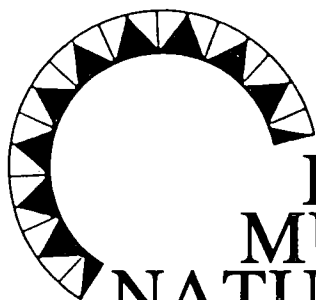


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**NEW AND LITTLE KNOWN LAND SNAILS OF THE
FAMILY SPIRAXIDAE FROM CENTRAL AMERICA AND
MEXICO (GASTROPODA, PULMONATA)**

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NEW AND LITTLE KNOWN LAND SNAILS OF THE FAMILY SPIRAXIDAE FROM CENTRAL AMERICA AND MEXICO (GASTROPODA, PULMONATA)

Fred G. Thompson¹

ABSTRACT

Two new genera and twelve new species are described, and various taxonomic changes are proposed. **EUGLANDININAE.**- *Euglandina*, subgen. *Varicoturris* Pilsbry, 1907: the subgenus is redefined. *Gheisbreghtia* Baker, 1941 is a synonym. The type species, *Spiraxis dubia* Pfeiffer, 1856 is redescribed and the type specimen is refigured. The subgenus is known from the Mexican states of Veracruz and Chiapas, and from Depto. Huehuetenango, Guatemala. Two new species are described: *E. (V.) pycnoptyx*, n. sp. from Veracruz, and *E. (V.) huehuetenangoensis*, n. sp. from Guatemala.

Euglandina, subgen. *Guillarmodia* Baker, 1941: the subgenus is redefined. The type species, *E. (G.) pupa* Baker, 1941, is figured. The subgenus is known from lowland areas in eastern and western México and contains nine species including six newly described: *E. (G.) brachystyla*, n. sp., *E. (G.) comma*, n. sp., *E. (G.) gracilior*, n. sp., *E. (G.) stenotrema*, n. sp. and *E. (G.) arthritica*, n. sp. from Guerrero and *E. (G.) kingi*, n. sp. from Oaxaca.

Euglandina, subgenus *Varicoglandina* Pilsbry, 1908: *E. (V.) rubiginosa*, n. sp. is described from Depto. Huehuetanango, Guatemala.

STREPTOSTYLINAE.- *Myxastyla* n. gen.; type species: *Streptostyla coxeni* Richards, 1938. Referred species: *Myxastyla pycnota* n. sp., *Myxastyla hyalina* n. sp. The genus occurs in north-central Guatemala, Belize, and Honduras.

SPIRAXINAE.- *Mayaxis* n. gen., type species: *Mayaxis leei* n. sp. from Honduras. *Mayaxis* is known from Chiapas, Guatemala, Belize, and Honduras. Referred species include: *Achatina lirifera* Morelet, 1851; *Achatina chiapensis* Pfeiffer, 1856; *Pseudosubulina fortis* Martens, 1898; *Pseudosubulina mitescens* Martens, 1898; and *Pseudosubulina martensi* Pilsbry, 1919.

RESUMEN

Se describen dos nuevos géneros y doce nuevas especies, y se proponen varios cambios taxonómicos. **EUGLANDININAE.**- *Euglandina*, subgén. *Varicoturris* Pilsbry, 1907: el subgénero es redefinido. *Gheisbreghtia* Baker, 1941 es un sinónimo. La especie tipo, *Spiraxis dubia* Pfeiffer, 1856 es redescrita y el espécimen tipo es redibujado. El subgénero es conocido en los estados mexicanos de Veracruz y Chiapas, y en el Depto. Huehuetenango, Guatemala. Dos nuevas especies son descritas: *E. (V.) pycnoptyx*, esp. n. en Veracruz, y *E. (V.) huehuetenangoensis*, esp. n. en Guatemala.

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Euglandina, subgén. *Guillarmodia* Baker, 1941: el subgénero es redefinido. La especie tipo, *E. (G.) pupa* Baker, 1941, es dibujada. El subgénero es conocido en las tierras bajas al este y oeste de México y consta de nueve especies incluyendo seis nuevas descritas: *E. (G.) brachystyla*, esp. n., *E. (G.) comma*, esp. n., *E. (G.) gracilior*, esp. n., *E. (G.) stenotrema*, esp. n. y *E. (G.) arthritica*, esp. n. en Guerrero y *E. (G.) kingi*, esp. n. en Oaxaca.

Euglandina, subgénero *Varicoglandina* Pilsbry, 1908: *E. (V.) rubiginosa*, esp. n. es descrito en el Depto. Huehuetanango, Guatemala.

STREPTOSTYLINAE. *Myxastyla* gén. n.; especie tipo: *Streptostyla coxeni* Richards, 1938. Especies asignadas: *Myxastyla pycnota* esp. n., *Myxastyla hyalina* esp. n. El género existe al norte-centro de Guatemala, Belice y Honduras.

SPIRAXINAE. *Mayaxis* n. gén., especie tipo: *Mayaxis leei* esp. n. en Honduras. *Mayaxis* es conocido en Chiapas, Guatemala, Belice y Honduras. Las especies asignadas incluyen: *Achatina lirifera* Morelet, 1851; *Achatina chiapensis* Pfeiffer, 1856; *Pseudosubulina fortis* Martens, 1898; *Pseudosubulina mitescens* Martens, 1898; y *Pseudosubulina martensi* Pilsbry, 1919.

INTRODUCTION

SPIRAXIDAE are carnivorous land snails similar in appearance but not closely related to the West Indian **OLEACINIDAE**. **SPIRAXIDAE** show relationship to **ACHATINOIDEA**; **OLEACINIDAE** are related to **SAGDIDAE** in the superfamily **OLEACINOIDEA** (Baker, 1962). The family **SPIRAXIDAE** is abundantly represented in northwestern Central America and México. This large geographic area has been very poorly explored for land snails, particularly for the obscure smaller species that live in rock piles and in leaf-litter. Many museum collections contain specimens of the larger and more conspicuous species of the spiraxid genera *Euglandina* and *Streptostyla*. Most specimens with reliable data were collected by herpetologists and mammologists. Smaller species are seldom collected.

SPIRAXIDAE are very much understudied taxonomically because of three major difficulties. The primary problem is that many species described in the 19th century were poorly diagnosed or were inadequately illustrated, rendering literature comparisons very difficult. A second problem is that subtle differences in shell sculpture and aperture morphology are important for distinguishing closely related species. Information depicting these subtle features frequently was omitted in earlier descriptions. Third, in some instances generic and subgeneric divisions were based on anatomical characteristics that are not supported by clear-cut shell differences, rendering generic identifications based only on shells doubtful in some instances, particularly in the subfamily *Spiraxinae*. These three problems cause great difficulty and frustration to those who first attempt identifications.

During the past 38 years I have collected numerous specimens of spiraxids from México south to Bolivia. It is apparent from the material I have examined that most species are locally endemic and have biogeographic patterns similar to those found in the neotropical **AMPHIBIA** as listed in Frost (1985). The greatest faunal diversity for the family occurs in México and northern Guatemala. At some localities in Veracruz, Chiapas, and Guatemala I have collected as many as 20 different species sympatrically. I record some of these here, as well as species from

other localities. Most of the smaller species described in this account were recovered from leaf-litter samples and were seldom noticed in the field.

Standard measurements are used in this study. Larger specimens were measured with Vernier calipers. Smaller specimens were measured with an ocular micrometer in a WILD M-5 dissecting microscope. Micrometer units were converted to metric units. They are reported to three significant places, although this actually exceeds the accuracy of the methodology employed. It is appropriate to elaborate on a few of these because of the distorted aperture that some species possess. Abbreviations in parentheses are used in tables of measurements. The height of the aperture (ApH) is measured parallel to the axis of the shell from the outer edge of the basal lip to the outer edge of the posterior corner. The length of the aperture (ApL) is the longest axis measured from the outside of the posterior corner to the outside of the basal-columellar lip. The width of the aperture (ApW) is the greatest span within the aperture perpendicular to the aperture length.

Geographic coordinates given for specimens collected after 1990 were taken in the field with GPS receivers. Coordinates given for earlier localities were taken from topographic maps.

ACKNOWLEDGMENTS

I wish to thank the following people who have assisted me with this study. Peter B. Mordan (British Museum of Natural History) kindly loaned me type specimens in his charge. I was assisted in the field by Steven P. Christman and Elizabeth L. Raiser (Florida Museum of Natural History), Eric N. Smith (University of Texas, Arlington), Harry G. Lee, William W. Buckingham, and Edward W. Cavin (all Jacksonville, Florida), and Eric Fernandez (San Pedro Sula, Honduras). Wendy B. Zomlefer illustrated the shells depicted in Figs. 1-25, 38-40 and 46-48. Barbara Harmon provided the illustrations for Figs. 41-45. Photographs comprising Figs. 27-37, 54-56 were provided by W. Stanley Blomeley. Eric Fernandez (San Pedro Sula) and Mario Espinal (Tegucigalpa) provided invaluable assistance in Honduras. Kurt Auffenberg assisted with the final preparation of the illustrations and many other tasks that contributed to this document. Kenneth C. Emberton reviewed the manuscript and provided many useful suggestions. I am grateful to each for their kind assistance.

Family SPIRAXIDAE Baker, 1939 Subfamily EUGLANDININAE Baker, 1941

Genus *Euglandina* Crosse and Fischer, 1870 Subgenus *Varicoturris* Pilsbry, 1907

Type species: *Spiraxis dubia* Pfeiffer, 1856, by original designation.

Synonym: *Gheisbreghtia* Baker, 1941 (type species: *Euglandina flammulata* Baker, 1941).

The definition of the subgenus is amended as follows. Shell small, about 7-10 mm long; oblong-turrite, with a long spire composed of about 8-9 narrow, convex whorls. Aperture short and diagonal; columellar plate oblique, strongly twisted and truncate. Embryonic whorls smooth; subsequent whorls with vertical ribs or

growth threads which are enlarged at the top and form an angulate shelf or cord below the suture; spire with occasional reddish flames that precede growth varices.

Baker (1941) differentiated *Gheisbreghtia* from *Varicoturris* as having a subsutural cord and a more oblique columella. Various species from México and Guatemala described below are intermediate in character and obviate the distinction of more than one subgeneric group. Another subgenus, *Streptostylella* Pilsbry, 1907, is monotypic and is known only from shells. It differs by having strongly carinate whorls sculptured with widely spaced, heavy vertical ribs. Characteristics of the aperture are very similar to *Varicoturris*. Baker (1941) treated *Gheisbreghtia* and *Streptostylella* as sections (= species groups) within *Varicoturris*, which differ only by shell morphology. *Streptostylella* has page priority over *Varicoturris* and is the senior name available for the subgenus in event that they prove to be synonyms.

Varicoturris is known from the Mexican states of Veracruz and Chiapas, and from the Depto. Huehuetenango, Guatemala. The subgenus includes four species.

Euglandina dubia (Pfeiffer, 1856)

Figures 1-2, 5

Spiraxis dubia Pfeiffer, 1856. Proceedings of the Zoological Society of London: 378. (Type locality: "Chiapa").- 1859. Monographia heliceorum viventium, IV: 580.

Streptostyla dubia (Pfeiffer), Fischer and Crosse, 1875. Miss. Sci. Mex. Amér. Cent. : 65.- Martens, 1891. Biol. Cent.-Amer., I: 90; pl. 5, fig. 10.- Pilsbry, 1907. Man. Conch.: II, 19: 161-162; pl. 28, fig. 65.

Euglandina dubia (Pfeiffer), Baker, 1941. Nautilus, 55: 54.

Until now this species has been known only from a single specimen which came from an unspecified locality in "Chiapas" collected by M. Gheisbreght. The figures given in Martens (1891) and in Pilsbry (1907) do not correctly depict the species. Through the kindness of Dr. Peter B. Mordan I have had the opportunity to examine the syntype (BMNH 1991144). It is consistent with figures published in the works cited above, except that it has a perforation through the back of the last half whorl. It is 8.9 mm long, contains 8.5 whorls, and has a blunt outer lip, indicating maturity. The columellar plate is nearly vertical and is only slightly twisted, in contrast to the much more twisted condition that normally exists at maturity. About a quarter turn behind the aperture there is a strong and irregularly developed varix at the base, indicating an injury at this stage of growth which caused the development of an atypical columella.

A specimen from Tabasco (Figs. 1-2, 5) is similar to the holotype in most respects, except that it is slightly smaller but mature with an oblique and truncate columellar plate. The shell is shiny and consists of 8.0 whorls. The color is tawny-gray with occasional irregularly-spaced rusty flames. The protoconch has 2.0 smooth whorls. The first whorl is raised and pointed. The teleoconch has

strong, close, obtuse plica that are raised and truncate below the suture forming a narrow shelf-like ledge (Fig. 5); the plica diminish below the middle of the last whorl. The aperture is short and oblique. The columella is slightly oblique in frontal view, and its base projects forward in lateral view (Fig. 2); its base is twisted-truncate and is thickened at its terminal edge. The outer lip is impressed and strongly arched forward near the middle, where it is blunt-edged and thickened internally. Shell length 8.50 mm; shell width 3.88 mm; aperture length 3.30 mm; aperture height 3.08 mm; aperture width 1.25 mm.

Anatomy.— A single immature specimen from near Ixhuatán, Chiapas was examined. It contained 8 whorls and was 6.5 mm long. The anatomy does not differ conspicuously from that described by Baker (1943) for *E. flammulata*. Salient features are as follow. Mantle collar with subequally developed dorsal and ventral lappets. Mantle spotted with black dots; minor veins distinct along anterior third of mantle. Right eye muscle free from genitalia. Penis retractor muscle attaching to inner surface of lung. Genital atrium long and stout. Penis and vagina underdeveloped due to immaturity. Epiphallic section of vas deferens long and enlarged; free segment of vas deferens very short. Prostate about half as long as the uterus. Ootestis not seen.

Specimens Examined.— MÉXICO. CHIAPAS: 3 km N of Ixhuatán, 550 m alt. (UF 193038, specimen dissected). TABASCO: Limestone hills 4 km E of Teapa (UF 77996).

