

## CENOZOIC MURICIDAE OF THE WESTERN ATLANTIC REGION

PART II—*CHICOREUS sensu stricto* AND *CHICOREUS* (*SIRATUS*)EMILY H. VOKES  
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## CONTENTS

I. ABSTRACT.....	181
II. INTRODUCTION.....	182
III. ACKNOWLEDGMENTS.....	183
IV. SYSTEMATIC DESCRIPTIONS.....	184
V. NOTES ON RECENT SPECIES OF <i>CHICOREUS</i> ( <i>SIRATUS</i> ).....	195
VI. RECTIFICATIONS IN NOMENCLATURE FOR PART I— <i>MUREX</i> s.s.....	197
VII. APPENDIX I: REFERENCES FOR SPECIES CITED.....	197
VIII. APPENDIX II: LOCALITY DATA.....	198
IX. LITERATURE CITED.....	200

## ILLUSTRATIONS

TEXT FIGURE 1.....	186
TEXT FIGURE 2.....	191
PLATE I.....	199
PLATE II.....	201
PLATE III.....	203

## I. ABSTRACT

There are 12 presently known species of the gastropod subgenus *Chicoreus sensu stricto* (type: *Murex ramosus* Linnaeus) from the Cenozoic of the western Atlantic region. Five of the species are Recent, of these three are known also as fossils, and the balance are known only from the fossil record. In this paper all of the species are treated systematically, including one new species, *Chicoreus* (*Chicoreus*) *floridanus* E. H. Vokes. It is suggested that the oldest repre-

sentatives of the group are derivatives of European species described from the Helvetian beds of western Europe.

In addition, those muricine species formerly assigned to a "Western Atlantic" subgroup of *Murex* s.s. are here placed in the subgenus *Chicoreus* (*Siratus*). Two specific homonyms in this group are renamed, they are: *C. (Siratus) perelegans* (n.n. pro *Murex elegans* Sowerby, non Donovan), and *C. (Siratus) reevei* (n.n. pro *Murex trilineatus* Reeve, non Sowerby).

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## II. INTRODUCTION

The genus *Chicoreus* (type species: *Murex ramosus* Linnaeus) was first proposed in 1810 by Denys de Montfort (p. 611) to include those species, formerly assigned to the genus *Murex* Linnaeus, 1758, which were to be distinguished by having:

"Coquille libre, univalve, à spire élevée et feuillée; bouche arrondie; columelle lisse; lèvre extérieure armée, frisée et crépue; canal de la base large et recouvert par la prolongation de la columelle."

Although the species illustrated by Montfort for *Murex ramosus* is *Murex brevifrons* Lamarck, there is no question that Montfort was using the name "*ramosus*" in a poly-specific sense and, therefore, the type of *Chicoreus* is the shell to which the name *ramosus* has been subsequently restricted by later authors. (For further discussion, see Vokes, 1964, p. 7-8.) Keen (1964, p. 422) recently placed a petition before the International Commission on Zoological Nomenclature to have *Murex ramosus* fixed as the type of *Chicoreus* to clarify the situation.

Although *Chicoreus* sensu stricto is perhaps the largest single group in the subfamily Muricinae, its distribution is largely Indo-Pacific, and there are only a few western Atlantic representatives, either Recent or fossil. There are only five species of *Chicoreus* s.s. in the Recent fauna: *C. brevifrons* (Lamarck), *C. florifer* (Reeve), *C. dilectus* (A. Adams), *C. argo* (Clench and Pérez Farfante) and *C. spectrum* (Reeve). The fossil record is scarcely better, only nine species being recognized in this paper, two of which are also Recent or a total of 12 species in the western Atlantic.

The first western Atlantic species of *Chicoreus* s.s. appear in the Miocene Chipola Formation of northwestern Florida and its correlatives. Although this formation has been generally considered to be uppermost lower Miocene (Burdigalian) in age, the presence in this formation of four species of *Chicoreus* which are closely related to species in the Helvetian of Europe suggests a change of age for the formation. This problem is discussed more thoroughly in a companion paper immediately following this one. For the purposes of this paper the generally accepted age for the Chipola will continue to be used, but with a query, indicating

that there is doubt in the mind of the writer as to its validity.

There have been no *Chicoreus* s.s. reported from the Shoal River Formation, nor the Oak Grove Sand, both of which may be only facies of the Chipola (Vernon, 1942, p. 75). The lack of *Chicoreus* is probably due to environmental control, as both of these formations are sandy, and *Chicoreus* seems to prefer a limy or silty bottom. In other Miocene localities throughout the western Atlantic region *C. cornurectus* (Guppy) is the most widespread species. Two other species, *C. compactus* (Gabb) from the middle Miocene of Santo Domingo, and *C. venezuelanus* (F. Hodson) from the middle Miocene of Venezuela, are only locally represented. In the upper Miocene of Florida a new species appears, *C. floridanus* Vokes, n. sp., a descendant of *C. dujardinioides* of the Chipola Formation. This species immediately became abundant throughout Florida, although it is not known from Caribbean localities. The line has persisted in the Recent form, *C. dilectus* (Adams). In the more southern area *C. brevifrons* (Lamarck) appears in the Pliocene, and today is found throughout the Caribbean.

The *Chicoreus* s.s. line evidently originated in the Tethyan Sea during early Miocene time. From *Murex tricarinatus* Lamarck, a common species in the middle and upper Eocene of western Europe, it is a simple step to derive the first *Chicoreus* species, as in *M. tricarinatus* the winglike varices are beginning to show a trend toward digitation, which ultimately form the elaborate frondose varices typical of *Chicoreus* s.s. (The *Chicoreus* (*Siratus*) group which seems to be an endemic western Atlantic form probably developed from a comparable American Eocene species, and thus may represent parallel evolution rather than true relationship.) From the Tethyan area of origin the group spread to the western Atlantic, and via the upper Miocene central European basins to the eastern Pacific, but not across the Pacific to the western coast of America. Strangely the *Chicoreus* group did not pass through the Isthmian channel which was open at various times both in Panama and in the Tehuantepec region, although other members of the Muricidae made the transition. (On the West Coast of the Americas the *Phyllonotus* and *Hexaplex* groups are dominant, as are the mem-

bers of the subfamily Tritonaliinae, to the complete exclusion of *Chicoreus*. *Murex* sensu stricto is represented by only two or three species but they are locally common.)

*Chicoreus* s.s. is a subtropical shallow water group, with the members generally inhabiting depths of less than 50 fathoms. A non-rocky bottom seems to be preferred, and some species even live in mangrove swamps. The members are carnivorous, attacking their prey by means of a hole bored in the shell. (One specimen of *C. dilectus*, dredged by the writer, was actively engaged in boring such a hole in a *Chione cancellata*. Such persistence was displayed by the snail that it did not release its prey until both were dropped into alcohol.) Due to the shallow, soft-sediment environment preferred by these animals, they are readily preserved as fossils, and although there are only a few species in the western Atlantic Tertiary, they are a common element in the fauna wherever they occur.

In addition to *Chicoreus* sensu stricto there are two subgenera of *Chicoreus* which seem to be endemic western Atlantic forms, and in these groups, *Siratus* (type species: *Murex senegalensis* Gmelin) and *Phyllonotus* (type species: *Murex margaritensis* Abbott, new name for *Murex imperialis* Swainson, non Fischer), there are numerous western Atlantic species, both Recent and fossil. The subgenus *Siratus* includes many species heretofore placed in the genus *Murex* s.s. In the previous part of this work (Vokes, 1963a) these species were allocated to a "Western Atlantic" group of *Murex* s.s., for it was believed that the two forms should be distinguished. Subsequent work has convinced the writer that those species which have a deflected siphonal canal and a tendency toward alate varices, are to be included in the subgenus *Siratus* rather than *Murex* s.s. This decision was discussed further by the author in another work on supraspecific groups of the Muricidae (Vokes, 1964, p. 9). Some of the fossil species from the western Atlantic which were treated in the *Murex* s.s. portion of this monograph therefore should be assigned to *Chicoreus* (*Siratus*). They are *Murex quirosensis* F. Hodson, *M. gardnerae* E. H. Vokes, *M. cbipolanus* Dall, *M. gilli* (Maury), *M. gilli polynematicus* Brown and

Pilsbry, *M. nicholsi* Gardner, and *M. antillarum* Hinds. The reader is referred to section V of this paper for a discussion of the Recent species now considered *Chicoreus* (*Siratus*). The species of the subgenus *Phyllonotus* are sufficiently numerous to be treated in a separate part of this monograph and will follow next in publication. Therefore the only species that will be covered systematically in this section are those of the subgenus *Chicoreus* s.s.

As in the previous part of this work (Vokes, 1963a) the author has tried to include all pertinent references to the fossil representatives, but the synonymies do not include all references to the Recent citations, for three of the species are very common and to list all references would extend the synonymies unnecessarily.

### III. ACKNOWLEDGMENTS

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## IV. SYSTEMATIC DESCRIPTIONS

Phylum MOLLUSCA

Class GASTROPODA

Subclass PROSOBRANCHIA

Order NEOGASTROPODA

Suborder STENOGLOSSA

Family MURICIDAE

Subfamily MURICINAE

Genus CHICOREUS Montfort, 1810

Subgenus CHICOREUS s.s.

CHICOREUS (CHICOREUS) FOLIDODES  
(Gardner)

Plate I, figures 1a, b.

*Murex trophoniformis* Heilprin. DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 140 (in part, *not* of Heilprin).

*Murex trophoniformis* Heilprin. DALL, 1915, U. S. Natl. Mus. Bull. 90, p. 74 (in part, *not* of Heilprin).

*Murex (Chicoreus) foliododes* GARDNER, 1947, U.S.G.S. Prof. Paper 142-H, p. 520, pl. 53, fig. 5.

*Diagnosis*: "Shell of moderate dimensions, rather heavy, stout fusiform, the maximum diameter falling in front of the median horizontal. Aperture little more than half as high as the entire shell. Whorls of conch probably 7, the early volutions broadly convex, the body increasing less rapidly in diameter than the whorls of the spire; the posterior margin of the closely appressed later volutions creeping up a little on the preceding whorl. Protoconch imperfectly preserved; final whorl small and smooth, somewhat flattened laterally. Axials on the early volutions narrow, well rounded, retractive, arranged in series slightly off set at the suture and performing about half a turn, increasing in prominence toward the anterior suture, equal and separated by concave interspaces of approximately their own width, commonly 9. Varices developed by the strengthening of every third rib, the costal to the right of the varix becoming increasingly feeble and finally obsolete, the costal to the left of the varix, gradually transformed into a rather prominent peripheral node; varices on the later whorls foliaceous, the free edges sharply fluted in a series of short, serrate processes, open toward the aperture; the primary spirals forming the axes of the spines; spines tending to lengthen anteriorly, most produced on the pillar. Entire surface except the apical region macroscopically shagreened by the sharp laminar incrementals, numbering about 4 to the millimeter over the greatest part of the adult shell; the free edges worn down in the type but probably in fresh specimens finely fluted by the spirals, even by the secondaries and tertiaries. Spiral sculpture well developed. Primary spirals 5 on the whorls of the spire, 13 or 14 on the body and pillar, rather angular and separated on the posterior portion of the shell

by angular interspaces, equally prominent on the costals and intercostals, but more elevated toward the anterior suture; linear secondaries intercalated between each pair of primaries on the third or fourth whorl of the conch, the number of intercalated secondaries increased on the fifth whorl to 2, on the final whorl of the spire to 3 or 4, and on the periphery of the body to 4 or 5, the medial secondary usually stronger than those on either side. Anterior fasciole not well differentiated, threaded with 9 or 10 subequal lirae. Aperture exclusive of the canal obliquely elliptical, emarginate posteriorly. Curvature of outer lip a little broader than that of the inner; margin of outer lip sharply crenate in harmony with the spiral sculpture, the interspiral channels showing up on the inner surface as low ridges and produced for some little distance within the mouth of the aperture. Labium smoothly excavated at the base of the body, heavily glazed. Pillar margin sharply rounded at the entrance to the canal. Anterior canal broad, compressed dorsoventrally, curved backward, obliquely truncate at its extremity, probably closed in the perfect adult; former canals, one to each varix, quite sharply divergent from the final canal." (Gardner, 1947)

Holotype: USNM 371852.

