Cyclococcolithina neogammation (Bramlette & Wilcoxon) Wilcoxon n. comb., = *Cyclococcolithus neogammation* Bramlette & Wilcoxon, 1967, Tulane Stud. Geol., v. 5, p. 104, pl. 1, figs. 1-3; pl. 4, figs. 3-5.

Cyclococcolithina orbis (Gartner & Smith) Wilcoxon n. comb., = *Cyclococcolithus orbis* Gartner & Smith, 1967, Univ. Kansas Paleont. Contr., Paper 20, p. 4, pl. 4, figs. 1-3.

Cyclococcolithina pertusa (Sullivan) Wilcoxon n. comb., = *Coccolithus pertusus* Sullivan, 1965, Univ. Calif. Publ. Sc. 53, p. 32, pl. 3, figs. 5a, b, 6a, b.

Cyclococcolithina pirocena (Kamptner) Wilcoxon n. comb., = *Cyclococcolithus pirocenus* Kamptner, 1967, Ann. Naturhist. Mus. Wien, v. 71, p. 129, pl. 4, fig. 25.

Cyclococcolithina reticulata (Gartner & Smith) Wilcoxon n. comb., = *Cyclococcolithus reticulatus* Gartner & Smith, 1967, Univ. Kansas Paleont. Contr., Paper 20, p. 4, pl. 5, figs. 1-4.

Cyclococcolithina rotula (Kamptner) Wilcoxon n. comb., = *Cyclococcolithus rotula* Kamptner, 1956, Anz. Österr. Akad. Wiss., Math.-Naturw. Kl., v. 93, p. 10.

Cyclococcolithina spatiosa (Kamptner) Wilcoxon n. comb., = *Cyclococcolithus spatiosus* Kamptner, 1963, Ann. Naturk. Mus. Wien, v. 66, p. 166, text-fig. 24.

Cyclococcolithina waxahachia (Bukry) Wilcoxon n. comb., = *Cyclococcolithus*? *waxahachia* Bukry, 1969, Univ. Kansas Paleont. Contr., Art. 51 (Protista 2), p. 30, pl. 9, fig. 10.

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NOTES ON CANCELLARIIDAE (MOLLUSCA: GASTROPODA)—II

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This is the second of a series of papers dealing with various aspects of the gastropod family Cancellariidae (Volutacea). In this paper one new genus is described, together with two new species from the Tertiary of the southeastern United States and two new species of Recent Cancellariidae from the Galápagos Islands. In addition, new names are proposed for two previously described species, one from off the Cape of Good Hope, and the other from Kerguelen Island, southern Indian Ocean.

OLSSONELLA Petit, n. gen.

Type, here designated: *Cancellaria smithii* Dall, 1888, Recent, Western Atlantic.

Description: Shell scalate, with corded varices, the outer lip arched, internally lirate; columella with two plications; shallow anterior notch; umbilicus may be present in varying degrees, differing even in the same species between juvenile and adult specimens; nepionic whorls smooth, polished, about 2½ in number, sutures very deep; aperture ovate-trigonal.

Discussion: Shells of this new genus would appear to be similar to figures in the literature of species of *Sveltella* Cossmann, 1889, of the Eocene of Europe, but actual comparison shows many differences, the primary distinction being the scalate form of *Olssonella*, its deeper sutures and the invariable presence of spiral cords.

The following species are considered to belong to *Olssonella*:

Olssonella vokesae Petit, n. sp. (Silverdale, North Carolina; early lower Miocene).

Cancellaria desmotis Gardner, 1937 (U. S. Geol. Surv. Prof. Paper 142-F, p. 373, pl. 45, fig. 5; Chipola Formation, Florida; late lower Miocene).

Cancellaria bifoliata Aldrich, 1903 (Nautilus, v. 16, p. 101, pl. 4, fig. 24; Oak Grove Sand, Florida; late lower Miocene).

Cancellaria (Trigonostoma) sphenoidostoma Gardner, 1937 (U. S. Geol. Surv. Prof. Paper 142-F, p. 376, pl. 45, figs. 11, 12; Shoal River Formation, Florida; middle Miocene).

undescribed species (Gatun Formation, Canal Zone; middle Miocene).

Cancellaria scalatella Guppy, 1873 (Proc. Sci. Assoc. Trinidad, v. 2, p. 78, pl. 2, fig. 4; Bowden Formation, Jamaica; upper Miocene).

Trigonostoma thisbe Olsson, 1964 (Neogene Moll. Northwestern Ecuador, p. 126, pl. 22, fig. 6; Esmeraldas Formation, Ecuador; Mio-Pliocene).

