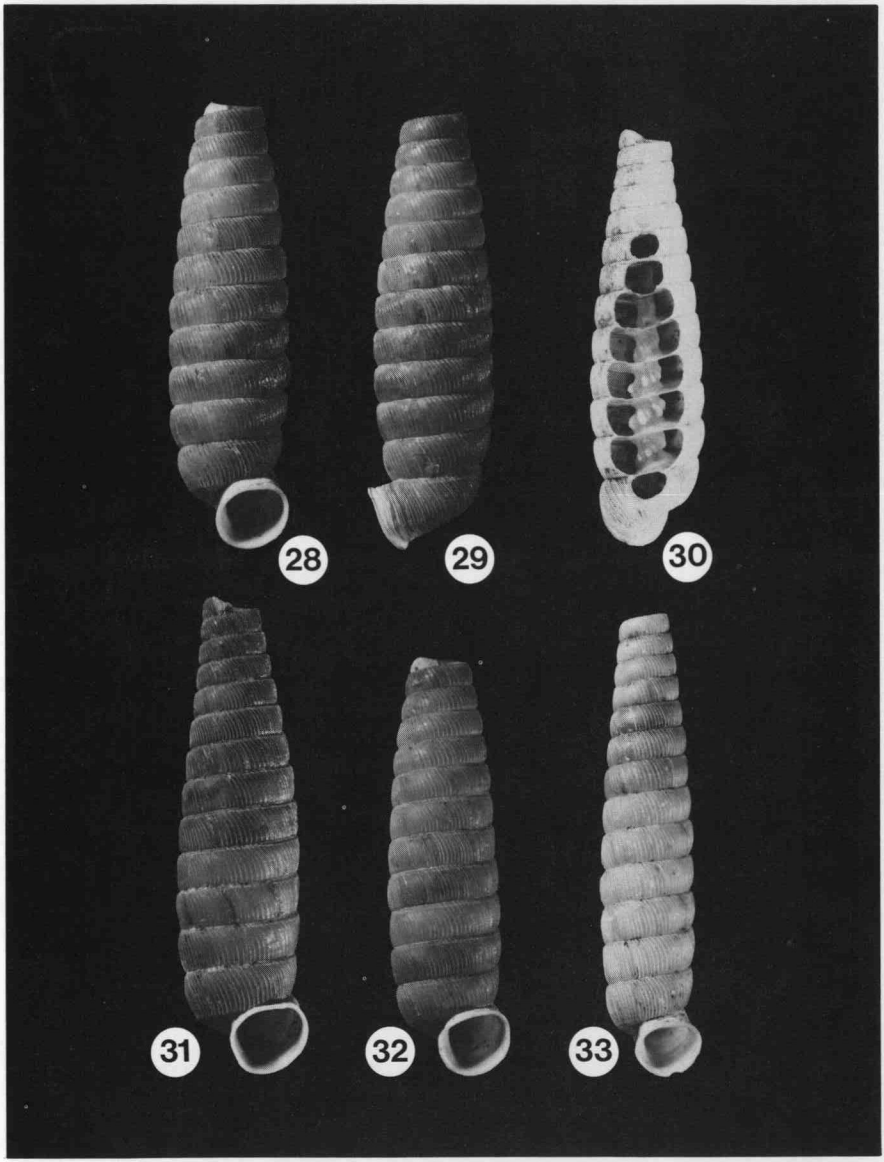


Figures 16-19.-- *Coelocentrum affinis*, new species. **Figures 16-17.**-- Front and side views of holotype (UF 159634). **Figures 18-19.**-- Front view of paratypes (UF 193543).

Figures 20-21.-- *Coelocentrum hinkleyi* Pilsbry, 1909. Paratypes (UF 50153).