Dimensions of holotype: height 43.3 mm, diameter 25 mm.

Type locality: USGS 3419 (= TU 457), one mile below Bailey's Ferry, Chipola River, Calhoun County, Florida.

*Horizon*: Chipola Formation, Florida; (?) uppermost lower Miocene.

*Figured specimen*: USNM 644821, height 42 mm, diameter 24.8 mm; locality TU 554. Other occurrences: TU locality no. 457.

*Discussion*: The affinities of this species and *C. lep-dotus* (Vokes), both from the Chipola Formation of northwestern Florida, have been discussed by this author in a previous work (Vokes, 1963b, p. 154). It should also be noted that *C. foliododes* resembles *C. aquitanicus* (Gratoloup) from the Helvetian and Tortonian of Europe, differing principally in the larger size and more elongate shell of the European species. *C. aquitanicus* may further be distinguished by the presence of two intervarical nodes rather than one, characteristic of *C. foliododes*. The strongest resemblance lies in the surface ornamentation of the two species, for both possess a spiral ornamentation consisting of strong cords, separated by one smaller thread, and two threadlets between each pair. The spiral cords are crossed by minute growth lines which give rise to a shagreened surface. *C. aquitanicus* is figured (plate I, figure 2) for comparison with the American

species. The stratigraphic significance of this resemblance is discussed in the companion paper which immediately follows this one.

CHICOREUS (CHICOREUS) LEPIDOTUS  
(Vokes)

Plate I, figure 4.

*Murex (Chicoreus) lepidotus* E. H. VOKES, 1963, Tulane Stud. Geol., v. 1, no. 4, p. 152, pl. 1, figs. 2a, 2b.

*Diagnosis*: "Shell large in size, whorls convex. Nucleus of two smooth, slightly bulbous whorls; termination of nuclear whorls marked by abrupt initiation of ornamentation. Seven post-nuclear whorls in the adult, suture appressed. Axial sculpture consists of ten equal nodes on the early whorls; on the third and successive post-nuclear whorls certain of these are strengthened to form four varices, with a single intervarical node between each pair. Spiral sculpture consists of primary threads, three in number on the earliest whorls, increasing to approximately six on the body whorl, with three additional primary threads on the pillar. Intercalated between the primary threads are one secondary, and usually two tertiary threadlets. Entire surface of shell sculptured by minute laminar incrementals which give a shagreened appearance to the intervarical areas. The free edges of the varices are sharply fluted by a succession of laminae with small open spinelets produced where the primary threads cross the varices. Two series of slightly larger spines are developed on the siphonal canal where the primary threads cross. Aperture subcircular; labium smooth, standing free at the anterior end, appressed at the posterior, with slight anal notch. Outer lip crenulated by about 12 paired denticles. Siphonal canal moderately long, broad and sharply recurved at tip; former canals conspicuously divergent." (Vokes, 1963)

Holotype: USNM 644371.

Dimensions of holotype: height 34 mm, diameter 20 mm.

Type locality: TU 554, Chipola River, at power-line crossing (SW  $\frac{1}{4}$  Sec. 17, TIN, R9W), Calhoun County, Florida.

*Horizon*: Chipola Formation, lower beds only, Florida; (?) uppermost lower Miocene.

*Figured specimen*: USNM 644371 (holotype). Other occurrences: TU locality no. 457.

*Discussion*: This species was discussed in the original description. Since that time the author has had the opportunity to examine a collection of European Miocene fossils and the resemblance to *C. bourgeoisi* (Tournouër) should be noted. (See plate I, figure 3.) The European species bears the same rela-

tionship to the European *C. dujardini* (Tournouër) as the Florida species does to *C. dujardinioides*. From the literature the two European species would seem to occur together but the parallelism of the forms suggests that perhaps there is a slight stratigraphic difference which has not been detected for the European species.

CHICOREUS (CHICOREUS) DUJARDINOIDES  
(Vokes)

Plate I, figure 6.

*Murex (Chicoreus) lepidotus dujardinioides* E. H. VOKES, 1963, Tulane Stud. Geol., v. 1, no. 4, p. 155, pl. 1, figs. 3a, 3b.

*Diagnosis*: "Shell large in size, whorls moderately convex. Nucleus of two smooth, slightly bulbous whorls; termination of nuclear whorls marked by appearance of ornamentation, both axial and spiral. Seven post nuclear whorls in the adult, suture appressed. Axial sculpture consists of ten equal nodes on the early whorls; on the fourth and successive post-nuclear whorls certain of these nodes are strengthened to form three varices, with two intervarical nodes between each pair. Spiral sculpture consists of primary threads, three in number on the earliest whorls, increasing to approximately seven on the body whorl, with three additional primaries on the pillar. Intercalated between the primary threads are one secondary, and usually two tertiary threadlets. Entire surface of shell sculptured by minute laminar incrementals which give a shagreened appearance to the intervarical areas. The free edges of the varices are sharply fluted by a succession of laminae with open spinelets produced where the primary threads cross the varices. One larger open spine developed at the shoulder, and two series of large spinelets on the siphonal canal. Aperture subcircular; labium smooth, standing free at the anterior end, appressed at the posterior, with a slight anal notch. Outer lip crenulated with about 12 paired denticles. Siphonal canal moderately long, broad, and sharply recurved at tip; former canals conspicuously divergent." (Vokes, 1963)

Holotype: USNM 644372.

Dimensions of holotype: height 32.5 mm, diameter 18.5 mm.

Type locality: TU 547, Chipola River (SW  $\frac{1}{4}$  Sec. 29, TIN, R9W), Calhoun County, Florida.

*Horizon*: Chipola Formation, upper beds only, Florida; (?) uppermost lower Miocene.

*Figured specimen*: USNM 644372 (holotype). Other occurrences: TU locality nos. 458, 453.

*Discussion*: The affinity of this species to the European species, *C. dujardini* (Tournouër) have been discussed in the original

description. Since that time the author has studied a series of specimens of the French species and in addition to the differences previously mentioned the two species can also be distinguished by the higher spire of *C. dujardini*. This European species is figured here (plate I, figure 5) for purposes of comparison.

*C. cornurectus* (Guppy), described from the Miocene of Santo Domingo, and *C. dujardinioides* occur in the Chipola Formation, but the two species are readily separable. The spire of *C. cornurectus* is proportionally higher, and the shoulder spine is much more developed. The characteristically shagreened surface of *C. dujardinioides* is not seen in *C. cornurectus*, that species lacking the minute growth lines which cause the peculiar surface texture in *C. dujardinioides* and allied species. Likewise the faces of the varices do not carry the succession of laminae with the small open spines noted in *C. dujardinioides*. The environmental preferences of the two species were evidently somewhat different, for *C. dujardinioides* has been found only at localities along the Chipola River where the formation is a lime-mud and *C. cornurectus* has been found only at the more westward exposures of the Chipola beds where the formation is silty. The localities in the Cercado and Gurabo Formations of Santo Domingo where *C. cornurectus* occurs are also silty and bear a strong lithologic similarity to the silty facies of the Chipola.

CHICOREUS (CHICOREUS) CORNURECTUS  
(Guppy)

Plate II, figure 2a, b., text figure 1.

*Murex (Chicoreus) megacerus* Sowerby. GABB, 1873, Amer. Phil. Soc., Trans., (N.S.) v. 15, pt. 1, p. 202 (not of Sowerby).

*Murex cornurectus* GUPPY, 1876, Geol. Soc. London, Quart. Jour., v. 32, p. 521, pl. 28, fig. 4.

*Murex (Euphyllon) cornurectus* Guppy. COSSMANN, 1903, Essais Paléoconch. Comp., v. 5, p. 25.

*Murex cornurectus* Guppy. GUPPY, 1910, Agri. Soc. Trinidad and Tobago, Paper no. 440, p. 6, 9. GUPPY, 1911, Agri. Soc. Trinidad and Tobago, Paper no. 454, p. 8 (ex Harris reprint: Bulls. Amer. Paleontology, 1921, v. 8, no. 35, pp. 149 (297), 151 (299), & 164 (312).)

*Murex (Phyllonotus) cornurectus* Guppy. MAURY, 1917, Bulls. Amer. Paleontology, v. 5, no. 29, p. 103 (267), pl. 16 (42), figs. 9, 10.

? *Murex (Phyllonotus) cornurectus* Guppy. HUBBARD, 1921, N. Y. Acad. Sci., Sci. Surv. Porto Rico & Virgin Islands, v. 3, pt. 2, p. 150.

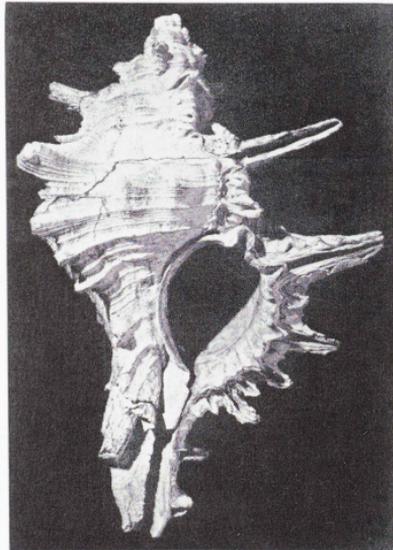
*Murex (Phyllonotus) cornurectus* Guppy. OLSSON, 1922, Bulls. Amer. Paleontology, v. 9, no. 39, p. 131 (303).

*Murex (Chicoreus) brevifrons* Lamarck. PILSBRY, 1922, Acad. Nat. Sci. Phila., Proc., v. 73, p. 352 (not of Lamarck).

*Murex brevifrons* Lamarck. MAURY, 1925, Serv. Geol. Min. Brasil, Mon. 4, p. 138-139, pl. 6, figs. 7, 9 (not of Lamarck).

*Murex (Phyllonotus) cornurectus* Guppy. MAURY, 1925, Bulls. Amer. Paleontology, v. 10, no. 42, p. 213 (365).

*Murex (Chicoreus) brevifrons* Lamarck. WOODRING, 1959, U.S.G.S. Prof. Paper 306-B, p. 216, pl. 35, fig. 12 only (in part, not of Lamarck).



Text figure 1. *Murex cornurectus* Guppy. (X 1). Lectotype: British Museum (Nat. Hist.) GG. 20254. (Photograph courtesy of the British Museum (Nat. Hist.).)

*Diagnosis*: "Ovate-turreted, with three varices, which are nearly continuous, and stout revolving ridges accompanied by finer lines; two or occasionally three variciform tubercles between each varix; varices fringed by subtubular spines, of which the one corresponding to the keel on the angle of the whorls is much the longest. Aperture oval, the inner margin callous, the outer margin dentate, the dentations running in pairs. Canal moderately long and slightly curved." (Guppy, 1876)

Lectotype (here designated): British Museum (Nat. Hist.) GG. 20254.

Dimensions of lectotype: height 89.2 mm, diameter, excluding spines, 45 mm.

Type locality: Rio Yaque, Dominican Republic.

*Horizon*: Quebradillas Limestone, Puerto Rico; Pirabas Limestone, Brazil; Chipola Formation, Florida; Cercado Formation, Dominican Republic; all (?) uppermost lower Miocene. Gurabo Formation, Dominican Republic; Gatun Formation, Panama and Costa Rica; middle Miocene. Springvale Beds, Trinidad; upper Miocene.