Euglandina flammulata Baker, 1941
Figures 3-4, 6-7

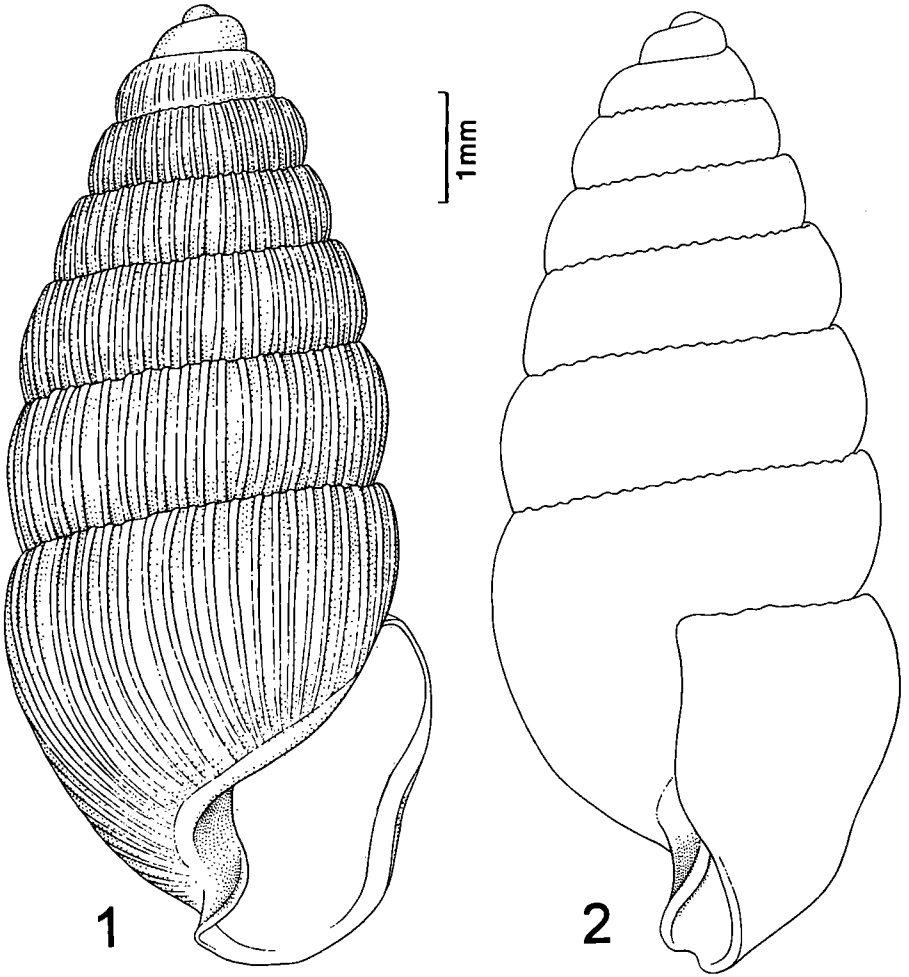
Euglandina (*Gheisbreghtia*) *flammulata* Baker, 1941. Nautilus, 55: 56-57; pl. 5, figs. 10-11 (shell).— Baker, 1943. Proc. Acad. Nat. Sci. Phila., 95: 7; pl. 1, figs. 10-11 (anatomy). Type locality: Las Tortolas, nr. Cordoba, 2700 ft. alt.

A specimen is illustrated for the purpose of comparison with related species (Figs. 3-4, 6-7).

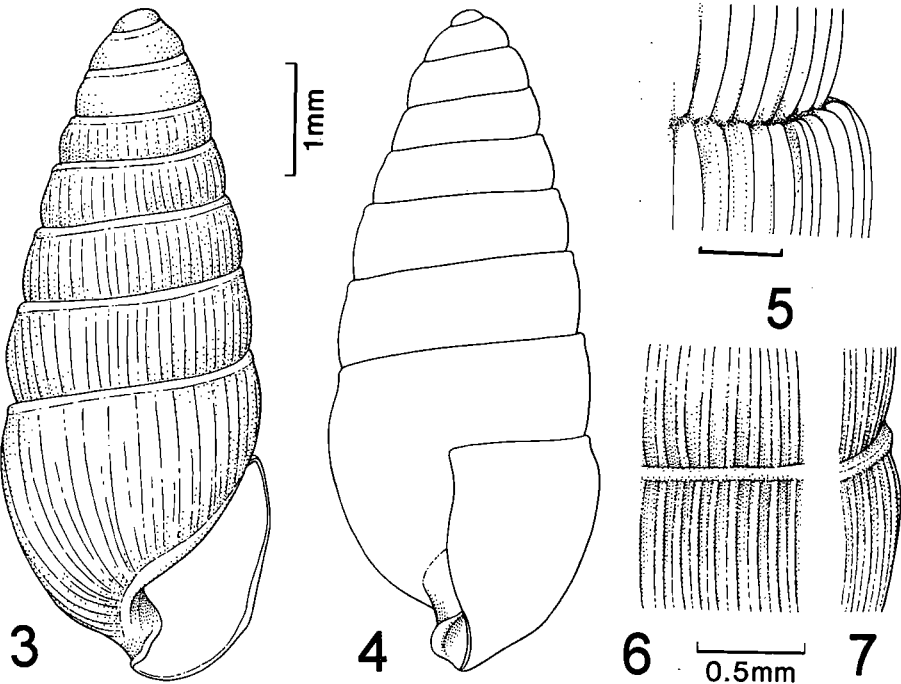
Specimens Examined.— MÉXICO. VERACRUZ: Cerro de las Palmas, 1 km E of Berlín, ca. 4 Km N of Cordoba, 980 m alt. (UF 190813, 190855).

Euglandina pycnoptyx, new species
Figures 8-13

Shell.— Minute, adults 5.5-6.7 (5.6) mm long. Shell slender, 0.39-0.48 times as wide as long; turrit in shape with a weakly concave spire; spire 0.61-0.66 (0.63) times length of shell. Solid, translucent; color light gray with faint and irregularly spaced rusty flames. Whorls 7.4-8.1 (7.4), separated by an impressed angulate suture that forms a narrow shelf and is bounded below by a weakly beaded spiral cord. Protoconch not distinctly demarcated from teleoconch. First whorl



Figures 1-2. *Euglandina dubia* (Pfeiffer, 1851), (UF 77796).



Figures 3-4, 6-7. *Euglandina flammulata* Baker, 1941. (UF 190855). Fig. 5. *Euglandina dubia* (Pfeiffer, 1851) Sculpture along penultimate whorl (UF 77796). Figures 6-7. *Euglandina flammulata* Baker, 1941; Sculpture along penultimate whorl (UF 190855).

pointed and protruding. First two whorls smooth; following whorl gradually acquiring faint vertical striations; remaining whorls with strong, regular vertical plicate striations; their upper ends cutting spiral subsutural cord into a series of irregular elongate beads (Figs. 12-13). Plicate striations interspersed with very weak minor striations; both becoming obsolete near the base of the last whorl. Growth varices sparse and inconspicuous. Aperture small and narrowly elongate with a deep sub-columellar embayment; outer lip slightly advanced near middle (Fig. 9); basal lip receded; both outer and basal lip considerably thickened within. Columella strongly oblique and projecting forward at the base. Columellar plate strongly twisted and thickened along edge.

The holotype is slightly immature. It was live-collected and the color pattern is well preserved. Measurements in mm (converted from micrometer units) of the holotype and two paratypes are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	5.56	2.50	2.06	2.31	1.00	7.4
UF 81795	6.19	2.63	2.19	2.38	1.13	7.8
UF 81914	6.69	2.63	2.25	2.50	1.25	8.1

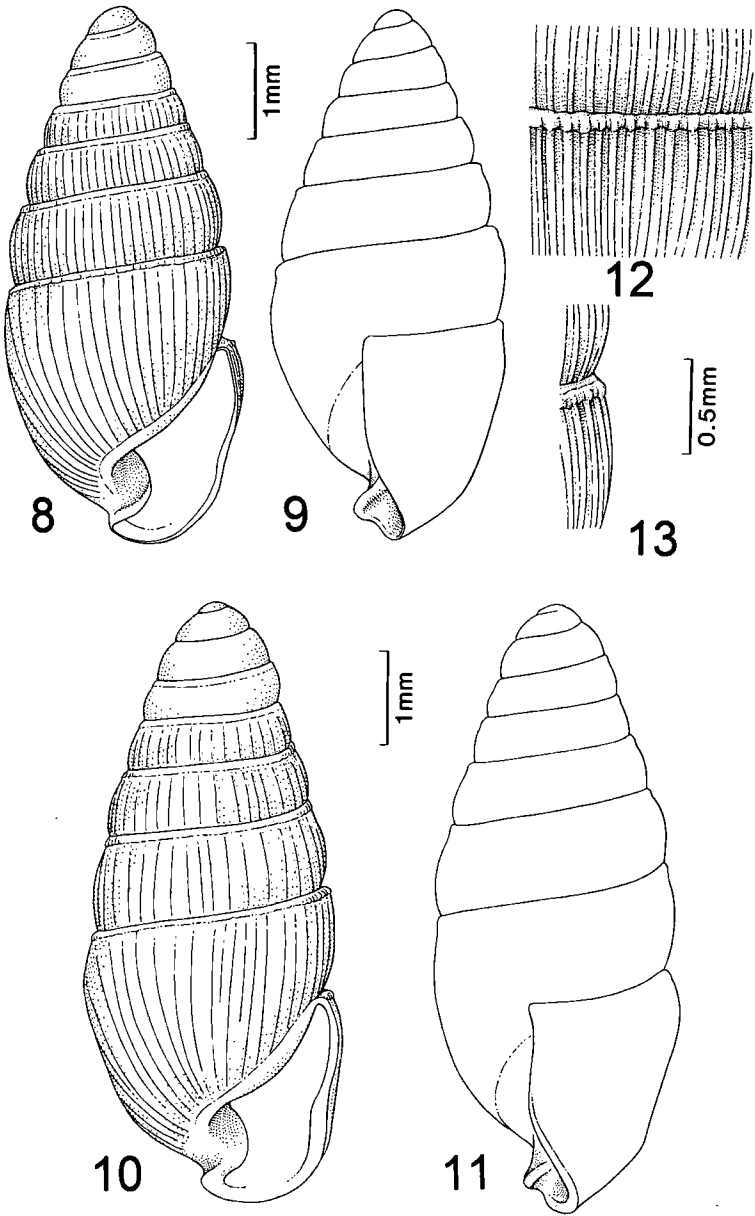
Type Locality.— Limestone bluff 6 km NE of Comalapa, Veracruz, MEXICO (18°42'N, 96°51'W); 220 m alt.. HOLOTYPE: UF 81946; collected 14 January, 1986 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 81795 (1), 81886 (2), 81898 (1), 81914 (1), 81984 (2); all from 1-6 km NE of Comalapa; 220-450 m. alt.

The area of the type locality is in a zone consisting of mesic forest over a strongly karsted limestone substrate. Specimens were found in leaf litter.

Distribution.— Known only from the type locality.

Remarks.— This species is most similar to *Euglandina flammulata* Baker, 1941 (Figs. 3-4). The latter differs by having a thinner shell with a thinner columellar fold, a more attenuate and weakly convex spire, weaker growth striations, and a well developed spiral cord below the angulate suture (Figs. 6-7). The spiral cord is not broken into beads as it is in *E. pycnoptyx*. The two species, though closely related, are disjunct in distribution and do not overlap in shell characteristics.

Etymology.— The species name *pycnoptyx* is from the Classical Greek πυκνός, thickened, and πτυχός, a fold. The name alludes to the thickened columellar fold that characterizes this species.



Figures 8-13. *Euglandina pycnoptyx*, new species. Figures 8-9. Holotype (UF 81946). Figures 10-11. Paratype (UF 81795). Figures 12-13. Holotype; sculpture along shoulder of penultimate whorl.

Euglandina huehuetenangoensis, new species

Figures 14-16

Shell.— Translucent and moderately sized for typical *Gheisbreghtia*, about 7.7 mm long; elongate-ovate in shape, 0.48 times as wide as long. Spire convex in outline, 0.61 times length of shell. Tawny gray in color with frequent reddish flames behind growth varices. Whorls 7.2.; first whorl protruding, rounded. Protoconch with 3 smooth turgid whorls separated by a moderately impressed suture. Teleoconch with weak, wide plicate striations that become obsolete near the middle of the whorl. Tops of plicae forming a narrow angulate shelf at the suture (Fig. 16), but a subsutural cord is not developed. Aperture oblique and narrow; elongate-auriculate in shape with deep columellar and sub-columellar embayments. Peristome thin; outer lip nearly vertical; basal lip receded. Columella short; oblique and protruding forward (Fig. 15); columellar plate moderately thin.

Measurements in mm (converted from micrometer units) of the holotype are as follow. length 7.69; width 3.69; aperture height 3.00; aperture length 3.50; aperture width 1.44.

Type Locality.— Finca Chiblac, ca. 5 km W of San Ramón, Dept. Huehuetenango, GUATEMALA (15°52'38"N, 91°14'34"N); 1000 m alt. HOLOTYPE: UF 190305; collected 4 March, 1991 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 190344 (2 immature specimens); cave below Finca Chiblac, Dept. Huehuetenango, Guatemala; 700 m alt.