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species cf. *smithii* Dall (Waccamaw Formation, South Carolina; Pliocene).
species cf. *smithii* Dall (Moín Formation, Port Limón, Costa Rica; Pleistocene).
Cancellaria smithii Dall, 1888 (*in* Agassiz, Three Cruises of *Blake*, p. 70, fig. 292; Recent, Western Atlantic).
Cancellaria funiculata Hinds, 1843 (Proc. Zool. Soc. London, pt. 11, p. 48; Recent, Panamic-Pacific).
Trigonostoma campbelli Shasky, 1961 (Veliger, v. 4, p. 20, pl. 4, fig. 5; Recent; Panamic-Pacific).

These southeastern U. S., Panamic, and Jamaican fossils, and the Recent (North Carolina to Gulf of Mexico) *O. smithii* (Dall), with the two Recent Panamic-Pacific species form a compact, well-defined group. *Olssonella vokesae* has only a faint umbilical chink, as does the type of the new genus. In the Miocene of Florida there are species that are openly umbilicate, as are the two Recent Panamic-Pacific species *O. funiculata* (Hinds) and *O. campbelli* (Shasky).

The genus is named for Mr. Axel A. Olsson, who has contributed so much to our knowledge of the Tertiary faunas of the Americas, and who is responsible for the writer's interest in Tertiary Mollusca.

Olssonella vokesae Petit, n. sp.

Plate 1, figs. 1a, 1b

Diagnosis: Protoconch smooth and large in proportion, of 2½ whorls. Aperture and spire equal in length. Whorls moderately convex, with impressed suture. Sculpture consisting of strong rounded axial ribs, numbering ten on the body whorl, crossed by about sixteen evenly spaced spiral cords, which rise over the axials. Spiral cords at the shoulder; intermediate, weaker cords in interspaces in some specimens. Aperture semi-lunate, the outer lip well rounded, lirate within, with about nine lirations. Columellar pillar straight, with two plaits of equal size, the lower one descending. Umbilical chink present.

Dimensions of holotype: height 8.4 mm; diameter 4.6 mm.

Holotype: USNM 646465.

Type locality: TU 562, "Silverdale Beds," Onslow County marl pit, on south side of Webb Creek, near Silverdale, Onslow County, North Carolina.

Occurrence: Known only from the type locality.

Figured specimen: USNM 646465 (holotype).

Discussion: This new species, based on a unique specimen collected by Dr. Emily H. Vokes, appears to be ancestral to *Cancellaria smithii* Dall of the Recent Western Atlantic, as well as other related species in the Tertiary of the southeastern United States and Caribbean, and the Tertiary and Recent of the Panamic-Pacific.

Charcolleria Olsson, 1942

Type, by original designation: *Cancellaria (Charcolleria) perdiciana* Olsson, 1942, Miocene, Colombia.

Charcolleria distinguenda Petit, n. sp.

Plate 1, figs. 2a, 2b

Diagnosis: Shell fusiform, high-spired, aperture slightly longer than apex. Protoconch smooth, glassy, with about 3½ whorls. Whorls convex, suture impressed, with smooth concave depression at the shoulder. Below the shoulder, on the body whorl, about fourteen strong, evenly spaced spiral cords, a few having intermediate weaker cords. Axial sculpture of rounded ribs, numbering about 20 on the body whorl, in general evenly spaced, but obliterated in places by evident stages of rapid growth. The spiral cords cross the axial ribs forming small nodes at the intersections. Aperture elongate-oval, produced into a short anterior canal, strongly lirate within, with about fourteen lirations. Columella with two folds, the posterior one being larger, and the anterior one descending. Umbilicus chink-like.

Dimensions of holotype: height 20.5 mm; diameter 10.8 mm.

Holotype: USNM 646466.

Type locality: TU 546, Chipola Formation, Ten Mile Creek, about 1½ miles west of Chipola River (NE ¼ Sec. 12, T1N, R10W), Calhoun County, Florida.

Occurrence: Known only from the type locality.

Figured specimen: USNM 646466 (holotype).

Discussion: In generic characters, this species is almost intermediate between *Charcolleria* and *Massyla* H. and A. Adams, 1854 (Type: *Cancellaria corrugata* Hinds, Recent, Panamic-Pacific). In *Massyla* the predominant sculpture is spiral, with little if any axial sculpture, the suture is less impressed, and the shell is not openly umbilicate. Though *C. distinguenda* is not openly umbilicate, a strong umbilical chink is present, and the spire is much more acute than in *Massyla*. *Charcolleria distinguenda* is easily distinguished from *Massyla venusta* (Tuomey and Holmes, 1856), *Massyla propevenusta* (Mansfield, 1930), and other *Massyla* by its acute spire. *C. distinguenda* differs from all

described species in having a chink-like umbilicus instead of a more open umbilicus.