*Figured specimen*: USNM 644822, height 38.5 mm, diameter, excluding spines, 20 mm; locality USGS 8550. Other occurrences: TU locality nos. 70, 196, 655.

*Discussion*: Like *C. dujardinioides* this species also resembles the European species, *C. dujardini*. The early whorls are especially similar, with both having a strongly cancellate appearance. The spires of *C. cornurectus* and of *C. dujardini* are of like proportions, and are relatively higher than *C. dujardinioides*. As has been discussed under *C. dujardinioides* the surface of *C. cornurectus* is smoother than the other two species and the varices lack the laminar frills, having instead five simple open spines. The shoulder spine of *C. cornurectus* is much more developed and the species attains a larger size. A small specimen is figured (plate II, figs. 2a, b) which shows the nature of the early whorls particularly well. The lectotype is of a more normal size.

There are two syntypes in the Geological Society of London collections now to be found at the British Museum (Natural History). Dr. L. R. Cox of the Museum writes (*in litt.*), "The smaller of the two, now registered as no. GG.20253 is the one represented in Guppy's plate xxviii, fig. 4, but the larger one, no. GG.20254 is better preserved and would make a better lectotype if only it were figured. Presumably Guppy figured the smaller one because there was not enough room for the larger one on his plate. The two are undoubtedly the same species." Therefore the larger specimen, no. GG.20254, is here selected as the lectotype and is figured in text figure 1.

Although this species has been placed in synonymy with *C. brevifrons* (Lamarck) by some authors the two forms are readily distinguishable. *C. cornurectus* has but one strong spine at the shoulder and *C. brevifrons* has two equally large spines with one small spinelet between them. *C. cornurectus*

has four smaller spines on the anterior portion of the varix, and *C. brevifrons* has only three. Therefore even though the total number of varical spines is the same for the two species, the difference in size of the second shoulder spine permits instant recognition. *C. cornurectus* is the ancestor of *C. brevifrons*, but little is to be gained by placing the two forms in synonymy. *C. argo* (Clench and Pérez Farfante) and *C. spectrum* (Reeve) both Recent species from the Lesser Antilles are perhaps even more closely related to *C. cornurectus* as they differ only in having three smaller anterior spines in place of the four of *C. cornurectus*.

In addition to the many Miocene localities in the Caribbean where this species has long been known and is not rare, it recently has been found by the writer in the upper beds of the Chipola Formation of northwestern Florida. Although this new find does not extend the geological range of the species, it does extend the geographical range considerably. Hubbard (1921) reported finding a portion of an external mold in the Quebradillas Limestone of Puerto Rico which may be this species, and Maury (1925a) reported it from the Pirabas Limestone of Pará, Brazil, as *M. brevifrons*. Both of these formations are correlated with the Chipola. Maury (1917) reported that this species was found in both the lower formation (Cercado) and the upper formation (Gurabo) in Santo Domingo. It has also been reported from the middle Miocene Gatun Formation of Costa Rica by Olsson (1922), and Woodring (1959) reported a "*Murex brevifrons*" from the Gatun Formation of Panama which seems in part to be *C. cornurectus*. His illustrations are of two species, the smaller specimen (pl. 35, fig. 12) being *C. cornurectus*. The larger specimen (pl. 35, figs. 11, 13) is not either *C. cornurectus* or *C. brevifrons*, but it is too poorly preserved to identify positively. The species has also been reported from the upper Miocene beds at Springvale, Trinidad, by Guppy (1910, 1911) and by Maury (1925b).

CHICOREUS (CHICOREUS) COMPACTUS  
(Gabb)

Plate II, figure 3a, b.

*Murex (Pteronotus) compactus* GABB, 1873, Amer. Phil. Soc., Trans., (N.S.) v. 15, pt. 1, p. 202.

*Murex textilis* Gabb. GUPPY, 1876, Geol.

Soc. London, Quart. Jour., v. 32, p. 522 (in part, *not of Gabb*).

*Murex (Pteronotus) textilis* Gabb. DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 142 (in part, *not of Gabb*).

*Murex compactus* Gabb, MAURY, 1917, Bulls. Amer. Paleontology, v. 5, no. 29, p. 103 (267), pl. 16 (42), fig. 8 ("Metatype").

*Murex rufus compactus* Gabb. PILSBRY, 1922, Acad. Nat. Sci. Phila., Proc., v. 73, p. 352, pl. 28, fig. 1 (Lectotype).

*Diagnosis*: "Shell short, thick, robust; spire about two-thirds as long as body whorl. Whorls eight; the first two nuclear, suture impressed. Body whorl broad above, tapering in advance, top sloping, very slightly concave. Varices three, short, robust, fimbriated or toothed on the margins, but bearing no spines or other elongate processes. Between each pair of varices, on the shoulder of the whorl, is a broad, blunt node. Surface ornamented by numerous large revolving ribs, between which are many smaller lines, all crossed by distinct, subsquamose lines of growth. Aperture small, sub-oval, inner lip with a faint tooth posteriorly; outer lip internally striate; canal short, blunt. Length 2.3 in.; width 1.4 in." (Gabb, 1873)

Lectotype: ANSP 3258.

Dimensions of lectotype: height 56.4 mm, diameter 32.3 mm (Pilsbry, 1922, p. 352).

*Horizon*: Gurabo Formation, Dominican Republic; middle Miocene.

*Figured specimen*: USNM 113775, height 36.5 mm, diameter 20 mm; locality, Potrero, Rio Amina, Dominican Republic.

*Discussion*: The type of this species from the middle Miocene of Santo Domingo was not figured until 1922 when Pilsbry published his *Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo*. As Pilsbry pointed out (1922, p. 306) Gabb selected a type series of specimens for his species. In the case of *C. compactus* the type lot consisted of five syntypes, all numbered ANSP 3258. Pilsbry's selection of this specimen would be the first valid selection of a lectotype.

Guppy (1876) and Dall, following him (1890), both placed *C. compactus* in the synonymy of *Murex textilis*, however there is little more than generic resemblance between the two species, and such a synonymy could never be justified. Even though the species had not been figured at the time of these workers there is little in Gabb's original description to suggest such a relationship.

Although Maury (1917, p. 267) cited this species in her work on Santo Domingo evidently no specimens were collected by the members of the expedition, for she stated:

"Our shell is a metatype sent by Professor Gabb from Santo Domingo." The specimen figured here is from Potrero on the Rio Amina where the Maury expedition did little collecting because of "floods and rebels" (1917, p. 452). These beds were tentatively assigned to the upper formation, later named the Gurabo Formation by Maury (1919) and correlated with the middle Miocene Gatun Formation of Panama.

*C. compactus* is most closely related to *C. dujardinioides*, but may be distinguished by the presence of only one intervarical node. In addition, the varical laminae have a tendency to become divided into discrete spines, foreshadowing the appearance of these spines in *C. floridanus*. Whether these three species represent a direct line of evolution is not certain, but, rather, they are each representatives of a stage of development. It might be presumed that there was a direct link between the two northern species, and *C. compactus* is the southern analog of an as-yet unknown middle Miocene Florida species which would possess two intervarical nodes, and the same type of intermediate varical spines. *C. compactus* is more likely the immediate ancestor of *C. florifer*, with its single intervarical node.

#### CHICOREUS (CHICOREUS) VENEZUELANUS (F. Hodson)

Plate II, figures 1a, b.

*Murex venezuelanus* F. HODSON, 1931, Bulls. Amer. Paleontology, v. 16, no. 59, p. 37, pl. 18, fig. 1; pl. 19, fig. 1, 3.

*Murex (Chicoreus) brevifrons* Lamarck. WOODRING, 1959, U.S.G.S. Prof. Paper 306-B, p. 216 (in part, *not of Lamarck*).

*Diagnosis*: "The shell is large, heavy, and ornamented with conspicuous spines. The protoconch is missing; there are about 6 subsequent convex whorls; the angular shoulder on each whorl bears 3 strong varices with a weaker intervarical tubercle between them. On the body whorl below the angulation, on adult specimens, there are 3 stronger spiral cords which form spines on the varices; the two anterior of these form larger spines. All the whorls show a spiral sculpture of close-set threads, some being stronger than others. The outer lip shows about 12 internal lirae; the lirae on the anterior half of the lip may occur in pairs." (Hodson, 1931)

Holotype: PRI 24097.

Dimensions of imperfect holotype: height 78.5 mm, diameter 54 mm.

Type locality: Rio Codore, 4.65 kilometers north and 550 meters west of Urumaco, District of Democracia, Falcón, Venezuela.

*Horizon:* Uramaco Formation, Venezuela; middle Miocene.

*Figured specimen:* PRI 24101 (paratype), height 48.5 mm, diameter 30 mm; locality same as holotype.

*Discussion:* According to A. N. Dusenbury, Jr. (*in litt.*), who has been working on the stratigraphic assignments of the Hodson species, the type locality cited above occurs in the middle member of the Uramaco Formation of upper middle Miocene age. Although placed in synonymy with *C. brevifrons* by Woodring (1959, p. 216) this species is distinguished by several criteria. The first is the markedly appressed suture. The later whorls ride up over the earlier whorls to the base of the shoulder spine, whereas in *C. brevifrons* there are two major spines present on the median whorls. Furthermore the spines are more numerous in *C. brevifrons*. On the last three varices there are five major spines, of which the two posterior ones are much larger than the three anterior ones. In *C. venezuelanus* there are only three spines, one at the shoulder and the other two grouped together near the canal. The spiral ornamentation is also much stronger in *C. brevifrons* with strong cords leading to each of the five major spines, and smaller threads leading to the secondary spinelets. Compared with *C. brevifrons*, the intervarical area of *C. venezuelanus* is nearly smooth, possessing only faint spiral sculpturing.

*C. venezuelanus* is probably a descendant of *C. foliododes* (Gardner) and consequently also resembles the European *C. aquitanicus* (Grateloup). *C. venezuelanus* differs from both of these species in the smoother surface, and the appressed suture mentioned above. However there is an interesting parallel in development, for *C. venezuelanus* is much larger than *C. foliododes*, and the upper Miocene specimens of *C. aquitanicus* attain a much greater size than the middle Miocene ones. Specimens from the Vienna Basin are commonly over 100 mm in height. Presumably it was the European line which gave rise to the Recent Red Sea species, *C. virginicus* (Röding) (= *Murex anguliferus* Lamarck), but that common species more closely resembles *C. venezuelanus* than it does *C. aquitanicus*. In *C. virginicus* there are two small additional spines on the anterior portion of the varix, but the overall structure of the shell is remarkably similar.

*C. virginicus* is variable, and there are forms especially close to *C. venezuelanus* in which the suture rides up on the previous whorls.

#### CHICOREUS (CHICOREUS) FLORIDANUS

E. H. Vokes, n. sp.

Plate III, figures 1a, b, 2, 3.

*Murex sexcostata* EMMONS, 1858, Rept. North Carolina Geol. Surv., p. 248, fig. 106. *Non Murex sexcostatus* Lamarck, 1816.

*Murex brevifrons* var. *calciatrapa* Lamarck. HEILPRIN, 1887, Wagner Free Inst. Sci., Trans., v. 1, p. 68 (*not of Lamarck*).

*Murex (Chicoreus) brevifrons* Lamarck. DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 140 (*not of Lamarck*).

*Murex (Chicoreus) rufus* Lamarck. DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 140 (*not of Lamarck*).

*Murex (Chicoreus) rufus* Lamarck. MAURY, 1922, Bulls. Amer. Paleontology, v. 9, no. 38, p. 65 (95) (*not of Lamarck*).

*Murex (Chicoreus) brevifrons* Lamarck. MAURY, 1922, Bulls. Amer. Paleontology, v. 9, no. 38, p. 66 (96) (*not of Lamarck*).

*Murex (Chicoreus) rufus* Lamarck. GARDNER, 1948, U.S.G.S. Prof. Paper 199-B, p. 218 (*in part, not pl. 29, fig. 23 = C. dilectus*).