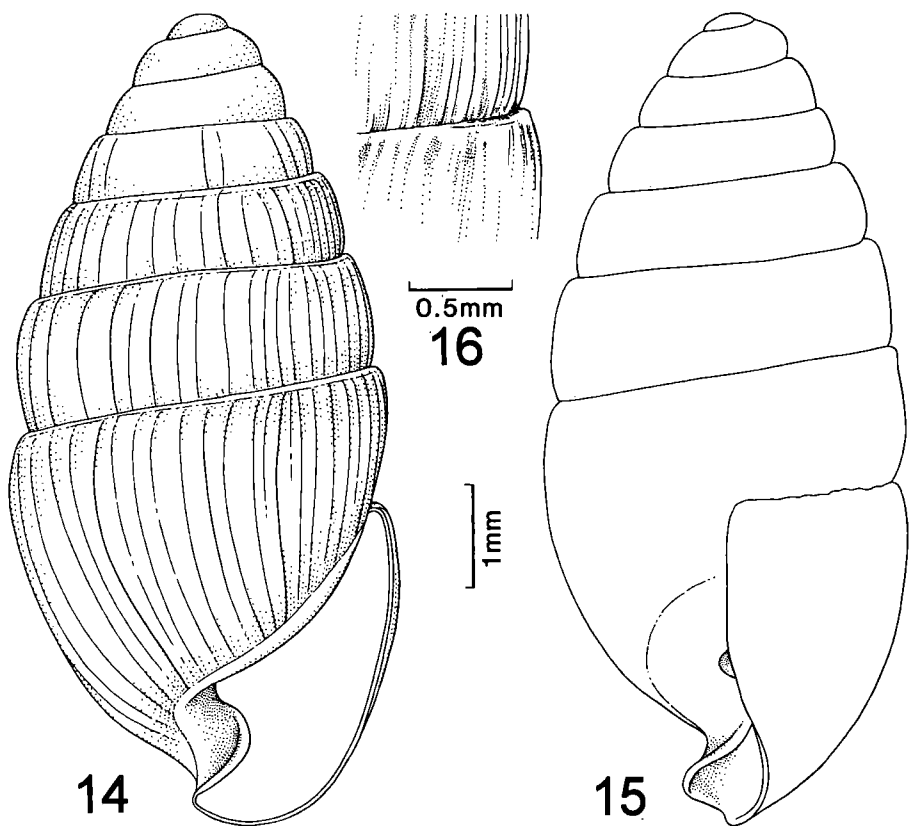
Distribution.— Known only from the type locality.

Remarks.— This species is unique within the subgenus because of its relatively obese shape. It differs from *Euglandina dubia* and bears some similarity to *E. flammulata* and *E. pycnoptyx* from Veracruz because of the weak sculpture. It differs from the latter two species by having even weaker sculpture that becomes obsolete above the middle of the whorl, by lacking any trace of a subsutural cord, by being larger and stockier, and by having fewer whorls. Characteristics of the suture indicate a closer relationship with *E. dubia*, which has a larger and more attenuate shell and a strongly plicate sculpture that forms close round ribs.

Etymology.— The species name alludes to the province in Guatemala from where it was collected.

Subgenus *Guillarmodia* Baker, 1941

Previously three species were recognized in this group: *E. pupa* Baker, 1941b, *E. elegans* (Martens, 1895), and *E. dorsalis* Thompson, 1963. *Guillarmodia* is redefined to include some additional and larger species. The shell is solid and slender and is up to 26 mm long. It is sculptured with weak growth striations and is nearly uniform in color. It lacks color bands or flames.



Figures 14-16. *Euglandina huchuetenangoensis*, new species. Figures 14-15> Holotype (UF 190305).
Fig. 16. Sculpture along shoulder of penultimate whorl.

Guillarmodia includes nine species and is known from Veracruz, Oaxaca, Guerrero, Michoacán, and Colima. Three species-groups are recognized. The typical group (*E. pupa*) is monotypic and is confined to southern Veracruz. It has a small elongate shell 6.75-8.13 mm long and a simple suture. A second group consists of species that bear a raised callus-like ridge on the face of the lower parietal wall and columella and have a simple or beveled suture. Species vary in size from 6-18 mm long. It includes four species known from coastal zones of Colima south to Guerrero. Another species described below from Oaxaca lacks a callus but also may belong in this group. The third group is confined to intermediate elevations in central Guerrero. It is characterized by its extremely elongate-elliptical shape, larger size (15-26 mm), and complex suture along the suture.

Euglandina pupa Baker, 1941
Figures 17-19

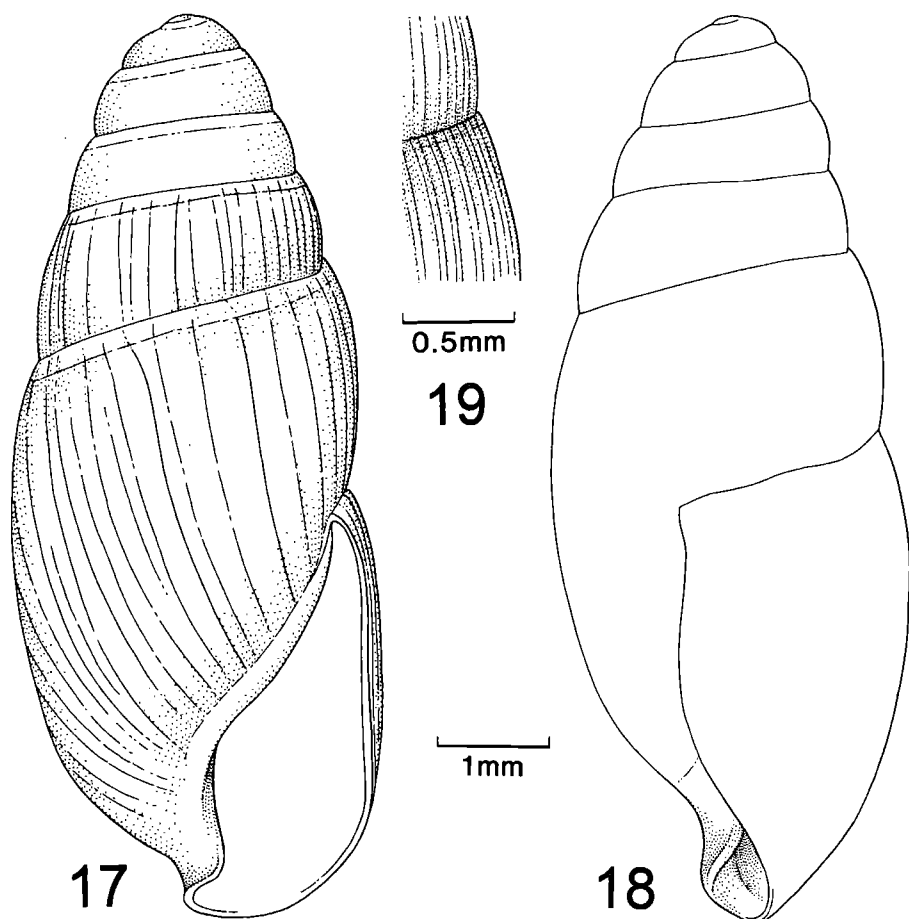
Euglandina (*Guillarmodia*) *pupa* Baker, 1941. Nautilus, 55:57; pl. 5, figs. 8-9 (shell).- Baker, 1943. Proc. Acad. Nat. Sci. Phila., 95: 8; pl. 2, figs 14-15 (anatomy).

Type Locality.- Atoyác, Veracruz, MÉXICO; 1300-1415' alt. Previously this species was known only from the type locality. A specimen from a nearby locality. is illustrated (Figs. 17-19) for comparison with related species. The following records add considerably to its known distribution.

Specimens Examines.- MÉXICO. OAXACA: limestone range 1 km W of Cedral, 100 m alt. (UF 159530, UF 159500); 4 km NW of Temascal, 100 m alt. (UF 159469); 3 km S of Acatlán, 100 m alt. (UF 189740); 4 km SW of Acatlán, 100 m alt. (UF 159530). VERACRUZ: 3 km NE of Atoyác, 640 m alt. (UF 190901); 1 km NW of Atoyaquillas, ca. 7 km NNW of Paraje Nuevo, 750 m alt. (UF 190924); limestone knoll 4 km ESE of Cordoba, 800 m alt. (UF 159365); 1 km E of Berlín, ca. 4 Km N of Cordoba, 980 m alt. (UF 190820); Cerro de Las Palmas, 1 km N of San Mateo, ca. 3 km NE of Cordoba, 910 m alt. (UF 190874); Comalapa, Cueva del Tunel (UF 77504, UF 77526); 4 km NE of Comalapa, 400 m alt. (UF 81909); 6 km NE of Comalapa, 250 m alt. (UF 81945).

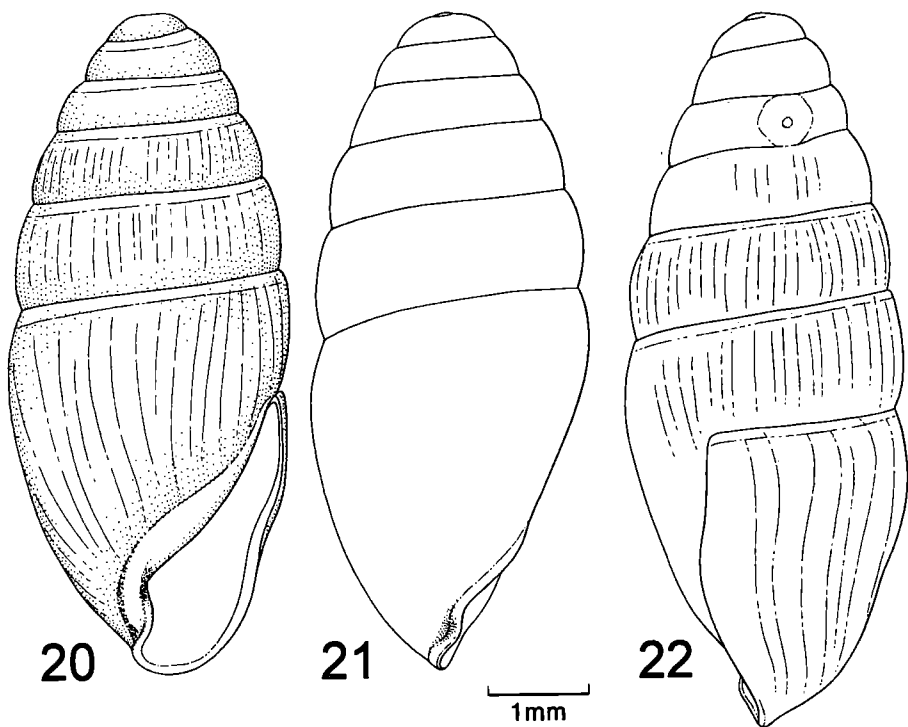
Euglandina brachystyla, new species
Figures 20-22

Shell.— Shell minute, 6.4-6.9 mm long; 0.42-0.44 times as wide as high. Glossy and transparent; amber colored with a lighter-tinged columellar crest. Elliptical in shape; apex obtuse. Spire 0.56-0.60 times length of shell; convex in outline. Whorls 6.5-7.0; moderately arched between sutures; not shouldered; with a clear subsutural hyaline zone. Suture simple and moderately impressed. Protoconch weakly demarcated, consisting of about 2.5 smooth whorls.



Figures 17-19. *Euglandina pupa* Baker, 1941. (UF 159500). Fig. 19. Sculpture of penultimate whorl.

Teleoconch with occasional barely distinct growth striations. Aperture narrow, height equal to or less than the width of the shell; about 0.29-0.31 times as wide as long; constricted below the periphery of the outer lip and with a distinct embayment at parietal-columellar corner. Columella slightly oblique, weakly twisted and very short (Figs. 21-22). Peristome conspicuously thickened along lower outer lip and slightly less so along the base. Parietal wall thickened and forming a rounded crest that continues below to the base of the columellar lip. Measurements in mm (converted from micrometer units) are as follow.



Figures 20-22. *Euglandina brachystyla*, new species. Figures 20-21 Holotype (UF 193587). Fig. 22. Paratype (UF 193588).

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	6.38	2.79	2.79	2.98	0.87	6.5
PARATYPE	6.94	2.85	2.79	2.98	0.93	7.0

Type Locality.— A small isolated karst limestone knoll 2 km east of Punta Troncones, Guerrero, MÉXICO (17°47'36"N, 101°42'43"W); 60 m altitude.

HOLOTYPE: UF 193587; collected 3 March, 1992 by Fred G. Thompson.

PARATYPE: UF 193588; same data as the holotype.

Punta Troncones is a small fishing village on the Pacific Coast about 12 km northwest of Pantla, Guerrero. The type locality is at the southeastern base of an isolated low mountain range that lies along the coast. The range consists of igneous, metamorphic, and sedimentary formations, including a few very localized karsted limestone outcrops. The two specimens comprising the type series were recovered from a leaf-litter sample taken from under large boulders at the top of the knoll. The vicinity is in a stand of dense lowland mesic deciduous forest. The knoll is sparsely vegetated with trees and vines and bears very little understory.

Distribution.— Known only from the type locality.

Remarks.— This and *E. pycnoptyx* are the smallest known species of *Euglandina*, a genus that varies in size up to 112 mm long (*E. titan* Thompson, 1987). *Euglandina brachystyla* is related to a group of species occurring in southwestern México that include *E. elegans* (Martens, 1895) *E. dorsalis* Thompson, 1963, and the following species. All are known from localities near the Pacific coast. They are alike in bearing on the lower surface of the parietal wall a callus-like ridge that extends downward onto the face of the columella. *Euglandina brachystyla* differs from these others by its much smaller size, its abbreviate columella, and its simple suture. No close relationship between *E. brachystyla* and other species of this group is apparent.

Etymology.— The species name *brachystyla* is from the Classical Greek βραχυσ, short and στυλως, and alludes to the abbreviated columellar projection at the base of the aperture (Figs. 21-22).

Euglandina comma, new species

Figures 23-25

Shell.— Medium-sized, adults about 13-18 mm in length. Shell light brown and glossy with a nearly white columellar crest. Shell faintly translucent or opaque. Elongate-ovoid in shape,; about 0.35-0.41 times as wide as long. Spire attenuate and weakly convex in outline, 0.59-0.65 times the length of the shell. Apex narrowly rounded, first whorl slightly protruding. Mature specimens with 7.4-8.8 weakly arched whorls. Suture impressed, forming a narrow rounded shelf. Protoconch with 2.75 rounded whorls, which are separated by a deep suture. The first 2.5 are smooth, and the next quarter whorl has very fine vertical threads. Teleoconch smooth except for strongly impressed and widely spaced striations below the suture. The striations have the appearance of a series of reversed commas (Figs 23, 25). Striations obsolete and irregular over the rest of the surface. Occasional weak growth varices present. Aperture elongate-auriculate in shape, with a deep bulge into the columellar embayment; aperture about 0.33-0.41 times

as wide as long. Peristome blunt-edged but not conspicuously thickened internally. Outer lip slightly advanced near the middle; basal lip receded (Fig. 24). Columella rounded-truncate, short and inclined at about 45°; compressed laterally and bearing on its outer surface an opaque, thick, white callus that is continuous with and fades into the parietal callus. The columellar crest develops in specimens with 7.4-7.7 whorls. Smaller specimens lack any indication of the structure.