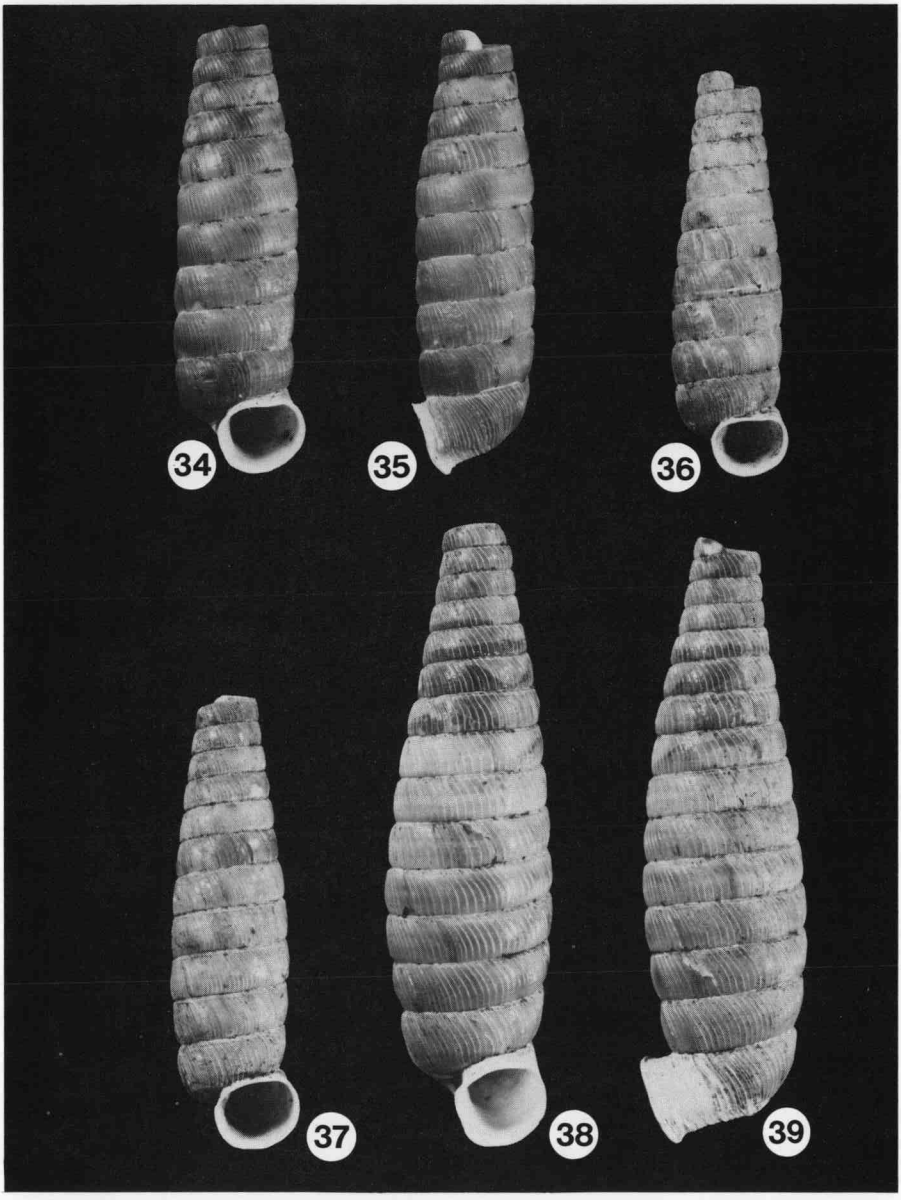


Figures 22-27.-- *Coelocentrum priosculptum*, new species. **Figures 22-23.**-- Front and side views of holotype (UF 159672). **Figures 24-27.**-- Paratypes (UF 193538).



Figures 28-32.-- *Coelocentrum paucinoda*, new species. **Figures 28-29.**-- Front and side view of holotype (UF 193544). **Figures 30-32.**-- Paratypes (UF 193545).

Figure 33.-- *Coelocentrum hinkleyi* Pilsbry; paratype (UF 50153).



Figures 34-37.-- *Coelocentrum torosum*, new species. **Figures 34-35.**-- Front and side views of holotype (UF 189695). **Figures 36-37.**-- Paratypes (UF 193525).

Figures 38-39.-- *Coelocentrum palmeri* Dall and Bartsch, 1908; (UF 193535).