*Murex (Chicoreus) brevifrons* Lamarck. OLSSON and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 244, pl. 36, fig. 2 (*not of Lamarck*).

*Murex (Chicoreus) salleanus* Adams. OLSSON and HARBISON, 1953, Acad. Nat. Sci., Phila., Mon. 8, p. 244, pl. 36, fig. 1 (*not of Adams*).

*Murex (Chicoreus) brevifrons* Lamarck. DuBAR, 1958, Florida Geol. Surv. Bull. 40, p. 196, pl. 12, fig. 1 (*not of Lamarck*).

*Diagnosis:* Shell large to moderate in size, whorls greatly inflated. Eight post-nuclear whorls in the adult; the nucleus, rarely preserved, consists of two smooth, bulbous whorls which terminate abruptly at a varix marking the initiation of ornamentation. Early axial ornamentation consists of small ribs at regular intervals, about 12 on each of the first two post-nuclear whorls. On the third post-nuclear whorl every third rib becomes strengthened to form a small varix, gradually increasing in size with each successive varix; three varices to one complete whorl. The two intervarical ribs continue as two nodes and persist as such up to the largest specimens seen. The spiral ornamentation on the first post-nuclear whorl consists of three equal cords; on the second to third whorls these are augmented by three smaller intercalary threads, and on the successive whorls additional threads appear. These threads are crossed by small axial growth lines which give a shagreened appearance to the entire surface of the shell. The three original cords persist as

spiral welts, but they are covered by finer threads, roughly alternating larger and smaller in size. On the body whorl there are usually nine of these welts, with six being on the body and three on the canal. On an adult specimen there are approximately nine larger threads from the crest of one spiral welt to the crest of the next. However the thread at the crest is no larger than the others. Where the spiral welts cross the varices, foliaceous spines are produced. The shoulder spine is somewhat wider than the others, but is not noticeably longer. The spines are open on the apertural side, and occasionally multiple layers are formed within the shoulder spine. There is a pronounced anal slit which is constricted at the edge of the aperture, so as to be almost invisible, but which opens behind the labrum. The siphonal canal is broad, recurved at the distal end, and almost covered over, however it remains open by a narrow slit.

Holotype: USNM 644823.

Dimensions of holotype: height 73 mm; diameter, excluding spines, 38 mm.

Type locality: TU 520, canal  $\frac{1}{2}$  mile east of Brighton, Highlands County, Florida.

Horizon: Choctawhatchee Formation and Pinecrest Beds, Florida; upper Miocene, Caloosahatchee Formation, Florida; Waccamaw Formation, North and South Carolina; Pliocene.

Figured specimens: Fig. 1, USNM 644823 (holotype). Fig. 2, USNM 644824 (paratype), height 11.4 mm, diameter 6 mm; locality TU 60. Fig. 3, USNM 644825 (paratype), height 52 mm, diameter, excluding spines, 28 mm; locality TU 202. Other occurrences: TU locality nos. 60, 72, 79, 200, 202 (247 specimens), 203, 206, 519 (152 specimens), 520 (135 specimens), 521, 522, 523 (107 specimens), 525, 527, 528, 529, 531, 532, 536, 539B, 540, 541, 558, 579, 583.

**Discussion:** This ubiquitous species from the upper Miocene and Pliocene of the southeastern United States has been much misunderstood, as the synonymy above demonstrates. It is most closely related to *C. dilectus* (A. Adams) an equally misunderstood species from the Pleistocene and Recent of the same area. There are four species of *Chicoreus* in the later Cenozoic of the western Atlantic which have been repeatedly confounded. The four will be discussed separately in succession, in an attempt to make some sense out of the confusion which has persisted in the literature on the southeastern area. Three of these species occur in the Recent: *C. dilectus* (A. Adams), *C. brevifrons* (Lamarck), and *C. florifer* (Reeve). The first two also occur in the fossil record, *C. dilectus* in the Pleistocene (?) of Florida, and *C. brevifrons* in the

Pliocene and Pleistocene south in the Caribbean region. *C. florifer* has not been reported occurring prior to the Recent. The only species which is found in the upper Miocene and Pliocene of Florida and the Carolinas is *C. floridanus*. The apparent cause of the difficulty in citation for this species is that it resembles both *C. dilectus* and *C. florifer* somewhat, but not enough to be unquestionably identified with either. Emmons (1858) was the first to report this species, but the name he used had been employed previously by Lamarck for a different form. Although two species have been reported from the "Caloosahatchee" beds by several authors (Dall, 1890; Maury, 1922; Olsson and Harbison, 1953), with large suites of specimens it is impossible to segregate two forms. The large, heavy adult specimens have been referred to "*Murex rufus*" or "*Murex salleanus*" and the small, light, long-spined, juvenile specimens have been referred to "*Murex brevifrons*."

The stratigraphy of the "Caloosahatchee" beds has only recently begun to be understood. In the past it has been commonly thought that all fossils found in southern Florida in the vicinity of the Caloosahatchee River and Lake Okeechobee were "Pliocene" in age. The problem of identical facies and deposition spanning an interval of time, combined with the almost complete lack of outcrop has led to confusion of fossils from beds that are now considered to be upper Miocene, Pliocene, and Pleistocene in age. As *C. dilectus* does occur in the Pleistocene of this area it has added to the misunderstanding of *C. floridanus*. Olsson (Olsson and Petit, 1964) is the first to publish an intelligent interpretation of the stratigraphy of the area. In that paper he established the Caloosahatchee Group, with an upper Miocene unit, the "Pinecrest beds"; a Pliocene "Caloosahatchee Marl"; and an as-yet unnamed upper unit, questionably late Pliocene or early Pleistocene. In view of the restriction herewith of *C. floridanus* to the Pinecrest and Caloosahatchee units of Olsson's stratigraphy, it is interesting to note that he observed: "Perhaps the most significant deduction derived at from present data is that contrary to a widely accepted view, the Caloosahatchee fauna is more closely related to that of the Miocene than it is to the Recent or Pleistocene." (1964, p. 513).

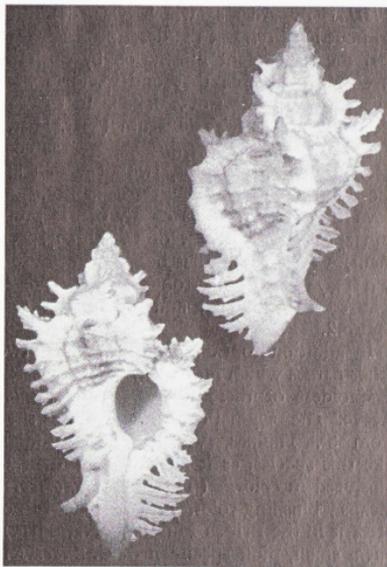
*C. floridanus* may be distinguished from *C. dilectus* by the presence of two small, equal intervarical nodes, instead of the one large node, with occasionally a second smaller axial rib, characteristic of *C. dilectus*. The shell of *C. floridanus* is wider proportionally than that of *C. dilectus*, and the spines are thinner and less frondose. The nature of the spiral sculpture is also different, with the surface of *C. floridanus* being covered by small threads that ride over the major spiral welts with no change in size. The spiral threads of *C. dilectus* are noticeably larger on the crest of the major welts. At the type locality (TU 520), where the "molluscan fauna shows many marked peculiarities of its own" (Olsson and Petit, 1964, p. 517), specimens of *C. floridanus* may attain an enormous size. One unfigured paratype measures 89 mm in height. Such large specimens are not found at most localities and the average adult measures 40 to 50 mm in height. A typical Caloosahatchee paratype (TU locality 202) is also figured (pl. III, fig. 3) for comparison with the oversized holotype.

CHICOREUS (CHICOREUS) DILECTUS  
(A. Adams)

Plate III, figure 4, text figure 2.

- ? *Murex pudoricolor* REEVE, 1845, *Conch. Icon.*, v. 3, *Murex*, pl. 33, fig. 171.  
 ? *Murex salleanus* A. ADAMS, 1854, *Zool. Soc. London, Proc.*, pt. 21 (1853), p. 70.  
*Murex dilectus* A. ADAMS, 1856, *Zool. Soc. London, Proc.*, pt. 23 (1855), p. 120.  
 ? *Murex salleanus* ADAMS. SOWERBY, 1879, *Thes. Conchyl.*, v. 4, *Murex*, p. 19, pl. 9, fig. 73.  
*Murex dilectus* ADAMS. SOWERBY, 1879, *Thes. Conchyl.*, v. 4, *Murex*, p. 18, pl. 6, fig. 60.  
*Murex florifer arenarius* CLENCH and PÉREZ FARFANTE, 1945, *Johnsonia*, v. 1, no. 17, p. 34, pl. 19, fig. 1-3. *Non Murex sandbergeri* var. *arenaria* Steuer, 1912.  
*Murex (Chicoreus) rufus* LAMARCK. GARDNER, 1948, U.S.G.S. Prof. Paper 199-B, p. 218, pl. 29, figure 23 (not of Lamarck, in part, = *C. floridanus*).  
 Not *Murex (Chicoreus) salleanus* ADAMS. OLSSON and HARBISON, 1953, *Acad. Nat. Sci. Phila.*, Mon. 8, p. 244, pl. 36, fig. 2 (= *C. floridanus*).

*Diagnosis*: "M. testa ovato-fusiformi triventricosa, carneola, rufescenti sparsim variegata, spira brevi, acuminata, infractibus septum, varicibus foliaceo-fimbriatis ac laciniatis, interstitiis plicato-nodosis, transversim liratis liris rufo articulatis; apertura ovali, canali vix clauso, valde recurvato, labro margine crenato." (Adams, 1856)



Text figure 2. *Murex dilectus* A. Adams. (X 1) Lectotype: British Museum (Nat. Hist.) reg. no. 19659.

Lectotype (here designated): British Museum (Nat. Hist.) reg. no. 1965-9.

Dimensions of lectotype: height 55 mm, diameter, excluding spines, 37 mm.

Type locality: Sanibel Island, Florida (after Clench and Pérez Farfante, 1945, p. 35).

*Horizon*: Unnamed post-Caloosahatchee formation, Florida; (?) Pleistocene. Recent, Gulf of Mexico and northern Caribbean.

*Figured specimen*: USNM 654369, height 54 mm, diameter, excluding spines, 26.5 mm; locality, off Long Boat Key, Florida (Recent). Fossil occurrences: TU locality nos. 201, 539A, 580, 582.

*Discussion*: The identity of this species, the most common *Chicoreus* in the Gulf of Mexico, has been confused by authors. It has been referred to "*Murex rufus*," to "*Murex florifer*," and to "*Murex salleanus*" to mention the most frequent citations. In 1945 Clench and Pérez Farfante proposed *M. florifer arenarius* for the form and thus it has become known in the succeeding interval. Unfortunately, that name is preoccupied by Steuer, 1912, and as a consequence another is required. A new one is not necessary as there is at least one valid name in existence for the species, and the possibility of two others. The most certain of these is *Murex*

*dilectus* A. Adams, which was described without locality. But the description is clear, and the subsequent illustration by Sowerby is so unmistakable that one wonders how this name has been overlooked. In the collection of the British Museum (Nat. Hist.) the type lot of *Murex dilectus* Adams consists of three specimens, two of which are the Florida species, the third is not. As Sowerby's illustration is clearly of the problem species, the largest of the three specimens, which closely matches the illustration, and may well be the one figured, is here selected as lectotype, and figured in text figure 2.