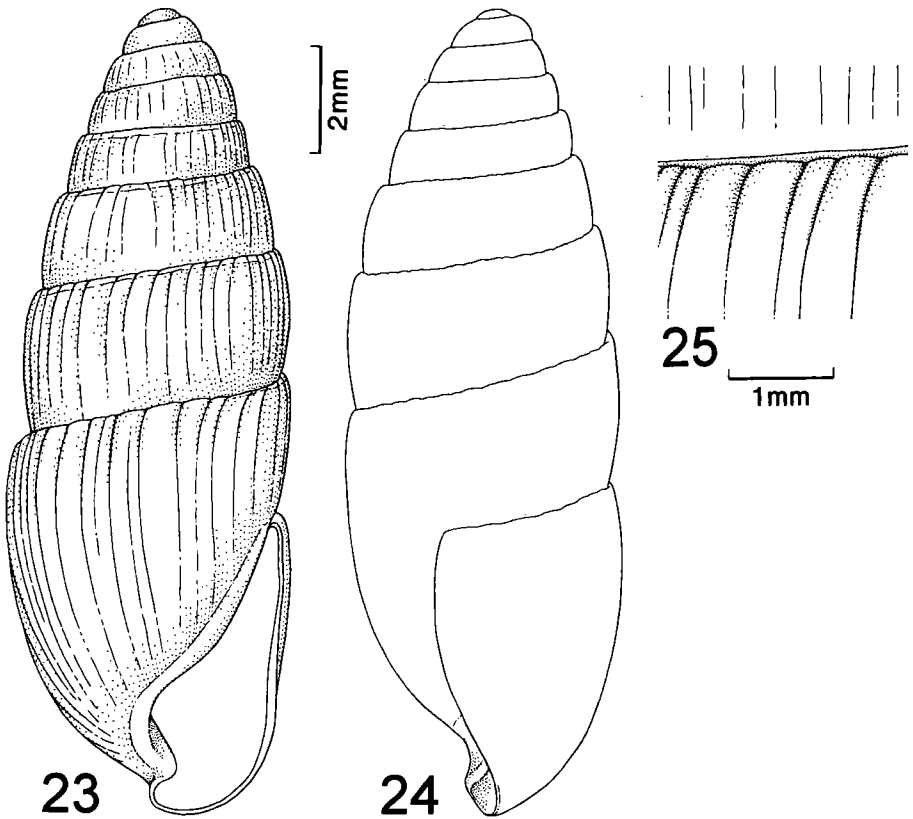
Specimens from the type locality are larger than those from other places. Specimens from near Zihuatanejo are smaller and have fewer whorls at maturity. Aside from differences in size and whorl count all of the paratypes are remarkably alike in their proportions and other morphological features. Measurements in mm for the holotype and five paratypes are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	16.5	6.0	6.0	6.3	2.5	8.5
UF 193039	14.9	5.7	5.5	6.0	2.4	8.3
UF 193039	18.6	6.5	6.6	6.8	2.8	8.8
UF 193040	12.0	4.9	4.6	5.0	2.0	7.8
UF 193040	13.5	5.1	5.4	5.8	2.1	7.7
UF 193040	15.1	5.5	5.4	5.9	2.3	8.7

Type Locality.— Southeast side of the Rio Ixtapa, 6 km southeast of Pantla, Guerrero, MÉXICO (17°43'N, 101°40'W); 20 m alt.. Pantla is a small village on the coastal highway 23 km NW of Zihuatanejo. The type locality is in a lowland mesic forest overlying a substrata consisting of lateritic soils and limestone. HOLOTYPE: UF 34663; collected 28 October, 1970 by Fred G. Thompson. PARATYPES.— GUERRERO: Same data as the holotype (UF 193039, 4 specimens); 2 km SE of Pantla, 30 m alt. (UF 34662, 5 specimens; UF 199949 - 20 specimens); 3.5 km NW of Zihuatanejo, 130 m alt. (UF 34659, 1 specimen) 4.5 km NW of Zihuatanejo, 100 m alt. (UF 34581, 2 specimens; UF 193040, 17 specimen).

Distribution.— This species is found along coast areas of northwestern Guerrero, México. Other records from GUERRERO: limestone hill 3 km E of Naranjillo (UF 211729); 2 km NE Punta Troncones (17°47'36"N, 101°42'43"W), 50 m. alt. (UF 200193); 1.3 km N of Playa Majahua (17°47'58"N, 101°44'11"W), 50 m alt. (UF 199985, UF 200009); 10 km N of La Unión (18°00'05"N, 101°45'20"W), 150 m alt. (UF 200331); 1 km SSE of La Junta (18°01'21"N, 101°44'58"W), 130 m alt. (UF 200344).

Remarks.— Two other species of *Guillarmodia* bearing a raised callus on the columella are *E. elegans* (Martens, 1895) and *E. dorsalis* Thompson, 1963. They occur in Colima and Michoacán respectively. *Euglandina comma* is much larger than these other two species. It is most similar to *E. dorsalis* by having a truncate suture forming a narrow spiral shelf. In the latter species the ledge is sharply



Figures 23-25. *Euglandina comma*, new species. Figures 23-25. Holotype (UF 34663). Fig. 25. Sculpture along suture of penultimate whorl of holotype.

angulate at the shoulder and is bordered below by close, weak striations that crenulate the suture. In addition, the spire is relatively shorter, being about 0.55-0.56 times the length of the shell, and it is only slightly convex in outline. In *E. comma* the edge of the ledge is rounded, and the sculpture is more widely spaced and much stronger. The spire is more attenuate, being about 0.59-0.65 times the length of the shell, and it is more convex in shape.

Etymology.— The species name *comma* is from the Latin *comma*, a punctuation mark, in reference to the strongly impressed sculpture below the suture.

Euglandina kingi, new species

Figures 26-28

Shell.— Shell medium sized, about 12-14 mm long in mature specimens. Translucent; glossy; color uniform light copper-brown. Ovate-cylindrical in shape; about 0.35-0.38 times as wide as high. Spire elongate, convex in outline; about 0.57-0.60 times the length of the shell. Apex rounded; first whorl weakly protruding. Whorls of apex and spire rounded and separated by a moderately impressed suture, which tends to be more deeply constricted in larger specimens. Suture bounded below by a lighter colored narrow cord, which is broken into beads of irregular length. Whorl 7.3-7.8 in mature specimens. Protoconch consisting of 2.7 smooth whorls that are margined by a narrow hyaline zone. Teleoconch sculptured with very fine incremental striation and occasional growth varices. The striation are nearly uniform in intensity over the surface of the shell. On the first postembryonic whorl the striations weakly crenulate the suture; the crenulations rapidly transforms into a sub-sutural beaded cord. Aperture elongate-auriculate in shape; about 0.36-0.41 times as wide as long; with a moderate columellar bulge. Peristome blunt-edged at maturity. Peristome in lateral view recurved between the suture and the periphery and retracted below so that the outer lip is advanced near the middle. Columella obliquely truncate and variably inclined with respect to the longitudinal axis of the shell. In some specimens the columella is nearly vertical; in others it slopes up to about 20° from the vertical axis.

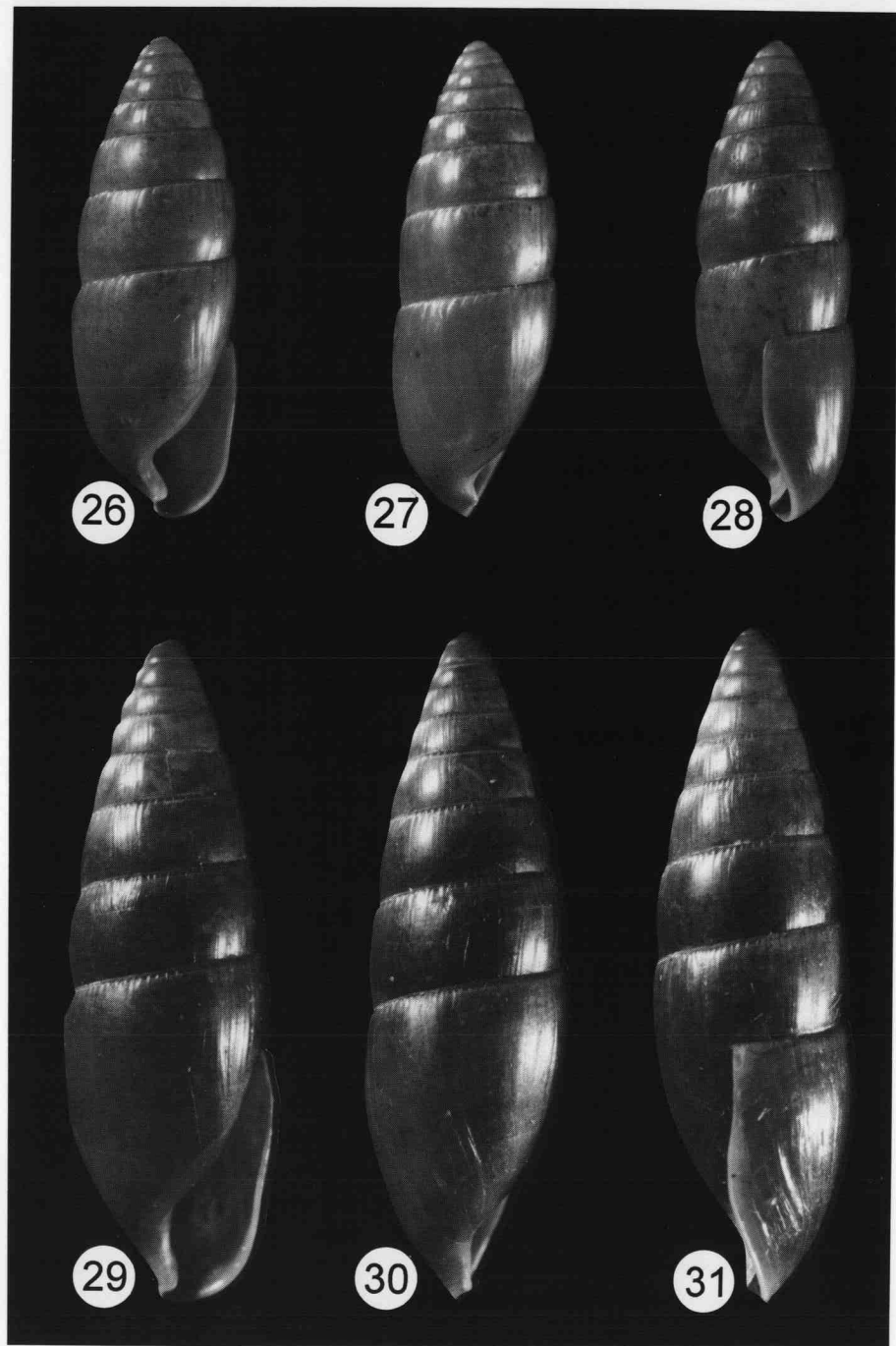
Measurements in mm of the holotype and four specimens selected for variation are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	12.9	4.8	5.5	5.6	2.3	7.3
PARATYPE	12.9	4.6	5.4	5.5	2.0	7.4
PARATYPE	13.4	4.9	5.5	5.8	2.3	7.5
UF 77788	14.1	4.9	5.5	5.9	2.3	7.8
UF 77788	14.3	5.0	5.4	5.8	2.1	7.8

Type Locality.— Among boulders in an open semi-xeric scrub forest on a limestone hillside, on the west side of the Rio Tehuántepec 25 km NW of the Presa Benito Juárez (dam), Oaxaca, MÉXICO; 300 m alt. HOLOTYPE: UF 34691; collected July 20, 1966 by F. Wayne King and Fred G. Thompson. PARATYPES: UF 193056 (19); same data as the holotype.

Distribution.— This species is confined to low and intermediate semi-xeric habitats along the Pacific coast of Oaxaca, México.

Specimens Examined.— MÉXICO. OAXACA: 30 km NW, 3 km NE of Tehuántepec, 200 m alt. (UF 34687); 13.5 km NW of Tehuántepec, 150m alt. (UF



Figures 26-31. *Euglandina kingi*, new species. Fig. 27. Holotype (UF 34641). Figs. 28-29. Paratype (UF 193056). Figs 29-31. *Euglandina gracilior*, new species. Holotype (UF 194115).

77788); 24 km NW, 3 km NE of Tehuántepec, 210 m alt. (UF 77781); 3.5 km NW of Mixtequilla, 130 m alt. (UF 77768); 26 km SE of El Camarón, 1100 m alt. (UF 77991); 10 km N of La Ventosa, 210 m alt. (UF 78003); limestone hill 10 km E of La Ventosa, 50 m alt. (UF 211463); 7.5 km N of La Ventosa, 100 m alt. (UF 211489); 15 km ESE of Santiago Astata (15°57'53"N; 95°32'59"W), 100 m alt. (UF 211509); limestone mtn. 3 km W of Santiago Astata (15°59'55"N, 95°42.45"W), 100 m alt. (UF 211518); 5 km E of Santiago Astata (15°58'50"N, 95°38'16"W), 100 m. alt. (UF 211550).

Remarks.— This species is unique within *Guillarmodia* because of the irregularly beaded subsutural cord. Other species with a subsutural cord are truncate above the cord, forming a narrow spiral ledge, and none are beaded as in *E. kingi*. Its shape, size, relatively impressed suture, and fine incremental sculpture also distinguish it from similar species.

Etymology.— I take great satisfaction in naming this species after my long-time friend and colleague, F. Wayne King.