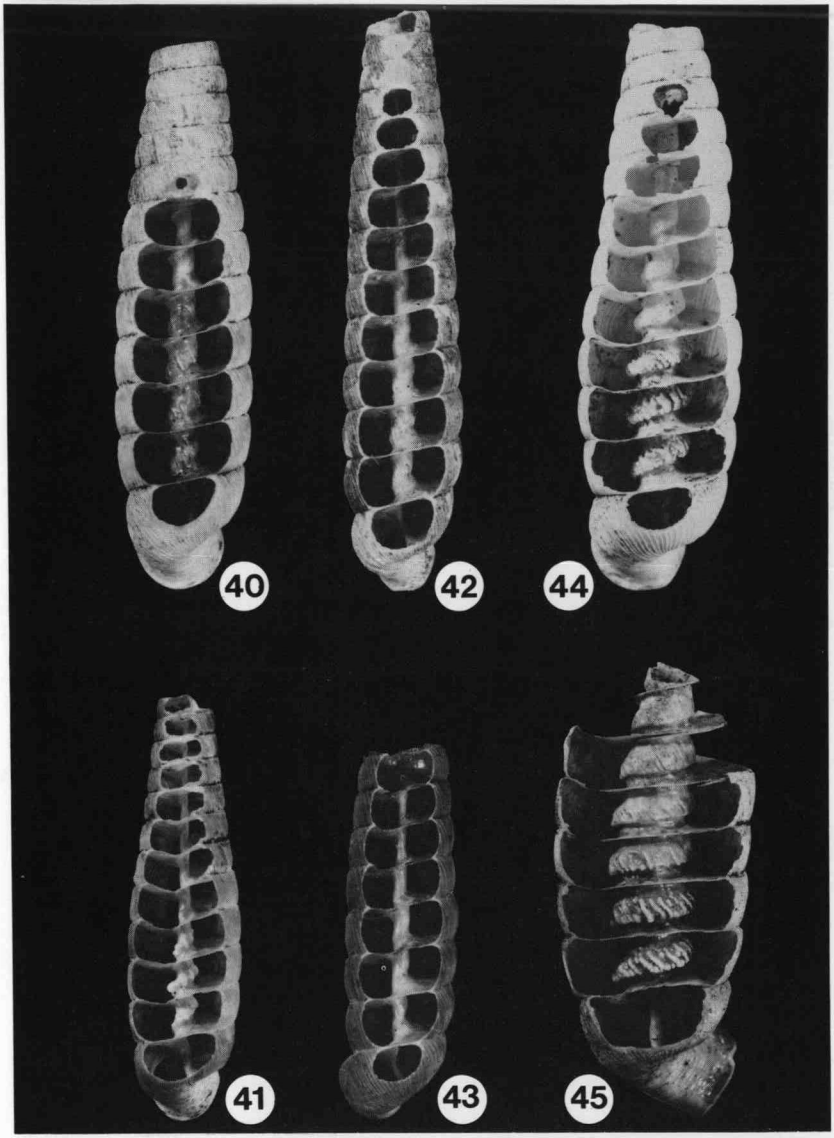


Figure 40.-- *Coelocentrum affinis,* new species. Opened shell showing columella (UF 193543).

Figure 41.-- *Coelocentrum torosum,* new species. Paratype (UF 193525).

Figures 42-43.-- *Coelocentrum hinkleyi* Pilsbry, 1909. Paratypes (UF 50153).

Figures 44-45.-- *Coelocentrum palmeri* Dall and Bartsch, 1908. Opened shells showing axis (193531).

Figure 46 (next page).-- *Coelocentrum telescopium, new species,* X14.

Figure 47(next page).-- *Coelocentrum tanydeira* Thompson, 1968 (UF 190410, X14.