In addition to *C. dilectus* there are two other names which may apply to this species. The oldest of these is *Murex pudoricolor* Reeve. The original description of this shell from St. Thomas, Virgin Islands, sounds like this species, as it is small and "delicate bluish-red in color." (The name *pudoricolor* means "blushing-color.") The type is not present in the British Museum (Nat. Hist.), but a small, pink specimen of *C. dilectus* is labelled "*Murex pudoricolor*" in the collection. However it is possible that this specimen may be misidentified. The juveniles of *C. argo* and *C. spectrum* are also pink so that the color is no valid criterion. As the exact identity of this species is not known, and as the only figured specimen is a juvenile, in this case it does not seem wise to select a lectotype, but rather the name should be considered a *nomen oblitum* and forgotten once again.

There is a second name, *Murex salleanus* A. Adams, which may possibly refer to this species. This taxon was described from Santo Domingo by Adams, and from the description and Sowerby's subsequent illustration, there is a strong suggestion that this is also the Florida species. However there is no type specimen, nor any other specimens which could be construed as type material, in the British Museum (Nat. Hist.). Sowerby's illustration shows a worn shell which could equally be *C. florifer*, as it was so considered by Clench and Pérez Farfante, or *C. dilectus*. For this reason it is deemed advisable to consider the name *Murex salleanus* A. Adams as a *nomen dubium* in the interest of stability.

Clench and Pérez Farfante adequately differentiated this species from the similar *C. florifer*, except that the juveniles are not

always pink. Brown apices are more common than the pink ones. *C. dilectus* may be distinguished from *C. florifer* by its narrower shell and generally lighter color. The shoulder spine of *C. dilectus* is approximately the same length as the other spines, although it may be much wider. The intervarical node is weaker, and occasionally a smaller second axial rib is present. Comparison with the ancestral species *C. floridanus* has been made already.

In passing it should be noted that the name *Chicoreus dilectus* has been used by Habe (1961, pl. 25, fig. 15) for a Japanese shell. This is not *C. dilectus* (Adams) but is *C. oligacanthus* (Euthyme).

#### CHICOREUS (CHICOREUS) BREVIFRONS (Lamarck)

##### Plate III, figure 5

- Murex brevifrons* LAMARCK, 1822, Anim. s. Vertèbres, v. 7, p. 161.  
*Murex calcitrapa* LAMARCK, 1822, Anim. s. Vertèbres, v. 7, p. 162. *Non M. calcitrapa* Lamarck, 1803, Eocene of France.  
*Murex brevifrons* Lamarck. KIENER, 1843, Coquilles Vivantes, v. 7, p. 26, pl. 20, fig. 1.  
*Murex calcitrapa* Lamarck. KIENER, 1843, Coquilles Vivantes, v. 7, p. 29, pl. 19, fig. 1.  
*Murex elongatus* Lamarck. REEVE, 1845, Conch. Icon., v. 3, *Murex*, pl. 6, fig. 26 (not of Lamarck).  
*Murex purpuratus* REEVE, 1846, Conch. Icon., v. 3, *Murex*, pl. 35, fig. 183.  
*Murex toupiollei* BERNARDI, 1860, Journ. de Conchyl., v. 8, p. 211, pl. 4, fig. 5.  
*Murex approximatus* SOWERBY, 1879, Thes. Conchyl., v. 4, *Murex*, p. 13, pl. 7, fig. 62.  
*Murex (Chicoreus) calcitrapa* Lamarck. GABB, 1881, Acad. Nat. Sci. Phila., Jour., (Ser. 2) v. 8, no. 4, p. 350.  
 Not *Murex brevifrons* var. *calcitrapa* Lamarck. HELPRIN, 1887, Wagner Free Inst. Sci., Trans., v. 1, p. 68 (= *C. floridanus*).  
*Murex brevifrons* Lamarck. LOIRÉ, 1889, Geol. Reichs-Mus. Leiden, Samml., (Ser. 2) v. 1, p. 136, pl. 2, fig. 41.  
 Not *Murex (Chicoreus) brevifrons* Lamarck. DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 140 (= *C. floridanus*).  
 Not *Murex (Chicoreus) brevifrons* Lamarck. PILSBRY, 1922, Acad. Nat. Sci., Proc., v. 73, p. 352 (= *C. cornurectus*).  
 Not *Murex (Chicoreus) brevifrons* Lamarck. MAURY, 1922, Bulls. Amer. Paleontology, v. 9, no. 38, p. 96 (= *C. floridanus*).  
 Not *Murex brevifrons* Lamarck. MAURY, 1925, Serv. Geol. Min. Brasil, Mon. 4, p.

- 138-139, pl. 6, figs. 7, 9 (= *C. cornurectus*).
- Murex toupiolleti* "Born". TRECHMANN, 1933, Geol. Mag., v. 70, no. 823, p. 38.
- Murex (Chicoreus) brevifrons* Lamarck. CLENCH and PÉREZ FARFANTE, 1945, *Johnsonia*, v. 1, no. 17, p. 28, pl. 15, figs. 1, 2; pl. 16, figs. 1, 2.
- Not *Murex (Chicoreus) brevifrons* Lamarck. OLSSON and HARBISON, 1953, *Acad. Nat. Sci. Phila.*, Mon. 8, p. 244, pl. 36, fig. 2 (= *C. floridanus*).
- Not *Murex (Chicoreus) brevifrons* Lamarck. DUBAR, 1958, *Florida Geol. Surv.*, Bull. 40, p. 196, pl. 12, fig. 1 (= *C. floridanus*).
- Not *Murex (Chicoreus) brevifrons* Lamarck. WOODRING, 1959, U.S.G.S. Prof. Paper 306-B, p. 216, pl. 35, figs. 11-13 (= *C. cornurectus*, in part).
- Murex (Chicoreus) brevifrons* Lamarck. WEISBORD, 1962, *Bulls. Amer. Paleontology*, v. 42, no. 193, p. 288, pl. 48, figs. 1, 2. Also ? p. 291, pl. 26, figs. 5, 6.
- Diagnosis*: "M. testa subfusiformi, ventricosa, crassa, ponderosa, transverse sulcata et striata, trifariam frondosa, alba, saepius lineis rubris cincta; frondibus brevibus; interstitiorum tuberculo maximo." (Lamarck, 1822)
- "Type figure:" Martini, 1777, *Conchy. Cab.* v. 3, pl. 103, fig. 983 (selected by Clench and Pérez Farfante, 1945, p. 30).
- Type locality: St. Thomas, Virgin Islands (selected by Clench and Pérez Farfante, 1945, p. 31).
- Horizon*: "Korallenkalk" and "Riffkalk," Curaçao; Mare Formation, Venezuela; "Clay Beds," Costa Rica; Pliocene. Barbados, Pleistocene. Recent, western Atlantic, exclusive of Gulf of Mexico.
- Figured specimen*: USNM 654370, height 77 mm, diameter, excluding spines, 39 mm; locality unknown (Recent).

*Discussion*: As may be seen from the lengthy synonymy above, this species has been misunderstood not only in the literature of the Tertiary but also in that of the Recent. The original controversy arose with Lamarck who named two species: *Murex brevifrons*, from "l'Océan américain," and *Murex calcitrapa*, with no locality. Kiener subsequently attributed a habitat of the Indian Ocean to *M. calcitrapa*. Later authors indicated a variety of Indo-Pacific localities for *M. calcitrapa*, but as best can be determined these are all based on either misidentifications or hearsay. No reliable reference for an Indo-Pacific occurrence has been found, either in the literature or in the collections of various museums. Most authorities agree that *M. brevifrons* and *M. calcitrapa* are synonyms, and the Caribbean locality is the only certain one. Since the

time of Lamarck there have been a number of other species erected for shells which are indistinguishable from *M. brevifrons*. The writer recently had an opportunity to study the collections in the British Museum (Natural History) and to resolve many of the problems concerning this species. *Murex purpuratus* Reeve, an objective synonym of *M. brevifrons*, is based on a unique specimen, probably gerontic, in which the canal is twisted in a peculiar fashion. Neither *Murex toupiolleti* Bernardi, nor *Murex approximatus* Sowerby (= *Murex elongatus* "Lamarck" Reeve, not of Lamarck) can be separated. In addition to these three species, Clench and Pérez Farfante, in their monograph *The genus Murex in the Western Atlantic* (1945, p. 28) included under *Murex brevifrons* a number of species which are not synonyms. These are: *Murex pudoricolor* Reeve (which may be the same as *C. dilectus*, but is not the same as *C. brevifrons* as the juveniles of this species are not pink), *Murex megacerus* "Sowerby" Reeve (there is an error in numbering of Reeve's plate 6, and figures 24 and 25 are reversed; figure 24 is species 25, *Murex sinensis* Reeve, a valid Indo-Pacific form; and figure 25 is species 24, *Murex megacerus* Sowerby, a valid West African form; neither is *M. brevifrons*); *Murex crassivariosa* Reeve (probably an Indo-Pacific species); *Murex alabastrum* A. Adams (the type of this species upon examination proves to be an *Aspella*); and *Murex adamsii* Kobelt (an unnecessary new name for *M. alabastrum* Adams, non *M. alabaster* Reeve).

As if this confusion in the Recent species were not enough, authors writing on the Tertiary of the western Atlantic region have elected to apply the name "*brevifrons*" to almost every *Chicoreus* found regardless of age or locality. Thus *C. cornurectus* and *C. floridanus* both are cited by this name. The only certain fossil occurrences of *C. brevifrons* are in the Pliocene Mare Formation of Venezuela (Weisbord, 1962) and the Pliocene of Curaçao (Lorié, 1889). This species has also been reported from the "Pliocene Clay Beds" of Costa Rica (Gabb, 1881) and from the Pleistocene of Barbados (Trechmann, 1933). The present distribution is throughout the Caribbean, and recently Bullis (1964, p. 105) extended the southern range to off the Amazon River in

Brazil. Clench and Pérez Farfante reported it off southern Florida but it is rare there.

CHICOREUS (CHICOREUS) FLORIFER  
(Reeve)

Plate III, figure 6

*Murex rufus* LAMARCK, 1822, Anim. s. Vertèbres, v. 7, p. 162. *Non Murex rufus* Montagu, 1803.

*Murex rufus* Lamarck, KIENER, 1843, Coquilles Vivantes, v. 7, p. 37, pl. 32, fig. 1. *Murex florifer* REEVE, 1846, Conch. Icon., v. 3, *Murex*, pl. 36, fig. 188.

*Murex (Chicoreus) florifer* REEVE. CLENCH and PÉREZ FARFANTE, 1945, Johnsonia, v. 1, no. 17, p. 32, pl. 18, figs. 1-5.

*Diagnosis*: "Shell triangularly ovate, somewhat fusiform, transversely ridged, ridges rather distant, interstices very finely corded, cords scabrous over the back of the fronds, with a large elongated tubercle between the varices, three-varicose, varices very beautifully frondose, fronds erect, floriferous, muricated; whitish, more or less stained with rusty brown, fronds darker brown, muricated extremities of the fronds white within and without, apex pink." (Reeve, 1846)

Lectotype (here designated): British Museum (Nat. Hist.) reg. no. 1965-11 (Reeve, pl. 36, fig. 188).

Dimensions of lectotype: height 75 mm, diameter, excluding spines, 40 mm.

Type locality: Honduras (Reeve, 1846).

*Horizon*: Recent only, so far as known.

*Figured specimen*: USNM 654371, height 61 mm, diameter, excluding spines, 32 mm; locality unknown (Recent).

*Discussion*: *C. florifer*, although similar to *C. dilectus*, may be distinguished from that species by its larger average size and heavier shell. It also has one longer spine at the shoulder and generally more imbricated spines. There is only one intervarical node which is much stronger than that of *C. dilectus*, and the shell is proportionally wider at the periphery, giving it a triangular aspect. The shell is darker in color, ranging from a pale yellow body with dark brown fronds, as shown by Reeve, to a completely dark brown shell such as the one figured by Kiener, as *Murex rufus*. *C. florifer* probably represents a more warm water form of *C. dilectus* as the range is generally more southerly. Clench and Pérez Farfante reported this species from the Bahamas, southern Florida, the Antilles, and the coast of Central America. Those authors placed *C. salleanus* (Adams) in synonymy with *C. florifer*, which may or may not be correct, as previously discussed. They also placed

*Murex despectus* Adams in synonymy, being misled by Adams' faulty locality data. Examination of the type in the British Museum (Nat. Hist.) reveals that it is, as most authors have agreed, a synonym of *Murex adustus* Lamarck (= "*Purpura*" *brunnea* Link.).