The unique type was collected by Dr. and Mrs. H. E. Vokes, Tulane University, New Orleans, Louisiana. No other species of *Charcolleria* has thus far been reported from the southeastern United States.

AGATRIX Petit, 1967

Type, by original designation: *Trigonostoma agassizii* Dall, 1889, Recent, North Carolina to Gulf of Mexico.

AGATRIX DEROYAE Petit, n. sp.

Plate 1, figs. 3a, 3b

Diagnosis: General shape as figured. Protoconch helicoidal, smooth, composed of 2½ whorls. Body whorl large, forming two-thirds of the length, the whorls shouldered. Sculpture consisting of axial riblets (11 on the body whorl), overridden by straplike spiral cords set between wider smooth intervals and enlarging into elongated nodes over the summit of the ribs, there being about 13 spiral cords between the shoulder and the anterior canal. On the shoulder-subsutural area three smaller spiral cords. Axial riblets sinuous and extending from the pillar area to the suture. Aperture semi-ovate, the outer lip thin, in some specimens smooth within and in others with up to 13 lirations well within the aperture, and directly beneath the heaviest axial ribs. The siphonal canal widely rounded, but not produced or forming a fasciole. Three columellar plaits, on an inclined pillar, the anterior one forming a keel bordering the siphonal canal.

Dimensions of holotype: height 15.9 mm; diameter 10.7 mm.

Holotype: American Museum of Natural History no. 154676.

Type locality: 150 meters depth, south of Academy Bay, Isla Santa Cruz, Galápagos Islands.

Occurrence: Known only from the Galápagos Islands.

Figured specimen: American Museum of Natural History no. 154676 (holotype).

Discussion: This genus is represented in the Recent fauna by only two species other than the one under discussion: *A. strongi* (Shasky, 1961) from the Gulf of California, and the type species, *A. agassizii* (Dall, 1889), from the western Atlantic. *Agatrix deroyae* may be easily distinguished from *A. strongi* by its more rounded body whorl and its chalky white to light brown coloration. It is represented in the Neogene of Tehuantepec by *A. zapoteca* (Böse, 1910). The relationship of *Agatrix* to the Eocene *Admetula* Cossmann has yet to be determined. Shell morphology is quite similar, but *Admetula* is characterized by the presence of one or more pronounced varices per whorl.

This species has been named for Mrs. Jacqueline DeRoy, who collected the first specimens to come to the writer's attention. These had been sent to Mr. Anthony D'Attilio, who donated them to the American Museum of Natural History, which in turn made them available for study. Of these specimens, and ones later sent to the writer by Mrs. DeRoy, the holotype and paratype remain in the American Museum of Natural History, N. Y., a paratype has been deposited in the United States Natural Museum, (no. 679537) and paratypes remain in the writer's collection.

Four additional specimens were made available for study from the Allen Hancock Foundation collection, which is on loan to the Los Angeles County Museum of Natural History. These bear catalogue numbers AHF 195-34, AHF 201-34, AHF 170-34, and AHF 147-34. I am indebted to Dr. James H. McLean for making these specimens available for study. In addition to Mrs. DeRoy and Dr. McLean, I am also indebted to many others for lending material and for other favors. Among those are: William K. Emerson and William E. Old, Jr. of the American Museum of Natural History, Myra Keen, of Stanford University, Druid Wilson of the U. S. Geological Survey, and Axel A. Olsson of Coral Gables, Florida. They have all contributed materially to the description of this species, and to other phases of the present study of the Cancellariidae.

CANCELLARIA Lamarck, 1799

Type, by monotypy: *Voluta reticulata* Linné, 1758, Recent, North Carolina to Gulf of Mexico.

CANCELLARIA DARWINI Petit, n. sp.

Plate 1, figs. 4a, 4b, 4c

Diagnosis: General shape as figured. Protoconch bulimuloid and rather large, of three smooth, glassy whorls, the last large, convex, the first or apical one very small, the coil slightly inclined to the axis and set off sharply from the sculptured first nepionic whorl. Aperture and spire about equal in length. The last whorl moderately convex, the suture distinct. Sculpture faintly cancellate, consisting of numerous weak axial riblets and very narrow spiral cords,

the spirals rising into sharp nodes over the axials. Thirteen spirals between the suture and the anterior canal. Spiral intervals quite wide and plain. Aperture semilunate, the outer lip rounded, inclined, deeply lirate within, with about eight lirations. Columellar pillar straight, with three plaits, the upper strongest. Aperture white; surface color yellowish white, the spiral cords brown.