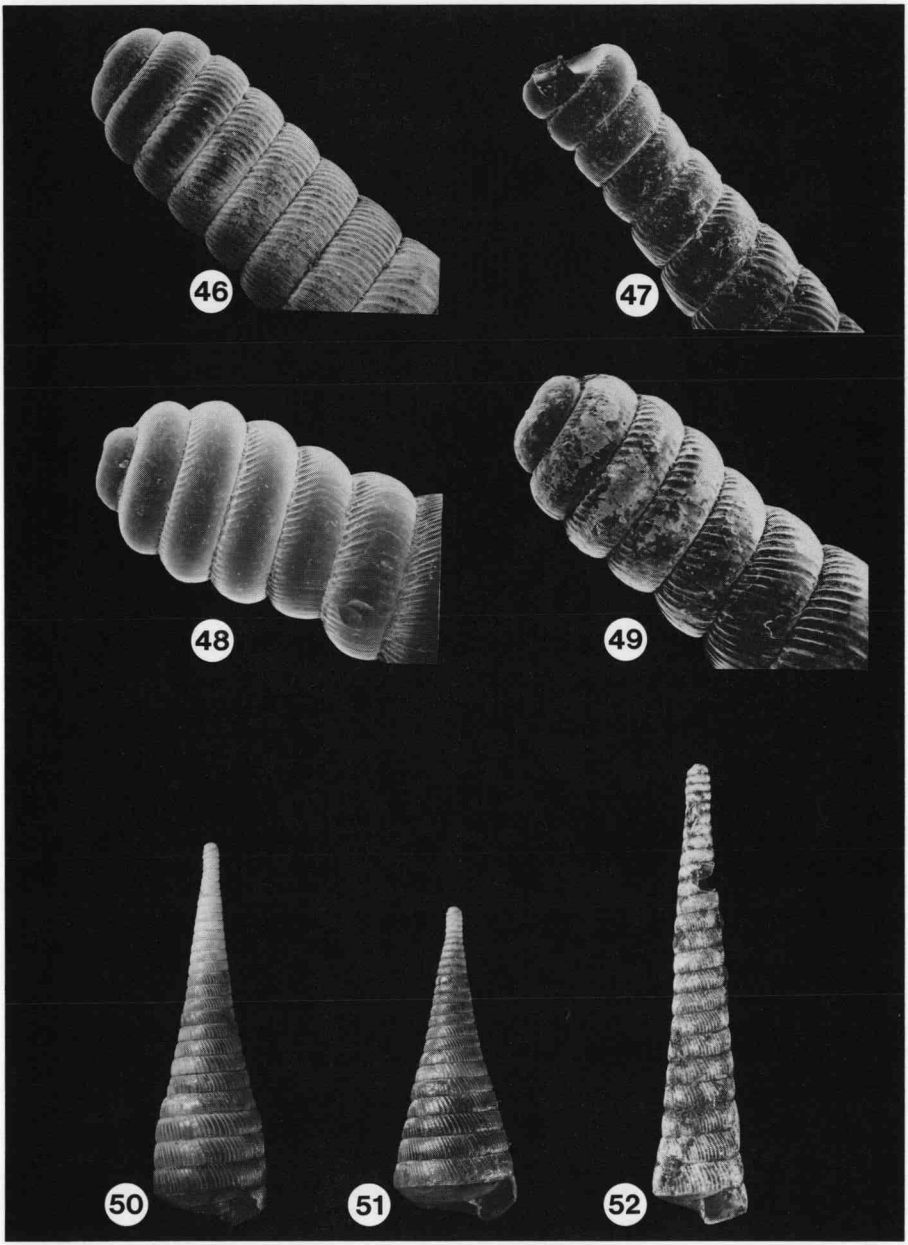


Figure 48.-- *Coelocentrum turris* (Pfeiffer, 1856) (UF 190726), X14.
Figure 49.-- *Coelocentrum palmeri* Dall and Bartsch, 1906. (UF 190972), X14.
Figure 50.-- *Coelocentrum telescopium,* new species. Paratype, juvenile shell (UF 193539).
Figure 51.-- *Coelocentrum brachyacron,* new species. Paratype, juvenile shell (UF 193542).
Figure 52.-- *Coelocentrum priosculpta,* new species. Paratype juvenile shell (UF 193538).

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