The type lot of *Murex florifer* Reeve in the British Museum (Nat. Hist.) consists of three specimens, one of which is that figured by Reeve. This figured specimen is here designated as lectotype. It is not refigured as the original figure by Reeve is entirely satisfactory.

CHICOREUS (CHICOREUS) ARGO  
(Clench and Pérez Farfante)

*Murex (Chicoreus) imbricatus* HIGGINS and MARRAT, 1877, Literary and Philosophical Soc. Liverpool, Proc., v. 31, p. 413, pl. 1, fig. 2. *Non Murex imbricatus* Brocchi, 1814; *nec* Risso, 1826; *nec* Nardo, 1847.

*Murex (Chicoreus) argo* CLENCH and PÉREZ FARFANTE, 1945, Johnsonia, v. 1, no. 17, p. 31, pl. 17. New name for *Murex imbricatus* Higgins and Marrat.

*Murex argo* Clench and Pérez Farfante. CLENCH, 1953, Johnsonia, v. 2, no. 32, p. 360, pl. 178 (Holotype).

*Diagnosis*: "M. testa subelongato-fusiformi, transversim granoso-lirata, inter varices fortiter hi vel trituberculata, trifasciam varicosa, varicibus conspicue confertim frondosis, laciniato-foliosis, ad apicem spinosis, incurvis laminato-squammatibus; columella laevi; aurantio lutescente, liris rufofuscis; apice rubescente." (Higgins and Marrat, 1877).

Holotype: Liverpool Museum.

Dimensions of holotype: height 82 mm, diameter 34 mm (Clench and Pérez Farfante, 1945, p. 32).

Type locality: Carinage, Island of Grenada, Lesser Antilles.

*Horizon*: Recent only, so far as known.

*Discussion*: *C. argo* is a rare shell and has been reported only twice since the original description by Higgins and Marrat. In 1949 Verrill reported a specimen taken off La Bime Point, Dominica, B.W.I., in a fish trap at a depth of between 30 and 50 fathoms. He subsequently figured a specimen (1950, pl. 10, fig. 2) from Soufriere Bay, Dominica, at 75 fathoms. According to Verrill, *C. argo* is a "deep red or reddish brown, with black concentric bands, with jet-black spines, and with a scarlet nucleus" (1950, p. 127-128).

Sowerby in the *Thesaurus Conchyliorum*, v. 4, stated of *C. spectrum*, "I cannot doubt its identity with *Chicoreus imbricatus* of Higgins and Marrat." (1879, p. 14). The

differences in the two forms, although subtle, are sufficient to cause doubt in the mind of this writer. The type specimen of *C. spectrum*, if complete, would measure approximately five inches in height, or almost twice as big as the type of *C. argo* and the spire of *C. spectrum* is proportionally higher. *C. spectrum* is lighter in color, the body of the shell is pale yellow, with brown spiral lines, and only the fronds are dark brown. On the other hand, *C. argo* is nearly black, and is also dark within the aperture, which *C. spectrum* is not. *C. argo* has two or three distinct, rounded intervarical nodes, but *C. spectrum* has three rather indistinct axial ridges only.

Both *C. argo* and *C. spectrum* resemble the Miocene species *C. cornupectus*. They both have a much longer siphonal canal than any other western Atlantic species of *Chicoreus* and have one longer spine at the shoulder with three smaller spines. The depth records for the two species would seem to indicate that they inhabit deeper water than the other *Chicoreus* species, and, perhaps for this reason, they are not known from the fossil record.

#### CHICOREUS (CHICOREUS) SPECTRUM (Reeve)

*Murex spectrum* REEVE, 1846, Conch. Icon., v. 3, *Murex*, pl. 36, fig. 187.

*Diagnosis*: "Shell erectly fusiform, transversely ridged, ridges irregular, nodose and tuberculated, sutures of the spire rather excavated; three-varicose, varices thickened, frondose, fronds rather elongated, branched and muricated, canal rather long; yellowish, fronds and ridges chestnut-brown." (Reeve, 1846)

Holotype: British Museum (Nat. Hist.) reg. no. 1950-10-23-1.

Dimensions of imperfect holotype: height 113 mm, diameter, excluding spines, 49 mm.

Type locality (here designated): Dominica, British West Indies.

*Horizon*: Recent only, so far as known.

*Discussion*: Although *C. spectrum* was described without locality data, and it has never been reported in the literature, there are two specimens in the U. S. National Museum collection which are unmistakably this species. Both specimens were taken off Dominica, B.W.I. in 75 to 100 fathoms by A. H. Verrill. As no other locality is known for the species, Dominica is here designated as the type locality.

#### V. NOTES ON RECENT SPECIES OF *CHICOREUS* (*SIRATUS*)

The group of muricids typified by *Murex senegalensis* Gmelin was first distinguished by Jousseume in 1880 (p. 335) as the genus *Siratus*, with the type species given as "*Purpura sirat*" Adanson. As Adanson is a pre-Linnaean author the first available name for this species is the one given by Gmelin, based on Adanson's plate 8, figure 19 (1757). Jousseume did not give a description of his genus in the original citation but shortly after (?1882, p. 324) he provided the following:

"Coquille à spire conique plus ou moins saillante; sur chaque tour 3 varices ailées en avant et armées d'épines simples ou ailées; entre chaque varice deux ou plusieurs bourrelets; canal plus court que la hauteur de la spire, large à la base, effilé et coudé en avant; ouverture ovale avec un petit canal postérieur."

In the interval since the publication of the first part of this monograph (Vokes, 1963a) the author has had the privilege of studying the collections in the British Museum (Natural History). As is discussed further in the Introduction to the present paper, this study has convinced the writer that many species formerly assigned to *Murex* s.s. are better placed in *Chicoreus* (*Siratus*). The following notes refer to species treated in Part I—*Murex* s.s. of this monograph.

1. *Murex* (*Murex*) *aguayoi* Clench and Pérez Farfante, *M. cailleti* Petit, *M. ciboney* Clench and Pérez Farfante, *M. antillarum* Hinds, *M. motacillus* Gmelin, and *M. consulae* Verrill (= *M. pulcher* Adams), are all referred to *Chicoreus* (*Siratus*).

2. *M. cailleti* variety *kugleri* Clench and Pérez Farfante was a new name for *M. similis* Sowerby, 1841, non Schroeter, 1805. Examination of a series of specimens indicates that *M. similis* is a synonym of *M. cailleti* and this is an unnecessary name. However *M. elegans* Sowerby (see Clench and Pérez Farfante, 1945, pl. 9, fig. 5, 6) is not a synonym of *M. cailleti*, as stated by those authors, but is a distinct species characterized by having almost no spines, and with pronounced spiral brown lines equally spaced over the entire shell. As Sowerby's name is preoccupied by Donovan, 1804, by

Schlotheim, 1820, and by Wood, 1828, a new name is here proposed for this species:

CHICOREUS (SIRATUS) PERELEGANS,  
*nom. nov.*

*Murex elegans* BECK in G. B. SOWERBY, JR., 1841, *Conch. Illus.*, pl. 192, fig. 84.

Not *Murex elegans* DONOVAN, 1804, *British Shells*, v. 5, pl. 179, fig. 3.

Not *Muricites elegans* SCHLOTHEIM, 1820, *Die Petrefactenkunde*, p. 141 (*vide* ICZN Code, Art. 56b).

Not *Murex elegans* WOOD, 1828, *Index Test.*, *Suppl.*, p. 15, pl. 5, fig. 8.

A specimen of this species in the collections of the British Museum (*Nat. Hist.*) seems to be the one figured by Reeve (1845, pl. 24, fig. 99) although perhaps not the one figured by Sowerby in the original illustration. This specimen (height 65 mm) is here designated as lectotype. The "Island of St. Domingo, West Indies," cited as the locality for the shell figured by Reeve, is here designated as type locality.

3. Another species placed in the synonymy of *M. caillieti* by Clench and Pérez Farfante is *M. trilineatus* Reeve. This is also a valid species, most easily identified by the short spines and almost invariable three spiral brown lines. As the name is preoccupied by J. Sowerby, 1813, a new name is here proposed:

CHICOREUS (SIRATUS) REEVEI,  
*nom. nov.*

*Murex trilineatus* REEVE, 1845, *Conch. Icon.*, v. 3, *Murex*, pl. 25, fig. 103.

Not *Murex trilineatus* J. SOWERBY, 1813, *Mineral Conch.*, v. 1, p. 80, pl. 35, fig. 4, 5.

The type lot of this species in the British Museum (*Nat. Hist.*) consists of three specimens. The specimen (height 58 mm) figured by Reeve is here designated as lectotype. The locality given by Reeve, "Gulf of Mexico," is here designated as type locality. The species is known to occur in Matanzas Bay, Cuba (author's collection).

4. *Murex (Murex) finlayi* Clench, also to be referred to *Siratus*, is a synonym of at least three older names. The first of these is *M. articulatus* Reeve, based on the figure given by Sowerby in the *Conchological Illustrations*, (1841) pl. 189, fig. 69, as "*Murex motacilla* variety." Reeve in the *Conchologia Iconica*, explanation to plate 22

(June, 1845), stated that Sowerby "published a drawing of another shell at Fig. 69, as a variety of *Murex motacilla*, which has little or no affinity with it, and which I propose to distinguish by the new title of *Murex articulatus*." Two months later Reeve (*ibid.*, August, pl. 25, fig. 107) named *Murex nodatus*, n. sp., explaining, "This shell was figured in the *Conchological Illustrations* by Mr. Sowerby as a variety of the *Murex motacilla*." As there is a previous *M. nodatus* of Gmelin, 1791, this second name does not especially concern us, but the shell figured by Sowerby as "*M. motacilla* variety" which Reeve named *M. articulatus*, as well as that figured by Reeve as *M. nodatus*, are the same species as the one subsequently named *M. finlayi* by Clench. The third name given this species is *M. gundlachi* Dunker, described from Matanzas Bay, Cuba, the type locality of *M. finlayi*. Clench and Pérez Farfante placed all of these prior names for *M. finlayi* in the synonymy of *M. antillarum* Hinds, but comparison of the illustrations shows that the synonymy lies with *M. finlayi* not *M. antillarum*. The question of the *nomen oblitum* has not yet been satisfactorily resolved by the International Commission on Zoological Nomenclature, and at this writing there is a movement in the direction of not conserving a name less than 50 years old. In this case the name *M. finlayi* would not be a candidate for conservation, as it is only 10 years old, and *M. articulatus* Reeve would be the valid name for the species.

5. The name *Murex antillarum* Hinds is also threatened by an older name, *Murex formosus* Sowerby. This latter name has been considered by most authors as a synonym of *Murex rarispina* Lamarck on the basis of Kiener's statement (1843, p. 18) that *M. formosus* "n'est qu'une variété un peu plus large" of *M. rarispina*. The "*M. rarispina*" figured by Kiener (plate 11, fig. 1), stated to be from Lamarck's "Cabinet" and probably the shell which Lamarck had before him when he described *Murex rarispina*, is the same as Sowerby's *M. formosus*. However Lamarck had not figured his shell but referred only to a previously published figure: Martini, vol. 3, pl. 113, f. 1056. As his description is indefinite that figure has generally been taken as the type of *M. rarispina* rather than the Kiener figure. Unfor-

unately, although Lamarck gave "Saint-Domingue" as his locality, the shell figured by Martini is Indo-Pacific, and is now known as *Murex trapa* Röding, based on the same Martini reference. Therefore although Kiener was correct in his evaluation, his synonymy cannot be accepted without creating nomenclatorial chaos, for the figures given by Kiener as *M. varispina* and by Sowerby, as *M. formosus*, both are the species known today as *M. antillarum* Hinds. At the present time *M. formosus* may be considered a *nomen oblitum* until some final conclusion is reached as to the validity of that designation.