Euglandina gracilior, new species

Figures 29-31

Shell.— Large for the subgenus *Guillarmodia*; adults about 21.7-25.5 mm long. Elongate-elliptical in shape; about 0.31-0.33 times as wide as long. Spire tapered and convex in outline, about 0.63-0.65 times the length of the shell. Color uniform brown. Shell translucent, nearly clear in life; glossy. Embryonic shell consisting of about 2.3 smooth whorls that are separated by a weakly impressed suture. The apical whorl slightly raised and pointed. Adult shells with 9.4-9.8 whorls that are weakly arched between the moderately impressed suture. Shoulder of whorls beveled. Postembryonic shell sculptured with regular but weak thread-riblets that are slightly enlarged along the suture, but become indistinguishable below the periphery. Aperture elongate-auriculate, of medium width with a moderate embayment into the columellar margin; about 0.35-0.39 times as wide as long. Columella nearly vertical and truncated; relatively longer and not as forward projecting as in the following two species. Outer lip above the periphery relatively thin. Outer and basal lip below the periphery conspicuously thickened. Outer lip in lateral profile weakly arched forward below the middle and retracted near the base.

There is considerable local variation in size and relative slenderness of the spire. The measurements given below are based on specimens with a conspicuously thickened lip, which is the definitive stage of adult development. In subadults the peristome is nearly uniformly thin, and the aperture may appear narrower and without a conspicuous columellar embayment.

Measurements in mm of the holotype and three other adult specimens are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	22.4	7.3	8.3	8.8	3.4	9.7
UF 34596	21.7	6.9	7.8	8.1	3.1	9.4
UF 194114	25.5	8.0	8.9	9.6	3.4	9.7
UF 194116	23.4	7.3	8.5	8.8	3.4	9.8

Type Locality.— An open oak forest 12 km by road southwest of Xochilapa, GUERRERO (17°48'41"N, 99°42'32"W); 1700 m altitude. HOLOTYPE: UF 194115; collected 29 February, 1992 by Fred G. Thompson. The area is an exposed limestone substrata with clusters of palms, shrubs and *Agave* sp. growing among the oaks. Snails were found under large limestone boulders in areas shaded by large trees.

Distribution.— This species is known only from intermediate altitudes along a limestone ridge southwest of Xochilapa, Guerrero. It is confined to a submesic zone between 1285-2200 m altitude that is dominated by sparse growths of oaks (*Quercus* sp.) on limestone substrata. I have examined specimens from the following localities.

Specimens Examined.— MÉXICO. GUERRERO: 10 km SW of Xochilapa, 1700 m alt. (UF 34596); 11.5 km SW of Xochilapa, 1750 m alt. (UF 34591); 12 km by rd. SW of Xochilapa, 1700 m alt. (UF 194117); 15 km SW of Xochilapa, 2200 m. alt. (UF 34642); 10 km SSW of Mazcala (18°34'03"N, 97°55'39"W), 1285 m alt (UF 194116); 10 km SSW of Mazcala (17°50'50"N, 99°40'25"W), 1485 m alt. (UF 194114).

Remarks.— *Euglandina gracilior* and the following two species form a small group within *Guillarmodia* that is found within north-central Guerrero. The group is characterized by having the basal and outer lip conspicuously thickened below the periphery, by their slender, elongate-elliptical shapes, and by their relatively large size compared to other *Guillarmodia*. *Euglandina gracilior* is found south of the Rio Balsas Basin. The other two species occur north of the basin in a small area between and west of Iguala and Taxco. *Euglandina gracilior* is similar to them in most aspects. It differs by its darker color, its larger and slightly more robust shell, and its weakly sculpted thread-riblets. Aspects of the columella and the suture also separate it from its two more northern relatives.

Etymology.— The species name *gracilior* is derived from the Latin *gracilis*, meaning slender.

Euglandina stenotrema, new species

Figures 32-34

Shell.— Light brown or grayish brown in color. Shell moderately thin throughout; translucent and shiny. Shell very slender elongate-elliptical in shape, about 16-19 mm long, about 0.31-0.37 times as wide as high. Spire attenuate and slightly convex in outline; apex narrowly rounded. Whorls 8.3-9.3 in mature specimens; whorls uniformly but weakly arched between the deeply impressed and beveled suture. Protoconch with 2.75 slightly rounded whorls which are separated by a shallow suture; first 2.5 whorls smooth; following quarter whorl with fine vertical striations. Teleoconch sculptured with regularly spaced thread-riblets that only slightly crenulate the suture at their upper ends; thread-riblets becoming weak on the middle of the whorls and obsolete on the base. Interspaces with very fine growth striations and occasional minute granules, which are absent on the thread-riblets. Growth varices conspicuous only on last whorl. Aperture 0.28-0.33 times as wide as long; narrowly auriculate in shape with a shallow columellar embayment. Outer lip and basal lip blunt-edged; slightly thickened internally; outer lip advanced at periphery; basal lip receded (Fig. 33). Columella truncate and slightly oblique.

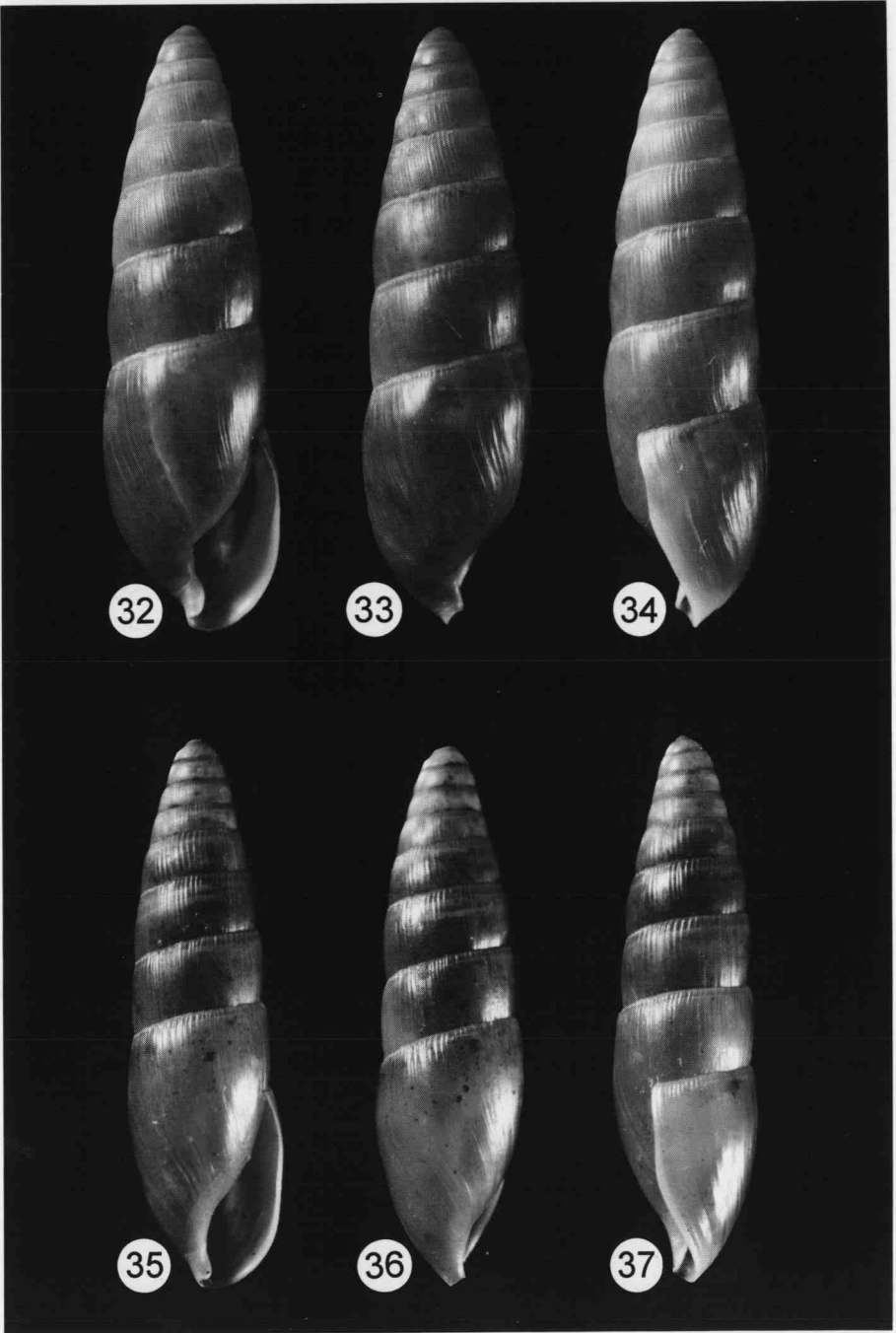
Measurements in mm of the holotype and five other specimens are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	19.5	5.8	6.6	7.2	2.6	9.8
PARATYPE	16.0	5.3	5.8	6.1	2.0	8.3
PARATYPE	16.9	5.5	6.3	6.6	2.1	8.7
UF 193041	17.0	5.5	6.3	6.5	2.1	8.3
UF 34627	18.0	5.7	6.5	6.9	2.0	9.0
UF 34727	19.0	5.9	6.6	6.9	2.0	9.3

Type Locality.— A limestone hillside 4.5 km ENE of Ixcateopán, GUERRERO, MÉXICO; 2500 m alt. The area is forested with a dense growth of junipers among limestone boulders. Ixcateopán (18°30'N, 99°47'W) is a small village about 37 km WSW of Taxco. HOLOTYPE: UF 193042; collected 1 October, 1970 by Fred G. Thompson. PARATYPES: UF 34640; same data as the holotype.

Distribution.— This species is confined to a small area of limestone terrain in northern Guerrero north of the Rio Balsas from 1100-2100 m altitude.

Specimens Examined.— MÉXICO. GUERRERO: ca 10 km NE of Chapa, 1420 m alt. (18°25'51"N, 99°44'31"W) (UF 194108); 1 km ENE of Ixcateopán, 2250 m alt. (UF 34592); 2 km ENE of Ixcateopán, 2100 m alt (18°30'16"N, 99°46'56"W) (UF 194109); 7.5 km ENE of Ixcateopán, 1650 m alt. (UF 193041); 5 km E of Teloloapán, 1850 m alt. (UF 34589); 25 km E of Teloloapán, 1850 m alt. (UF 34597, 34627); 18 km N of Tonalapa; 1100 m alt. (UF 77735); 9 km S of



Figures 32-37. Figs. 32-34: *Euglandina stenotrema*, new species. Holotype (UF 34640). Fig. 34. Sculpture along shoulder of penultimate whorl. Figs 35-37: *Euglandina arthritica*, new species. Holotype (UF 34666). Fig. 37. Sculpture along shoulder of penultimate whorl.

Buenavista de Cuellar, 1350 m alt. (UF 77998); ca. 20 km NNW of Buenavista de Cuellar 1540 m alt. (18°33'57"N, 99°27'57"W) (UF 194110); Cerro Tuxpan, 1450 m alt. (18°23'36"N, 99°28'53"W) (UF 194107). Specimens were found in oak and juniper forests under limestone boulders.

Remarks.— This is a medium-sized *Guillarmodia*, characterized by its very slender shape, its weakly ribbed sculpture, and its very narrow aperture. It is most similar to the preceding species because of the shape of the aperture, its large number of whorls, and its long attenuate spire. It differs by its smaller size, its narrower aperture, its lighter color and its coarse sculpture.

Etymology.— The name *stenotrema* is derived from the Classical Greek, στενός, narrow, and τρημα, small hole, and alludes to the narrow aperture characteristic of this species.

Euglandina arthritica, new species

Figures 35-37

Shell.— Large, mature specimens 23-24 mm in length. Very elongate-elliptical in shape; about 0.31-0.33 times as wide as long. Spire tapered and slightly convex in outline, nearly straight sided; about 0.67-0.69 times the length of the shell. Color chestnut brown with a whitish subsutural cord. Shell opaque and almost lusterless. Whorls 9.2-9.3. Protoconch consisting of 2 whorls. Initially these are sculptured with faint and irregular indentations which fade into weak threads by the last 1/4 whorl of protoconch. Apical whorl slightly raised and obtusely pointed. Suture between first few whorls not impressed so that apex forms a smoothly rounded dome. Suture between lower whorls deeply impressed and crenulate. Whorls of teleoconch weakly and evenly arched. Sculpture consisting of close, fine ribs which are strongest and most distinct on the upper whorls and become weaker and less discrete on the last whorl. Upper ends of ribs knob-like and coalescing to form a rugose subsutural cord that weakly crenulates the suture. Interspaces between riblets with weak incremental striations. Interspace and surface of riblets bearing scattered, minute, elongate granules. Growth varices conspicuous only on last whorl. Aperture elongate-auriculate, about 0.37-0.40 times as wide as long; moderately wide with a deep embayment into the columellar margin. Peristome blunt-edged and slightly thickened internally along lower outer lip and basal lip. Outer lip slightly advanced near middle; basal lip receded. Columella truncate and oblique, lying at about 20° to axis of shell.

Measurements in mm of the holotype and two paratypes are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls	stage
HOLOTYPE	23.2	7.2	7.3	7.8	2.9	9.3	mature
PARATYPE	24.0	7.8	7.9	8.5	3.3	9.4	mature
PARATYPE	17.1	6.2	6.3	6.6	2.6	8.0	immat.

Type Locality.— An oak-forested limestone hillside 7.5 km ENE of Ixcateopán, Guerrero, MÉXICO; 2650 m alt. HOLOTYPE: UF 34666; collected 1 October, 1970 by Fred G. Thompson. PARATYPES: (UF 193044); same data as the holotype.

Distribution.— Known only from the type locality.