Dimensions of holotype: Height 18.7 mm; diameter 10.3 mm.

Holotype: American Museum of Natural History no. 154677.

Type locality: 170–200 meters depth, south of Academy Bay, Isla Santa Cruz, Galápagos Islands.

Occurrence: Known only from the Galápagos Islands.

Figured specimen: American Museum of Natural History no. 154677 (holotype).

Discussion: This species is easily distinguished from all other eastern Pacific Cancellarids by its evenly spaced, brown spiral ridges on the cream colored surface. This is a curious species, sculptured and colored much like a *Littorina*. The narrow spiral cords contrast sharply with the background color of the shell. *Cancellaria darwini* is nearest to *C. decussata* Sowerby and *C. gemmulata* Sowerby, but cannot be confused with either due to the aforementioned unique coloration. It is doubtful that this species will remain in *Cancellaria* s.s. when the family is better understood.

All known specimens of *C. darwini* were dredged by Mrs. Jacqueline DeRoy, Isla Santa Cruz, Galápagos Islands. Paratypes have been deposited in the Stanford University collection and in the U. S. National Museum. Other paratypes remain in the Petit collection.

The following two names are preoccupied. Therefore, new names are here proposed.

ZEADMETE WATSONI Petit, *nom. nov.*

Cancellaria (Admete) carinata Watson, 1882, Jour. Linn. Soc. London, v. 16, p. 327.
Not *Cancellaria carinata* Briart and Cornet, 1880. Mém. Acad. Roy. Sci., Lettres, Beaux Arts. Belg., v. 43, p. 14, pl. 14.

This Magellanic species was figured by Watson (1886, pl. 18, fig. 9). The type locality is Royal Sound, 28 fathoms, Kerguelen Island. It has since been reported from the Falklands and Tierra del Fuego at depths of 95–210 meters (Carcelles, 1950, p. 64; Carcelles and Williamson, 1951, p. 304).

Type: BM(NH) 1887.2.9.943.

CANCELLARIA AFRICANA Petit, *nom. nov.*

Cancellaria imbricata Watson, 1882, Jour. Linn. Soc. London, v. 16, p. 325.
Not *Cancellaria imbricata* Hörnes, 1856, Die Fossilen Mollusken des Tertiaer-Beckens von Wien, v. 1, Univalves, p. 327, pl. 35, fig. 16.

This species was taken from *Challenger* Station 142, 150 fathoms, off the Cape of Good Hope. It was figured by Watson (1886, pl. 18, fig. 10). There is no question about this species being a cancellarid, but it cannot be placed in *Cancellaria* s.s. Until more

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PLATE 1

Figures

1. *Olssonella vokesae* Petit, n. sp. (× 6) ..... Page 84
USNM 646465 (holotype); height 8.4 mm, diameter 4.6 mm.
Locality: TU 562. "Silverdale Beds," North Carolina; lower Miocene.

2. *Charcolleria distinguenda* Petit, n. sp. (× 3) 84
USNM 646466 (holotype); height 20.5 mm, diameter 10.8 mm.
Locality: TU 546. Chipola Formation, Florida; lower Miocene.

3. *Agatrix deroyae* Petit, n. sp. (× 3) 85
AMNH 154676 (holotype); height 15.9 mm, diameter 10.7 mm.
Locality: Isla Santa Cruz, Galápagos Islands, 150 meters.

4. *Cancellaria darwini* Petit, n. sp. (× 3) 85
AMNH 154677 (holotype); height 18.7 mm, diameter 10.3 mm.
Locality: Isla Santa Cruz, Galápagos Islands, 170–200 meters.

(In all figures except 4c the specimen is whitened to show details of ornamentation.)