6. In addition to the above mentioned species which are to be referred to *Chicoreus* (*Siratus*), two new species from the Caribbean described recently by Bullis (1964) are also referable to this group. They are *Murex springeri* and *Murex thompsoni* from off the northeastern coast of South America.

#### VI. RECTIFICATIONS IN NOMENCLATURE FOR PART I—MUREX s.s.

The controversial species, *Murex messorius* Sowerby, is apparently after all a West Coast form. Olsson has selected a lectotype (in press), from the specimens in the British Museum (Nat. Hist.), which is one of the *M. recurvirostris* complex, and so the western Atlantic species referred to *M. messorius* needs reidentification. All of the specimens in the British Museum which correspond to the Caribbean species now called *M. woodringi* Clench and Pérez Farfante are labelled "*M. nigrescens* Sowerby." Although that species was described from the western coast of Colombia (Xipixapi) there is always likelihood of mistaken locality data in any of the old Cuming collections. There is still the necessity for much more work on this entire complex and for the time the best solution would seem to be the use of the name *M. woodringi* for the Caribbean species which may or may not be the same as *M. nigrescens* Sowerby.

#### VII. APPENDIX I

##### REFERENCES FOR SPECIES CITED BUT NOT TREATED IN SYSTEMATIC DESCRIPTIONS

- Murex adamsii*, Kobelt, 1877, Deutsch. Malak. Gesell., Jahrg., v. 4, p. 154. New name for *M. alabastrum* Adams, non *M. alabastrum* Lamarck, 1822, Anim. s. Vert., v. 7, p. 162.  
*M. alabaster* Reeve, Conch. Icon., v. 3, *Murex*, pl. 10, fig. 39.  
*M. alabastrum* A. Adams, 1864, Zool. Soc. London, Proc., 1863, p. 29.  
*M. anguliferus* Lamarck, 1822, Anim. s. Vert., v. 7, p. 171.  
*M. aquitanicus* Grateloup, 1833, Soc. Linn. Bordeaux, Actes, v. 6, no. 33, p. 94.  
*M. bourgeoisi* Tournouër, 1875, Journ. de Conchyl., v. 23, p. 156, fig. 5, 5a.  
"*Purpura*" *brunnea* Link, 1807, Naturlien-Sammel. Univ. Rostock, v. 2, p. 121.  
*Murex calcitrata* Lamarck, 1803, Ann. Mus. Natl. Hist. Nat., v. 2, p. 223.  
*M. crassivariosa* Reeve, 1845, Conch. Icon., v. 3, *Murex*, pl. 9, fig. 33.  
*M. despectus* A. Adams, 1854, Zool. Soc. London, Proc., pt. 21 (1853), p. 72.  
*M. dujardini* Tournouër, 1875, Journ. de Conchyl., v. 23, p. 151, pl. 5, fig. 4, 4a.  
*M. formosus* G. B. Sowerby, Jr., 1841, Conch. Illus., pl. 197, fig. 112.  
*M. gundlachi* Dunker, 1883, Malak. Blatter, (N.S.), v. 6, p. 35, pl. 1, figs. 1, 2.  
*M. imbricatus* Brocchi, 1814, Conch. Subap., v. 2, p. 408, pl. 7, fig. 13.  
*M. imbricatus* Risso, 1826, Hist. Nat. Europe, v. 4, p. 196.  
*M. imbricatus* Nardo (*ex* Chiereghini), 1847, Sin. mod. spec. Lag. Veneto, p. 55.  
*M. imperialis* Fischer, 1807, Mus. Demidoff, v. 3, p. 198.  
*M. imperialis* Swainson, 1831, Zool. Illus., (2) v. 2, pl. 67.  
*M. margaritensis* Abbott, 1958, Acad. Nat. Sci. Phila., Mon. 11, p. 61, pl. 1, fig. n. o. New name for *M. imperialis* Swainson, non Fischer.  
*M. megacerus* G. B. Sowerby, Jr., 1834, Conch. Illus., pl. 60, fig. 18.  
*M. nodatus* Gmelin, 1791, Systema Naturae, ed. 13, v. 1, pt. 6, p. 3536.  
*M. oligacanthus* Euthyme, 1889, Soc. Malac. France, Bull., v. 6, p. 269, pl. 7, fig. 2, 3.  
*M. ramosus* Linnaeus, 1758, Systema Naturae, ed. 10, p. 747.  
*M. varispina* Lamarck, 1822, Anim. s. Vert., v. 7, p. 158.  
*M. rufus* Montagu, 1803, Test. Brit., v. 1, p. 263.  
*M. sandbergeri* var. *arenaria*, Steuer, 1912, Geol. Landesanst. Darmstadt, Abh., v. 6, p. 21, pl. 2, figs. 6-9.  
*M. senegalensis* Gmelin, 1791, Systema Naturae, ed. 13, v. 1, pt. 6, p. 3537.  
*M. sexcostatus* Lamarck, 1816, Encyl. Méth., p. 9, pl. 441, fig. 3a, b.  
*M. sinensis* Reeve, 1845, Conch. Icon., v. 3, *Murex*, pl. 6, sp. 25, fig. 24.  
*M. springeri* Bullis, 1964, Tulane Stud. Zoology, v. 11, no. 4, p. 104, figs. 7, 8.  
*M. textilis* Gabb, 1873, Amer. Phil. Soc., Trans., (N.S.) v. 15, pt. 1, p. 202.  
*M. thompsoni* Bullis, 1964, Tulane Stud. Zoology, v. 11, no. 4, p. 103, figs. 3, 4.  
*M. trapa* Röding, 1798, Museum Boltenianum, p. 145.

- M. tricarinatus* Lamarck, 1803, Ann. Mus. Natl. Hist. Nat., v. 2, p. 223.  
*M. trophonijormis* Heilprin, 1887, Wagner Free Inst. Sci., Trans., v. 1, p. 107, pl. 15, fig. 40.  
 "Purpura" *virginica* Röding, 1798, Museum Boltenianum, p. 141.

References for species here referred to *Chicoreus* (*Siratus*) will be found in Part I—*Murex* s.s. portion of this monograph.

## VIII. APPENDIX II

## LOCALITY DATA

The following are Tulane University locality numbers:

60. Choctawhatchee Fm., borrow pits at Jackson Bluff, Ochlockonee River, (NW  $\frac{1}{4}$  Sec. 21, T1S, R4W), Leon Co., Florida.  
 70. Chipola Fm., Ten Mile Creek, at bridge of Florida Highway 73, (NW  $\frac{1}{4}$  Sec. 12, T1N, R10W), Calhoun Co., Florida.  
 72. Choctawhatchee Fm., Alum Bluff, Apalachicola River, (Sec. 24, T1N, R8W), Liberty Co., Florida.  
 79. Caloosahatchee Fm., Ortona Locks, Caloosahatchee River, (Sec. 27, T42S, R30E), Glades Co., Florida.  
 196. Chipola Fm., Ten Mile Creek, about  $\frac{1}{4}$  mile upstream from bridge of Florida Highway 73, (NE  $\frac{1}{4}$  Sec. 11, T1N, R10W), Calhoun Co., Florida.  
 200. Pinecrest Beds, borrow pits about one mile southwest of Acline, (Sec. 29, T41S, R23E), Charlotte Co., Florida.  
 201. Unnamed post-Caloosahatchee formation, spoil banks two miles south of Belle Glade, Palm Beach Co., Florida.  
 202. Caloosahatchee Fm., south bank of Caloosahatchee River, about two miles west of La Belle, (SE  $\frac{1}{4}$  Sec. 12, T43S, R28E), Hendry Co., Florida.  
 203. Caloosahatchee Fm., north bank of Caloosahatchee River, about two miles east of Fort Denaud, (SW  $\frac{1}{4}$  Sec. 11, T43S, R28E), Hendry Co., Florida.  
 206. Caloosahatchee Fm., junction of U. S. Highway 27 and Florida Highway 78, just west of Moore Haven, Glades Co., Florida.  
 453. Chipola Fm., Alum Bluff, Apalachicola River, (Sec. 24, T1N, R8W), Liberty Co., Florida.  
 457. Chipola Fm., west bank of Chipola River, about  $\frac{1}{2}$  mile below Ten Mile Creek, (SW  $\frac{1}{4}$  Sec. 17, T1N, R9W), Calhoun Co., Florida. (Same as USGS 2213 and 3419, "One mile below Bailey's ferry.")  
 458. Chipola Fm., east bank of Chipola River, above Farley Creek, (Center Sec. 20, T1N, R9W), Calhoun Co., Florida.  
 519. Caloosahatchee Fm., Harney Pond Canal spoil banks, northwest side of Lake Okechobee, (NW  $\frac{1}{4}$  Sec. 18, T40S, R33E), Glades Co., Florida.  
 520. Pinecrest Beds, spoil banks, canal  $\frac{1}{2}$  mile east of Brighton, (SE  $\frac{1}{4}$  Sec. 26, T37S, R32E), Highlands Co., Florida.  
 521. Pinecrest Beds, North shore Lake Okechobee, Pumping Station no. 129,

## PLATE I

Figures		Page
1a, 1b.	<i>Chicoreus foliododes</i> (Gardner) X 1 $\frac{1}{2}$ USNM 644821; height 42 mm, diameter 24.8 mm. Locality: TU 554. Chipola Fm., (?) lower Miocene.	184
2.	<i>Chicoreus aquitanicus</i> (Gratoloup) X 1 $\frac{1}{2}$ Zurich 65/T/003; height 57 mm, diameter 30 mm. Locality: Saubrigues, near Dax, France. Helvetian.	184
3.	<i>Chicoreus bourgeoisi</i> (Tournouër) X 2 Zurich 65/T/002; height 33.3 mm, diameter 20 mm. Locality: Pont Levoy, near Blois, France. Helvetian.	185
4.	<i>Chicoreus lepidotus</i> (E. H. Vokes) X 2 USNM 644371 (holotype); height 34 mm, diameter 20 mm. Locality: TU 544. Chipola Fm., (?) lower Miocene.	185
5.	<i>Chicoreus dujardini</i> (Tournouër) X 2 Zurich 65/T/001; height 31.7 mm, diameter 16 mm. Locality: Pont Levoy, near Blois, France. Helvetian.	186
6.	<i>Chicoreus dujardinioides</i> (E. H. Vokes) X 2 USNM 644372 (holotype); height 32.5 mm, diameter 18.5 mm. Locality: TU 547. Chipola Fm., (?) lower Miocene.	185