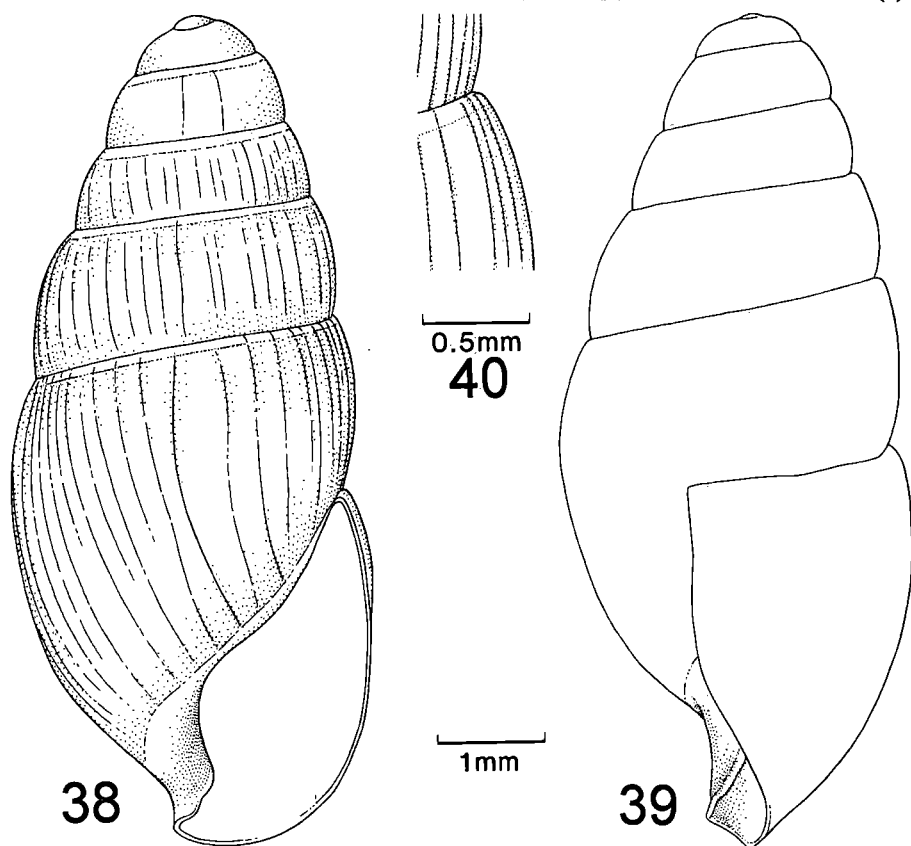
Remarks.— This species is most similar in appearance to *Euglandina stenotrema*. It differs from the latter by its chestnut brown color with a whitish subsutural cord, its wider aperture with a deep columellar embayment and an oblique columella, its crenulate suture, and its coarser sculpture in which the upper end of the riblets are enlarged into knobs and partially coalesce to form the subsutural cords. In addition the protoconch is obtusely pointed and consists of 2 whorls. The suture between them is not impressed. The microsculpture of the protoconch and the teleoconch differ as is noted in the descriptions of the two species.

Superficially *E. arthritica* and *E. stenotrema* are very similar. They were collected together at the type locality of *E. arthritica*. A mature specimen of *E. stenotrema* (UF 193041) collected at that locality is nearly identical in size to the immature paratype of *E. arthritica*. It is listed for comparison in the table of measurements for the former species.

Etymology.— The species name *arthritica* is from the Classical Greek ἀρθριτὸς, and alludes to the knob-like swellings at the upper end of the riblets.

Subgenus *Varicoglandina* Pilsbry, 1908
Euglandina rubiginosa, new species
Figures 38-40

Shell.— Small, 7.6 mm long. Moderately thin and transparent. Elliptical-ovate in shape, 0.43 times as wide as long. Spire nearly straight sided; 0.58 times the length of the shell. Color shiny gray with faint rusty tints along the upper margin of the whorls along suture and around the base to form two faint rusty zones that occasionally are bridged by faint rust-colored flames preceding irregularly spaced varices. Whorls 6.1 in only mature specimen examined. Protoconch with 1.5 smooth whorls. Teleoconch with irregular faint incremental striations that are most distinct below the suture and diminish on the middle and lower sides of the whorls; striations becoming stronger near aperture. Occasional weak growth varices present. Suture deeply impressed, bordered below by a beveled narrow hyaline zone (Fig. 40). Aperture moderately high, trapezoidal in shape with a weakly concave columnar margin; widest below the center. Outer lip thin, slightly advanced near middle; basal lip receded (Fig. 39). Columella moderately thin; truncate; relatively long; oblique at about 16° to axis of shell and projected forward at the base.



Figures 38-40. *Euglandina rubiginosa*, new species. Holotype (UF 190175).. Fig. 40. Sculpture along shoulder of penultimate whorl.

Measurements in mm (converted from micrometer units) for the holotype are as follow. length 7.63; width 3.25; aperture height 3.18; aperture length 3.50; aperture width 1.63.

Type Locality.— A limestone knoll 11 km S of Cobán, Dept. Alta Verapaz, GUATEMALA; 1350 m alt. (15°24'57"N, 90°24'09"W). HOLOTYPE: UF 190175; collected 24 February, 1991 by Fred G. Thompson and Steven P. Christman.

Distribution.— This species is known only from a small area in Alta Verapaz Dept., Guatemala.

Specimens Examined.— GUATEMALA: DEPT. ALTA VERAPAZ; 15 km by road N of Cobán, 1050 m alt. (15°37'14"N, 90°19'10"W) (UF 189913, 1 PARATYPE); limestone knoll 17.5 km NW of Tactic, 1330 m alt. (15°21'29"N,

90°25'25"W) (UF 189844, 2 PARATYPES); 2 km ESE of Cajaj, 1250 m alt. (15°33'25"N, 90°06'56"W), (UF 190020).

Remarks.— *Euglandina rubiginosa* is characterized by its small size, its elliptical-ovoid shape with a nearly straight-sided spire, its oblique, twisted columella, its thin transparent shell and its rusty color pattern. The three paratypes are fresh juvenile shells. They are like the holotype in these features.

The relationship of *E. rubiginosa* is uncertain. It is placed in *Varicoglandina* because of its reduced sculpture, simple suture, and flammulate color pattern. Baker (1941) recognized three species groups (sections), which he distinguished by varying degrees of sculpture and color banding. The conical spire, striate sculpture, and color pattern suggest a relationship to the typical species group of *Varicoturris* (*E. monilifera* group) from Chiapas and Guatemala. Other species of this group are much larger in size and are more distinctly flammulate (Pilsbry, 1908; Baker, 1941).

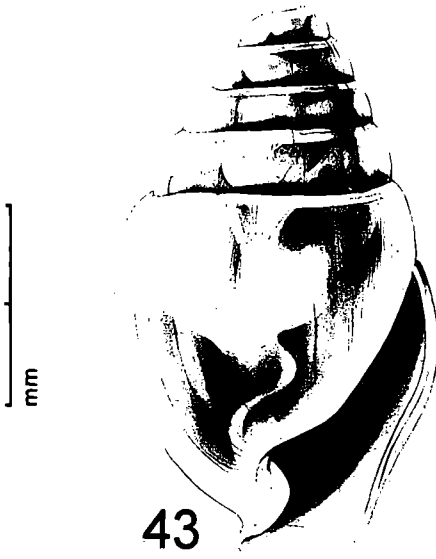
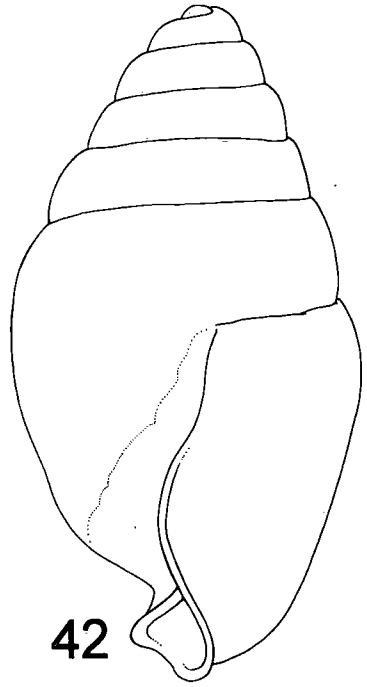
Euglandina rubiginosa is superficially similar in size and appearance to *E. (Guillarmodia) pupa* Baker, 1941 (Figs. 17-19). The latter has a thick, elongate-ovoid shaped shell that is uniform buff or milky white in color and is translucent. I have examined numerous juvenile specimens of *E. pupa*, and all show the same thick aspect of the shell as do the adults. *E. pupa* differs further by having a less convex-sided spire with a shallower suture between the whorls, a broader subsutural hyaline zone, and a relatively shorter, thicker columella in the aperture. Also, the columella of *E. pupa* is vertical or nearly so, in contrast to the more oblique columella in *E. rubiginosa*.

Etymology.— The species name *rubiginosa* is from the Latin, meaning rust-colored, in reference to its color pattern.

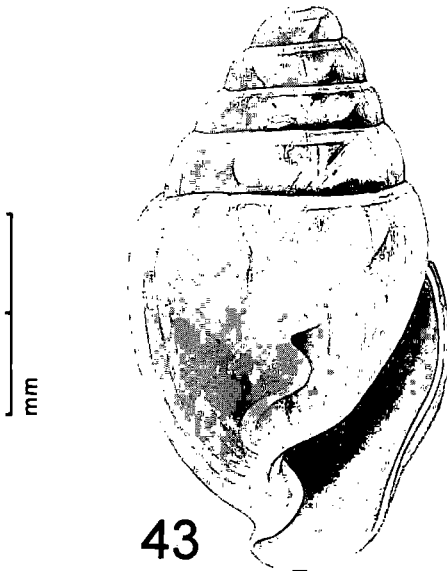
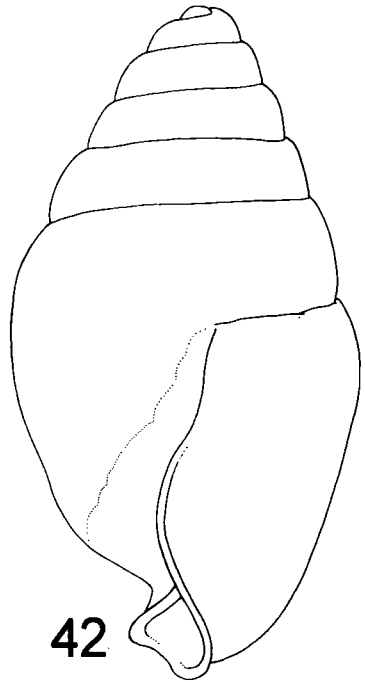
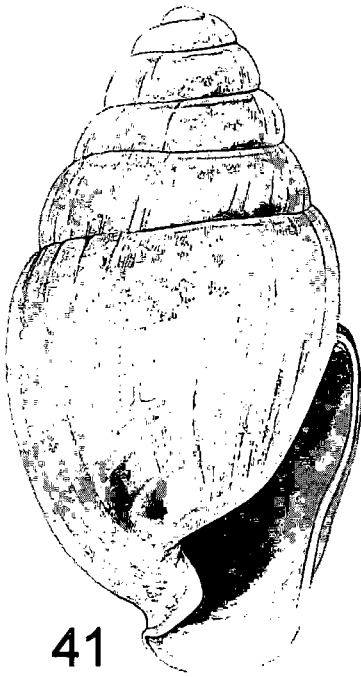
Euglandina constricta, new species

Figures 41-43

Shell.— Moderately small in size, adults about 5.5-6.3 mm long, and about 0.56-0.57 times as wide as high. Glossy, hyaline; with sparse rusty flames on a tan-colored background; edge of columellar plate white. Obovate in shape with a conical apex that is about half the length of the shell. Last whorl with a weak spiral constriction just below its middle. Whorls 5.9-6.0 in mature specimens. Suture deeply impressed, forming a narrow rounded shelf along following whorl. Protoconch consisting of 2.3 whorls that bear very fine, close vertical striation. Following whorls with similar fine striations that become irregularly spaced and form occasional very weak growth varices; shoulder of whorls with distinct comma-like indentations that weakly crenulate the suture. Height of aperture about 0.49-0.51 times the length of the shell; auriculate with a deep columellar embayment, and slightly impressed along middle of outer lip. Aperture about 0.52-0.59 times as wide as high. Columella oblique; with a strongly twisted and



Figures 41-43. *Euglandina constricta*, new species. Figures 41-42. Holotype (UF 210812). Fig. 43. (UF 200543).



Figures 41-43. *Euglandina constricta*, new species. Figures 41-42. Holotype (UF 210812). Fig. 43. (UF 200543).

truncate columellar plate that is thickened along its outer edge. Middle of outer lip strongly advance; basal lip receded.

Measurements in mm (converted from micrometer units) for the holotype (UF 210812) and two referred specimens (UF 200543) are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	6.26	3.5	3.2	3.5	1.8	5.9
UF 200543	5.52	3.2	2.7	3.1	1.6	6.0
UF 200543	5.27	3.1	2.9	3.2	1.5	5.7

Type Locality.— A limestone ridge 3 km WNW of Mazín Grande, OAXACA, MÉXICO (18° 08' 01" N, 96° 21' 48"W); 200 m alt. HOLOTYPE: UF 210812; collected 30 July, 1993 by Elizabeth Raiser. The type locality is in a rain forest at the crest of a limestone ridge. The holotype was recovered from leaf litter collected from along the bases of limestone ledges.

Distribution.— Known only from a small area in extreme northeastern Oaxaca, Mexico.

Remarks.— Two specimens from 12 km NW of Bethenia, Oaxaca (UF 200543) differ from the holotype (Figs. 41-42) in that they appear to achieve adulthood at a smaller size, and the incised axial sculpture below the suture is less pronounced (Fig. 43). Other aspects of the shell are typical as described above.

This species is not particularly close in its relationship to other known species. It is placed in the subgenus *Varicoturris* because of its occasional varix-like growth striations and its flammulate color pattern. Its small size, its relatively short conical spire, its weakly constricted last whorl, its oblique columella with a strongly twisted, truncate columellar plate, and its advanced outer lip combine to form very distinctive features within *Varicoturris*.

Etymology.— The species name *constricta* is from the Latin, and refers to the medial constriction in the last whorl which, in part, characterizes this species.

Subfamily STREPTOSTYLINAE Baker, 1941

Myxastyla, new genus

Type Species.— *Streptostyla coxeni* Richards, 1938.

Description.— Size minute, about 2-4 mm in length; cylindrical-ovate or ovate-elliptical in shape, with the spire comprising about half the length of the shell. About 4-5 whorls. Sculpture simple, consisting of nearly uniformly spaced impressed growth varices. Aperture pinched inward along the outer lip. A strongly twisted columellar plate forms a narrow, deep channel between the parietal wall and the edge of the plate.

This genus is placed provisionally in the Subfamily STREPTOSTYLINAE. It differs from other streptostylid genera by its sculpture. It resembles in shape some species of *Streptostyla*, but mature *Streptostyla* are much larger, and none has regular spaced impressed growth varices. To a lesser extent *Myxastyla* resembles some *Spiraxis* (Subgenus *Volutaxis*) because of its strongly twisted columellar plate. However, the various species of *Volutaxis* have raised axial sculpture, they are much more attenuate in shape, and they have a greater number of whorls.