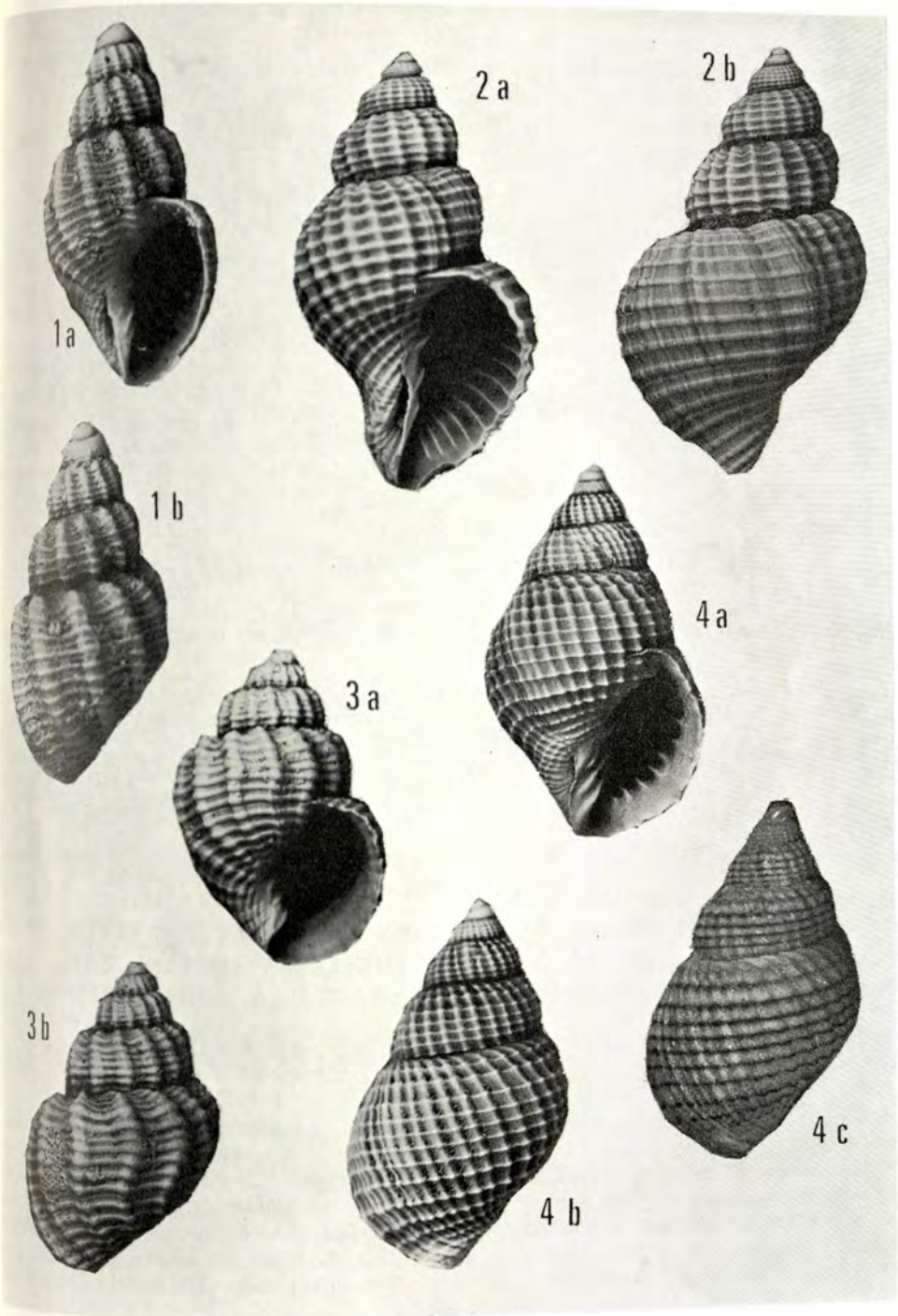

PLATE 1

is known about the relationships within this family, it cannot with certainty be placed in any named genus. Barnard (1958, p. 13) stated that "although Watson said the aspect of the shell suggested an *Admete*, the presence of a radula shows that he placed the species in the correct genus." The presence of a radula, as the family is presently understood, serves only to separate *Cancellaria* from *Admete*, and does not offer, *per se*, any assistance in placement within the complex of *Cancellaria* s.l.

Type: BM(NH) 1887.2.2.940.

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NOTES ON THE FAUNA OF THE CHIPOLA FORMATION—III TWO NEW SPECIES OF *VASUM* (MOLLUSCA: GASTROPODA), WITH COMMENTS ON *VASUM HAITENSE* (SOWERBY)

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When the writer (Vokes, 1966) published a monograph on the genus *Vasum* in the western Atlantic there were two species of *Vasum* known from the Chipola Formation of northwestern Florida. Since then, additional collecting has revealed two new species in this formation, plus many more and better examples of one of the previously described forms, *Vasum haitense* (Sowerby). The second described form, *V. chipolense* Vokes, remains a mystery, with no new material being discovered in spite of extensive additional collecting. Since 1966, collections from 26 new Chipola localities have been added, plus much more material from previous localities. Ironically, the two new species are from one of the oldest known Chipola sites, the "One mile west of Bailey's Ferry, on Ten Mile Creek" (USGS 2212) of Dall and Gardner. One of the most fascinating aspects of the Chipola fauna is its incredible variety. Every collecting trip adds a number of new species and this particular place is one of the richest and most exciting of all of the pres-