Myxastyla also resembles the Jamaican species of *Sigmataxis* (OLEACINIDAE) in its sculpture. However, the shell of *Sigmataxis* is elongate in shape as in *Spiraxis*. I suspect that the similarity between *Myxastyla* and *Sigmataxis* in sculpture is due to convergence and no close relationship exists. The species of *Sigmataxis* were reviewed by Pilsbry (1907). Baker (1941a) outlined the relationship of *Sigmataxis* within the OLEACINIDAE.

At present, *Myxastyla* is known from central Guatemala in the Provinces of Izabál, Alta Verapáz, and Huetuetenago, and from Roatán Island, Honduras. Three species are known, genero-type and two new species described below. Other undescribed species are before me from Belize and Honduras. At least two additional species are present among the material that I have examined from Guatemala, but the specimens are too few in number to allow further taxonomic treatment. Material from Belize and Honduras will be treated elsewhere. Within its range *Myxastyla* is found in tropical wet mesic or submesic forests over limestone substrata and occurs between 400-1350 m altitude. It is commonly found in leaf litter.

Etymology.— The name *Myxastyla* (f.) is derived from the Classical Greek $\mu\upsilon\chi\alpha\alpha\iota\alpha$ oil-lamp nuzzle, and $\sigma\tau\upsilon\lambda\omicron\varsigma$, a column, alluding to the shape of the aperture base.

Myxastyla coxeni (Richards, 1938)

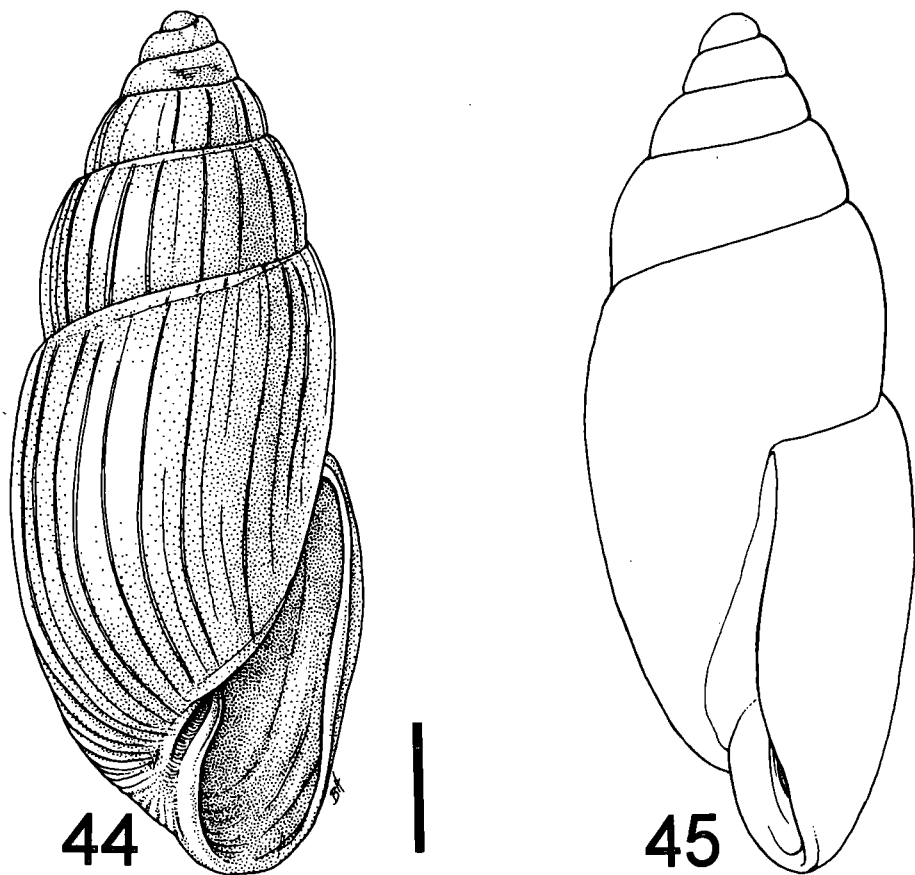
Figures 44-45

Streptostyla coxeni Richards, 1938; Proceedings American Philosophical Society, 79:172; pl. III, fig. 2.

Type Locality.— HONDURAS: Bay Islands, Roatán Island, limestone outcrops between Coxen Hole and West End. Holotype: ANSP 170020.

Distribution.— Apparently endemic to Roatán Island. Other species of *Myxastyla* occur elsewhere in Honduras.

Specimens Examined.— HONDURAS: Bay Islands: Roatán Island: limestone knoll on west side of Oak Ridge Harbor, 0.5 km N Oak Ridge (16°23'43" N, 86°21'18"W) (UF 224466); coralline limestone outcrop, E end Mangrove Bight, 6.5 km WSW Coxen Hole (16°17'10"N, 86°34'40"W) (UF 224570); 1.6 km E West Bay Beach (16°16'34"N, 86°35'29"W) (UF 224531); limestone ridge 0.5 km E West Bay Beach (16°16'30"N, 86°35'49"W) (UF 224546); E side of Half Moon Bay, West End Village (16°18'36"N, 86°35'34"W) (UF224507).



Figures 44-45. *Myxastyla coxeni* (Richards, 1938); Honduras, Roatán Island, limestone ridge 0.5 km E West Bay Beach (16°16'30"N, 86°35'49"W) (UF 224546). Scale bar = 1 mm.

Remarks.— *Myxastyla coxeni* is the largest of the three known species. It is intermediate in stockyness compared to its congeners (Fig. 44-45) and is considerably more attenuate in shape.

Myxastyla pycnota, new species

Figures 46-48

Shell.— Minute, about 3 mm in length. Shell glossy, unicolor light gray, relatively thick, translucent. Ovate-cylindrical in shape; about 0.35-0.38 times as wide as long. Spire convex in outline; about 0.52-0.57 times length of shell.

Apical whorl large, with the first quarter raised and almost pointed. Whorls 4.3-4.6; arched between the suture; with a broad subsutural hyaline zone that is about 1/4 the width of the whorls on the spire. Suture moderately impressed; rapidly descending along the last whorl. Protoconch with 2.3 smooth whorls. Teleoconch sculptured with nearly uniformly spaced impressed growth varices; smooth between varices but with occasional fine longitudinal striations. Columellar plate thin and weakly spiral within the shell (Fig. 47). In the last whorl it rapidly enlarges to form a thick spiral plate that emerges at the base of the aperture to form and partially cover a narrow deep oblique channel between the parietal wall and the plate. Aperture narrowly auriculate in shape and partially constricted near the middle by the curvature of the outer lip. Outer lip pinched inward below the middle, partially obstructing the aperture. Outer lip and basal lip strongly thickened internally, and continuous in curvature and thickness with the base of columellar plate. Peristome advanced near middle and strongly retracted below (Fig. 45).

One paratype is a nearly fresh shell and is the basis for observations on color and translucence. Other paratypes and the holotype are older and more opaque.

Measurements in mm of the holotype and four paratypes are as follow.

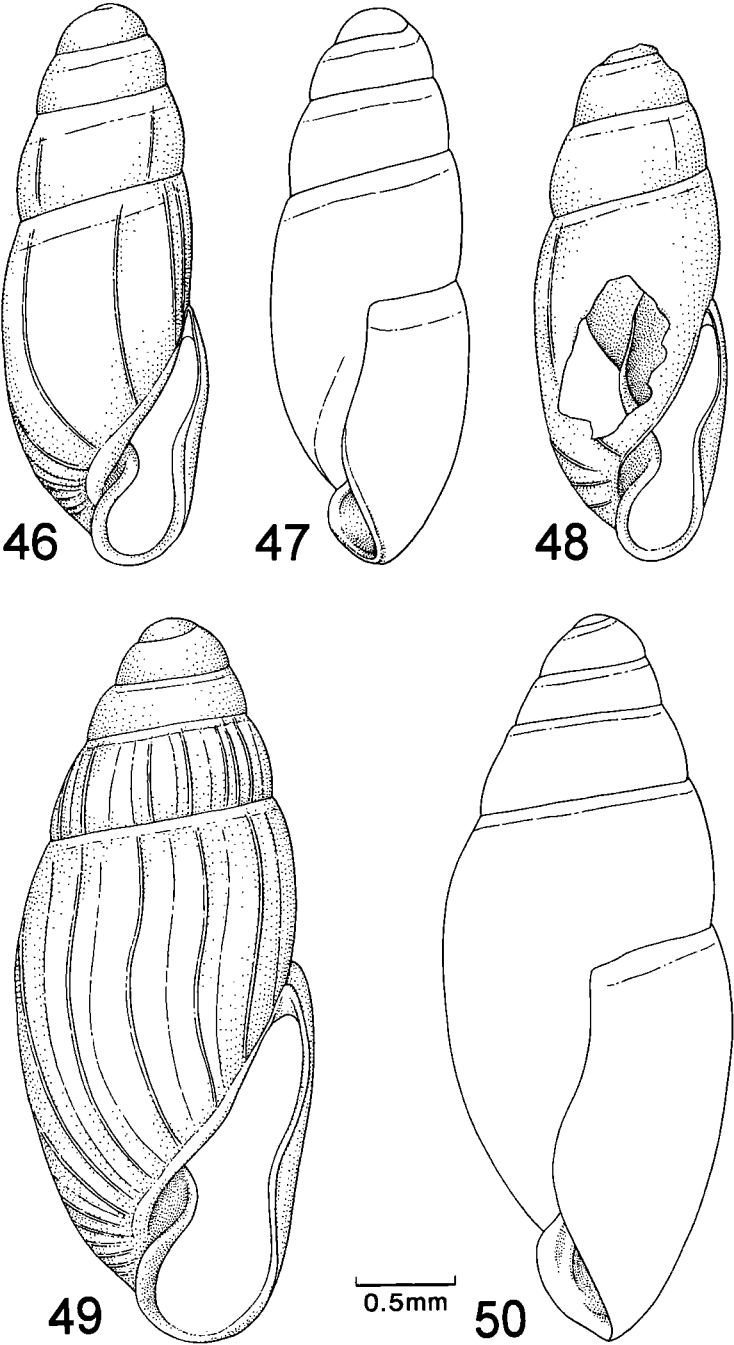
Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	2.95	1.02	1.30	1.36	0.62	4.5
PARATYPE	2.7	1.05	1.18	1.27	0.56	4.3
PARATYPE	2.7	0.99	1.27	1.30	0.56	4.4
PARATYPE	3.0	1.08	1.30	1.36	0.62	4.6
PARATYPE	3.1	1.12	1.36	1.40	0.62	4.6

Type Locality.— Gorge along the Rio Selequa 12 km SSE of La Democracia, Dept. Huehuetenango, GUATEMALA; 950 m alt. HOLOTYPE: UF 190415; collected 11 March, 1991 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 193057 (5); same data as the holotype. Specimens were collected in leaf litter gathered in a submesic zone along the base of a high limestone cliff.

Distribution.— Known only from the type locality.

Remarks.— At present this species is known only from the type locality. We collected specimens of *Myxastyla* resembling *M. pycnota* from three localities in the Depto. Alta Verapaz. Apparently they represent one or more additional species of *Myxastyla*. The three samples contain only one or two individuals, which are in unsatisfactory condition for taxonomic treatment.

Myxastyla pycnota is readily distinguished from the following species by its nearly cylindrical shape, its narrow aperture, its broad subsutural hyaline zone and its thick peristome.



Figures 46-50. Figs. 46-48: *Myxastyla pycnota*, new species. Figures 46-47; Holotype (UF 190415). Fig. 48; Paratype (UF 193057). Figs. 48-50: *Myxastyla hyalina*, new species. Holotype (UF 189852).

Etymology.— The species name *pyncota* is from the Classical Greek πυκνότες, thickness, and alludes to the thickened lower part of the peristome.

Myxastyla hyalina, new species

Figures 49-50

Shell.— Very small, 3.2-3.7 mm long. Ovoid-elliptical in shape; about 0.42-0.45 times as wide as long. Spire weakly convex, nearly straight-sided; about 0.44-0.47 times the length of the shell. Thin, transparent, glossy; amber colored with a whitish outer lip and columellar plate. Suture weakly impressed; rapidly descending to the aperture along the last half whorl. Suture bordered below by a narrow hyaline subsutural zone that is about 1/8 the width of the whorls on the spire. Whorls 4.7-5.1 at maturity; weakly convex between the suture. Protoconch rounded and containing 2.3 whorls. First whorl smooth and obtusely angulate with a raised nucleus when viewed along the initial suture. The following whorl has very fine vertical striations. Teleoconch sculptured with nearly regularly spaced impressed growth varices that are continuous onto the base. Varices closer and stronger near the outer lip; occasional very weak growth striations present between the varices. Aperture irregularly auriculate in shape; pinched inward at middle by weakly indented outer lip; aperture about 0.38-0.41 times as wide as high. Outer lip strongly advanced near middle (Fig. 48). Basal lip retracted below. Peristome slightly thickened along outer lip; slightly thinner below. Columellar plate about as thick as outer lip; strongly reflected and high; forming and partially covering an oblique narrow channel between plate and parietal wall (Fig. 47).

Measurements in mm of the holotype and paratypes are as follow.

Specimen	length	width	ApH	ApL	ApW	whorls
HOLOTYPE	3.7	1.6	1.86	1.92	0.74	5.1
PARATYPE	3.2	1.4	1.76	1.82	0.69	4.7
PARATYPE	3.3	1.5	1.74	1.86	0.68	4.7
PARATYPE	3.3	1.5	1.80	1.83	0.74	4.8
PARATYPE	3.3	1.5	1.80	1.86	0.68	4.9
PARATYPE	3.5	1.5	1.80	1.86	0.74	4.9

Type Locality.— Limestone knoll 17.5 km by road NW of Tactic, Dept. Alta Verapaz, GUATEMALA (15°21'29" N, 90°25'25" W); 1330 m alt. HOLOTYPE: UF 189852; collected 16 February, 1991 by Fred G. Thompson and Steven P. Christman. PARATYPES: UF 193058 (3); same data as the holotype. The holotype and three paratypes are fresh shells. The area around the type locality consisted of a dense thicket of small trees and shrubs in a lowland rain forest that had been drastically cut over for small-crop agriculture. Specimens were found by sifting leaf-litter.

Distribution.— Known only from Alta Verapaz Dept., Guatemala.

Specimens Examined.— GUATEMALA. DEPT. ALTA VERAPAZ: 11 km W of San Cristobal Verapaz, 1120 m alt. (UF 193059); 1.5 km SE of San Juan Chamelco; 1300 m alt. (UF 189875); 2 km ESE of Cajaj; 1250 m alt. (UF 190018); 11 km S of Cobán; 1350 m alt. (UF 190169); 14 km N of Cobán; 990 m alt. (UF 189927).

Remarks.— This species is distinguished from *Myxastyla pycnota* by its broader elliptical shape, its wider aperture, its thinner shell and its narrow subsutural hyaline zone as well as other minor traits that are depicted in the descriptions. It is distinguished from *M. coxeni* by its stockier form and relatively larger aperture.

Etymology.— The species name is from the Classical Greek *βαλινος* meaning glassy in reference to the smooth, glossy shell.

Subfamily SPIRAXINAE Baker, 1939

The classification of the subfamily was reviewed by Baker (1939). He recognized a single genus, *Spiraxis* C. B. Adams, 1850. This study recognizes as genera *Spiraxis* C. B. Adams, 1850, *Pseudosubulina* Strebel and Pfeffer, 1882, *Volutaxis* Stebel and Pfeffer, 1882, *Rectaxis* Baker, 1926, and *Miraradula* Baker, 1939. They are defined by Baker (1939) as subgenera within *Spiraxis*, because the shell characters of some species are non-diagnostic at the generic level, even though anatomical data justify the recognition of several genera. A new genus is proposed for a group of large-sized species.

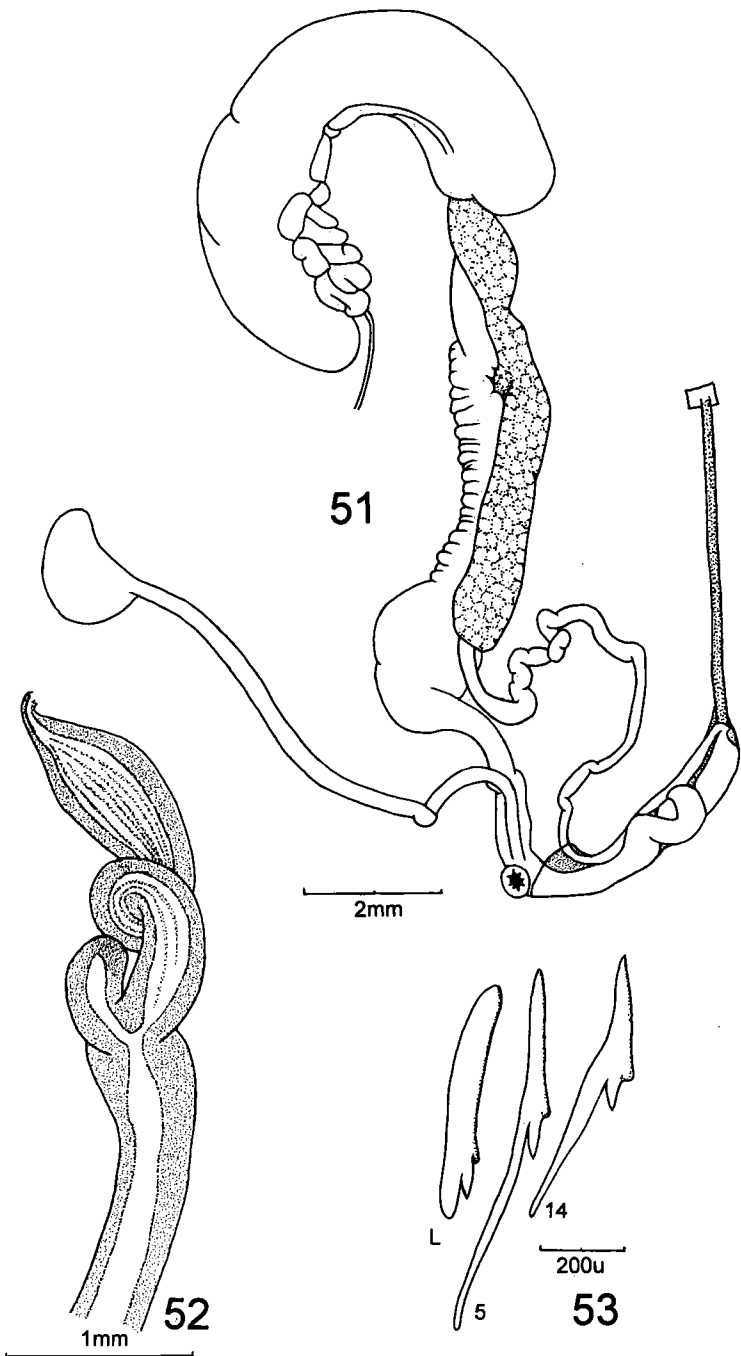
Mayaxis new genus

Figures 51-53

Type Species.— *Mayaxis leei*, new species.

Description.— A genus of the subfamily Spiraxinae characterized by having an opaque, corneas colored, turrit-shaped shells bearing wide, nearly flat ribs that crenulate the suture. The ribs are as wide as or wider than their interspaces. The protoconch consists of about two narrow raised whorls, the first of which is smooth and the second bears heavy axial ribs. The aperture has a truncate columella.

The following anatomical data are based on the type species. The radula (Fig. 53) contains a vestigial unicuspid central tooth, a single heavy bicuspid lateral, and 23 bicuspid marginals. The marginal teeth bear a very long slender entocone and a short ectocone. Reproduction apparently is oviparous. The reproductive system (Fig. 51) opens below the right eye stalk. The genital atrium is very short. The penis is large and stout and has a short appendix at its apex and a larger stout epiphallus (Fig. 52). The penis wall is thickened below the apex but lacks an internal papilla or folds. The epiphallus has a large voluminous chamber at its apical end and bears internally about six low longitudinal folds. The penis,



Figures 51-53. *Mayaxis leei*, new genus & new species. Fig. 51 Reproductive system. Fig. 52 Penis and associated structures. Fig. 53. Radular teeth; L = lateral, 5 = 4th marginal, 14 = 13 th marginal teeth respectively.

appendix, epiphallus, and descending vas deferens are enclosed within a sheath. The penis retractor muscle is long and attaches high onto the inner wall of the lung. The prostate is well developed. It is almost as long as and is tightly attached to the uterus. The ovotestis (not illustrated) consists of a chain of multiple clavate lobes located about one whorl above the albumen gland and is about one whorl long. The primary gonoduct is slender and very thin; the secondary gonoduct is greatly enlarged and convoluted along the inner curvature of the albumen gland. The talon and the carrefour are imbedded within the albumen gland. The uterus is long and voluminous. The post-uterine oviduct is about half as long as the uterus. The vagina is vestigial. The spermatheca is appressed against the uterus at the base of the prostate, as is usual for the subfamily, and its duct enters the female system just above the genital atrium.

Mayaxis is unique within the SPIRAXINAE because of the presence of strong wide ribs on the opaque shell, by the extremely long, slender cusps on the marginal teeth of the radula, by the presence of an appendix on the penis, and by the presence of an epiphallus. These characters are unique to *Mayaxis* and strongly isolate it within the subfamily. Its radula is similar to *Volutaxis*, *Pseudosubulina*, and *Spiraxis* by having a unicuspid central, and bicuspid lateral and marginal teeth (Baker, 1939), although none of these has the extreme development of the inner cusp on the marginal teeth that typifies *Mayaxis*. It is like other Mexican and Central American generic groups in being oviparous and having a chain of multiple clavate lobes comprising the ovotestis, and it is like *Volutaxis* in having a penis sheath. It differs from other mainland genera but is similar to the Jamaican genus *Spiraxis*, by having a well developed uterus that is longer than the combined length of the post-uterine oviduct + the vagina. However, *Spiraxis* is viviparous and has a single clavate lobe comprising the ovotestis. The combination of characters suggest that *Mayaxis* is primitive in its relationships to *Spiraxis*, *Volutaxis*, and *Pseudosubulina*. These genera form a clade distinct from that of *Miraradula* and *Rectaxis*. The latter two genera are alike in having tricuspid radular central teeth.

Described species of *Mayaxis* were assigned to *Pseudosubulina* by previous authors because of the truncate columella, a character shared by the two genera. *Mayaxis* is known from the Mayan realm of Honduras, Guatemala, and southeastern Mexico. The name alludes to this origin and its shell shape (axis $\alpha\chi\omicron\varsigma$ Gr., m. a pole or axle). The following species are placed in *Mayaxis* because of their sculpture and truncate columellae. *Pseudosubulina robusta* Martens, 1898, may also belong in this group.

Mayaxis chiapensis (Pfeiffer, 1856)

Achatina chiapensis Pfeiffer, 1856; Proc. Zool. Soc. Lond.: 379.

Subulina chiapensis (Pfeiffer), Crosse and Fischer, 1878; Miss. Sci. Mex., I: 637; pl. 26, figs. 2.

Pseudosubulina chiapensis (Pfeiffer), Strebel, 1882; Beitr. Mex. Land- Susswas. Conch., V: 119; pl. 7, fig. 17.- Martens, 1898; Biol. Cent.-Amer.: 303.- Pilsbry, 1907; Man. Conch., Ser. II, 19: 3.

Type Locality.— "Chiapas," Mexico.

Distribution.— Known from northern Chiapas and immediately adjacent Tabasco.

Specimens Examined.— MÉXICO. CHIAPAS: S of Motozintla, 1872 m alt. (UF 155830). TABASCO: limestone knoll 3 km E of Teapa, 120 m alt. (UF 193386).

Mayaxis fortis (Martens, 1898)

Pseudosubulina fortis Martens, 1898; Biol. Cent.-Amer.: 304; pl. 17, fig. 17.- Pilsbry, 1907; Man. Conch., Ser. II, 19: 5; pl. 5, fig. 19.

Type Locality.— Here-in restricted to El Reposo, western Guatemala; 800 ft. alt.. This is the locality of the specimen illustrated by Martens.

Distribution.— Martens (1898) listed several localities in western Guatemala.

Mayaxis lirifera (Morelet, 1851)

Achatina lirifera Morelet, 1851; Testacea Novissima, II: 12.

Subulina lirifera (Morelet), Crosse and Fischer, 1878; Miss. Scietifique. Mex., 1: 633; pl. 25, fig. 12.

Pseudosubulina lirifera (Morelet), Martens, 1898; Biol. Cent.-Amer., 304-305; pl. 17, figs. 20.- Pilsbry, 1907; Man. Conch., Ser II, 19: 2-3; pl. 5, figs. 14-17.

Type Locality.— Woods of Petén, near San Luís, Guatemala.

Distribution.— Known only from the type locality and Livingston, Guatemala.

Mayaxis martensiana (Pilsbry, 1919)

Pseudosubulina martensiana Pilsbry, 1919; Proceedings of the Academy of Natural Sciences Philadelphia: 214; pl. 11, fig. 3.

Type Locality.— Mountains west of Livingston, Depto. Izabal, Guatemala.

Distribution.— Known only from the type locality and Las Escobas, Depto. Izabal, Guatemala (UF 193388).

Mayaxis mitescens (Martens, 1898)

Pseudosubulina mitescens Martens, 1898; Biol. Cent.-Amer.: 304; pl. 17, figs. 18.- Pilsbry, 1907; Man. Conch., Ser. II, 19: 5-6; pl. 5, fig. 10.

Type Locality.— Dueñas, near Antigua, Depto. Sacatepeque, Guatemala; 5000 ft. alt.

Distribution.— Known only from the type locality.



Figures 54-56. *Myaxis leei*, new genus & new species. Holotype (UF 193387).

Mayaxis leei, new species

Figures 54-56

Shell.— Large, exceeding 24 mm in length; about 0.23 times as wide as long. Opaque, shiny, color yellowish-corneas. Subcylindric-turrite in shape; apex protruding and narrow, nearly pointed; upper third of shell elongate-conical with a weakly convex spire; lower part of shell nearly cylindrical. Whorls 11.3, separated by a deeply impressed and telescoped suture. First two whorls smooth. The next half whorl is sculptured with weakly defined low broad riblets, which grade into low but strong, broadly rounded riblets that are separated by narrower interspaces on the subsequent whorls. The ribs are equally developed throughout the length of shell and continue unto the base of last whorl. The upper ends of ribs are narrower and raised, and weakly crenulate the suture. Last whorl with 64 ribs; penultimate whorl with 61. Aperture height 0.19 times length of shell; strongly prosocline and broadly ellipsoid in shape; columella truncate at base of aperture and slightly oblique to axis of shell; columella-parietal region with a slight hump; callus sparsely granular. Measurements for the holotype are: length of shell 24.2 mm; width 5.5 mm; aperture height 4.6 mm.

Type Locality.— Cerro Santa Barbara, Finca Las Quebradas, 3 km W of Nueva Esperanza, Depto. Santa Barbara, HONDURAS; 1280 m alt. HOLOTYPE: UF 193387; collected October 11, 1991 by Fred G. Thompson and Harry G. Lee. The holotype was found on the ground under a wood chip in a rain forest.

Distribution.— At present it is known only from the vicinity of the type locality. A second specimen, badly weathered, was collected in a rainforest 4.6 km WSW of Nueva Esperanza; 1430 m alt. (UF 193385).

Remarks.— Among described taxa this species is similar to *Mayaxis fortis* (Martens, 1898) and *M. mitescens* (Martens, 1898) because of the characteristics of its sculpture and the development of the columella in the aperture. It differs from both by its much larger size and its shape. *M. fortis* and *M. mitescens* are subulate-turrite in shape, reach a length of 14-16 mm and have 9-10 whorls respectively. *Mayaxis leei* is the largest known species in the subfamily SPIRAXINAE.

Etymology.— This species is named in honor of Harry G. Lee of Jacksonville, Florida, a physician and an ardent collector of mollusks. Dr. Lee provided generous support for field work in Honduras and his collecting efforts added greatly to our field results.

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