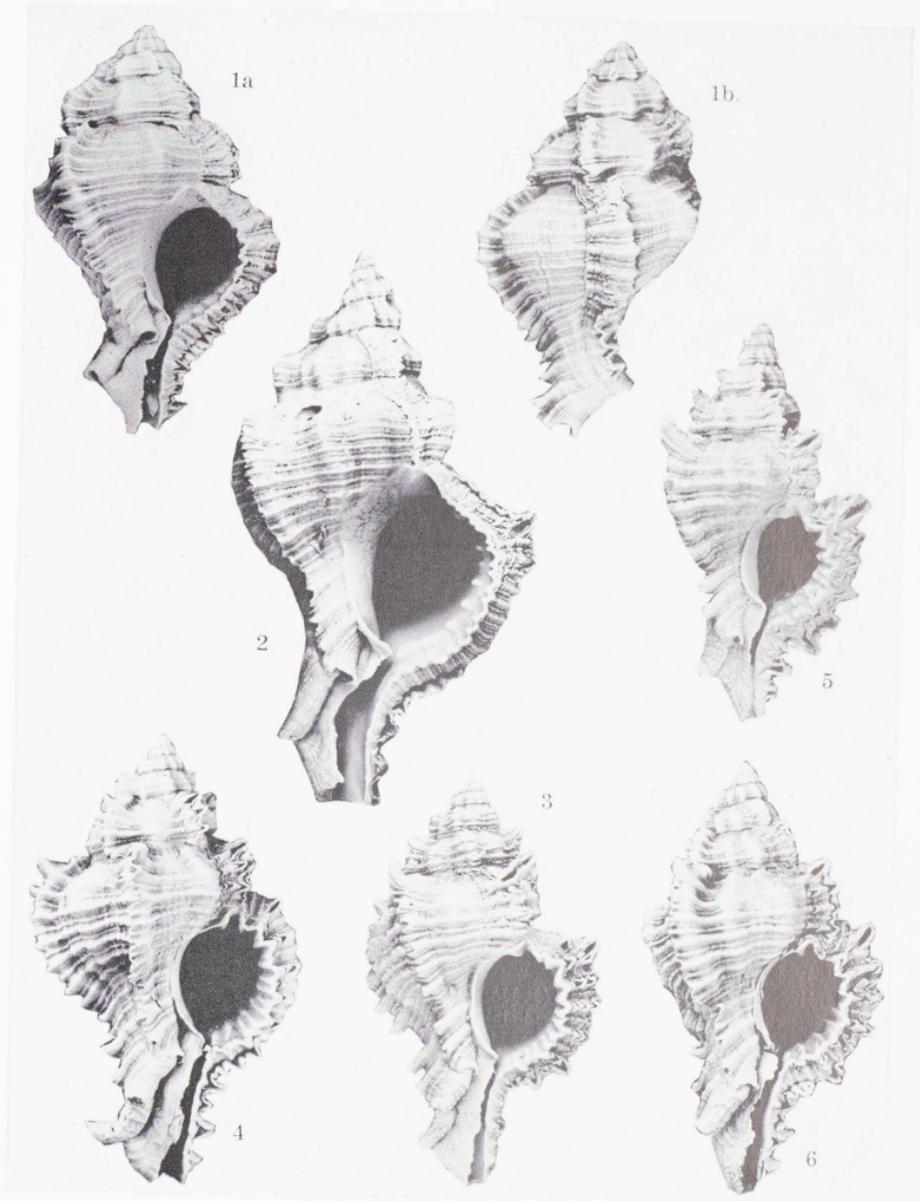


PLATE I

- (NW  $\frac{1}{4}$  Sec. 2, T40S, R33E), Glades Co., Florida.
522. Pinecrest Beds, Harney Pond Canal spoil banks, three miles northwest of Florida Highway 78, (NE  $\frac{1}{4}$  Sec. 36, T39S, R32E), Glades Co., Florida.
523. Pinecrest Beds, Harney Pond Canal spoil banks, six miles northwest of Florida Highway 78, Brighton Indian Reservation, (NW  $\frac{1}{4}$  Sec. 22, T39S, R32E), Glades Co., Florida.
525. Pinecrest Beds, U. S. Highway 41, at "Forty-mile Bend," Dade Co., Florida.
527. Pinecrest Beds, North shore Lake Okeechobee, Pumping Station no. 127, (NE  $\frac{1}{4}$  Sec. 35, T39S, R33E), Glades Co., Florida.
528. Pinecrest Beds, Florida Highway 78,  $5\frac{1}{2}$  miles west of Indian Prairie Canal, (NW  $\frac{1}{4}$  Sec. 9, T40S, R33E), Glades Co., Florida.
529. Caloosahatchee Fm., north bank of Caloosahatchee River, about two miles west of La Belle, (SE  $\frac{1}{4}$  Sec. 12, T43S, R28E), Hendry Co., Florida.
531. Pinecrest Beds, spoil banks, canal crossing Florida Highway 771 about one mile west of Murdock R.R. Station, (SE  $\frac{1}{4}$  Sec. 12, T40S, R21E), Charlotte Co., Florida.
532. Pinecrest Beds, spoil banks, canal  $2\frac{1}{2}$  miles southwest of Murdock R.R. Station, (SE  $\frac{1}{4}$  Sec. 24, T40S, R21E), Charlotte Co., Florida.
536. Caloosahatchee Fm., south bank of Caloosahatchee River about one mile east of La Belle, (Sec. 3 & 4, T43S, R29E), Hendry Co., Florida.
- 539A. Unnamed post-Caloosahatchee formation, upper beds Shell Creek, about eight miles east of Cleveland, (Sec. 25, T40S, R24E), Charlotte Co., Florida.
- 539B. Caloosahatchee Fm., lower beds Shell Creek, same as above.
540. Caloosahatchee Fm., Miami Canal spoil banks, one to three miles south of pumping station at Palm Beach county line, Broward Co., Florida.
541. Caloosahatchee Fm., Miami Canal spoil banks, two miles north of pumping station at Broward county line, Palm Beach Co., Florida.
547. Chipola Fm., west bank of Chipola River, about  $\frac{1}{4}$  mile above Four Mile Creek, (SW  $\frac{1}{4}$  Sec. 29, T1N, R9W), Calhoun Co., Florida.
554. Chipola Fm., east bank of Chipola River at power line crossing, (SW  $\frac{1}{4}$  Sec. 17, T1N, R9W), Calhoun Co., Florida.
558. Waccamaw Fm., marl pits at north end of Crescent Beach Airport, Crescent Beach, S. Carolina.
579. Caloosahatchee Fm., Miami Canal spoil banks, four miles north of pumping station at Broward County line, Palm Beach Co., Florida.
580. Unnamed post-Caloosahatchee formation, North New River Canal spoil banks, one mile south of South Bay, Palm Beach Co., Florida.
582. Unnamed post-Caloosahatchee formation, Rim Ditch spoil banks, just north of Florida-East Coast R.R. crossing, (Sec. 29, T36S, R39E), St. Lucie Co., Florida.
583. Caloosahatchee Fm., Miami Canal spoil banks, seven miles north of pumping station at Broward County line, Palm Beach Co., Florida.
655. Chipola Fm., Ten Mile Creek, about  $\frac{1}{2}$  mile down stream from bridge of Florida Highway 73, (NW  $\frac{1}{4}$  Sec. 12, T1N, R10W), Calhoun Co., Florida.

The following are United States Geological Survey locality numbers:

- USGS 3419. Chipola Fm., McClelland farm, one mile below Bailey's ferry, Chipola River, Calhoun Co., Florida (= TU 457).  
USGS 8550. Gurabo Fm., Rio Gurabo, Dist. de Monte Cristo, Dominican Republic.

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#### PLATE II

Figures	Page
1a, 1b. <i>Chicoreus venezuelanus</i> (F. Hodson) X $1\frac{1}{2}$ _____	188
PRI 24101 (paratype); height 48.5 mm, diameter, 30 mm.	
Locality: Rio Codore, near Uramaco, Falcón, Venezuela.	
Uramaco Fm., middle Miocene.	
2a, 2b. <i>Chicoreus cornurectus</i> (Guppy) X 2 _____	186
USNM 644822; height 38.5 mm, diameter excluding spines, 20 mm.	
Locality: USGS 8550. Gurabo Fm., middle Miocene.	
3a, 3b. <i>Chicoreus compactus</i> (Gabb) X 2 _____	187
USNM 113775; height 36.5 mm, diameter 20 mm.	
Locality: Potrero, Rio Amina, Dominican Republic.	
Gurabo Fm., middle Miocene.	

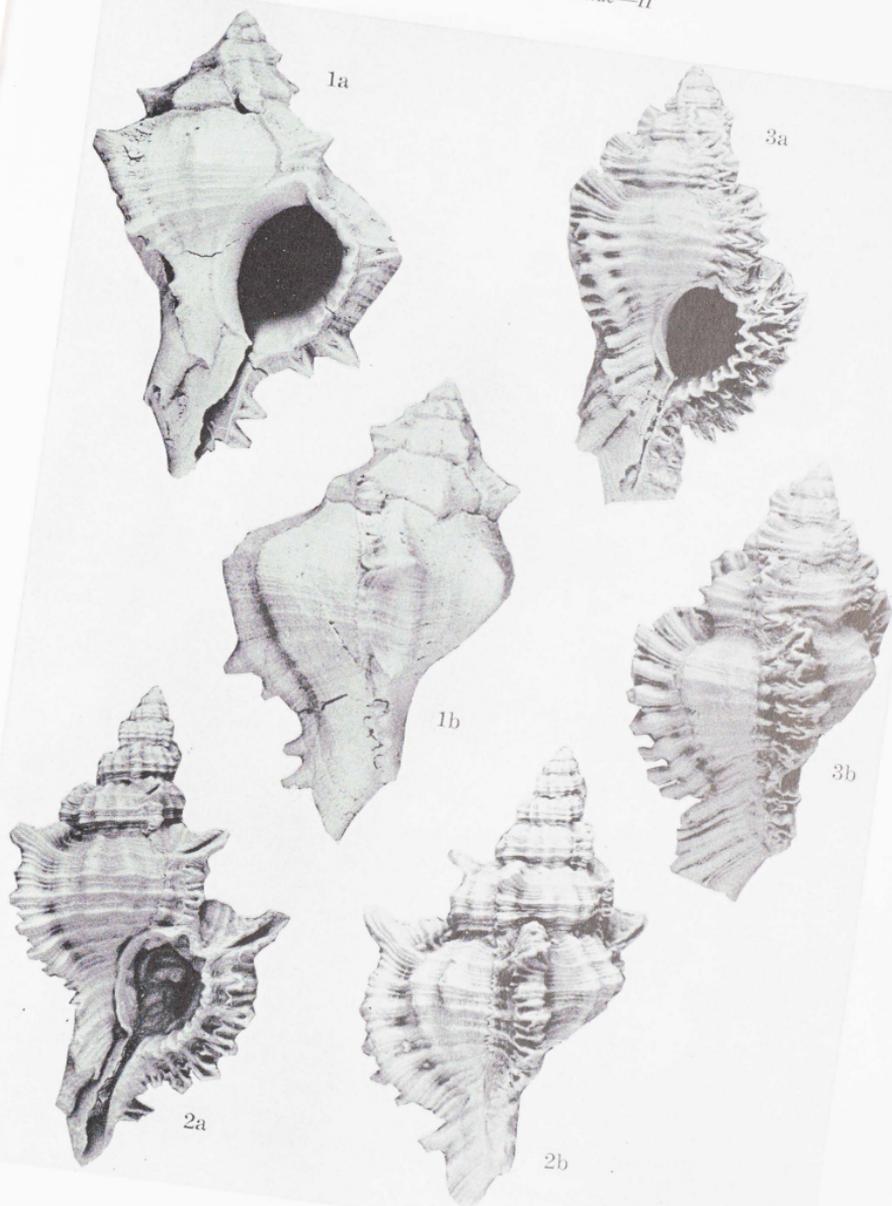


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## PLATE III

Figures		Page
1-3.	<i>Chicoreus floridanus</i> E. H. Vokes, n. sp. _____	189
	1a, b. (X 1) USNM 644823 (holotype); height 73 mm, diameter, excluding spines, 38 mm. Locality: TU 520: Pinecrest Beds, upper Miocene.	
	2. (X 4) USNM 644824 (paratype); height 11.4 mm, diameter 6 mm. Locality: TU 60, Choctawhatchee Fm., upper Miocene.	
	3. (X 1) USNM 644825 (paratype); height 52 mm, diameter, excluding spines, 29 mm. Locality: TU 202. Caloosahatchee Fm., Pliocene.	
4.	<i>Chicoreus dilectus</i> (A. Adams) X 1 _____	191
	USNM 654369; height 54 mm, diameter, excluding spines, 26.5 mm. Locality: off Long Boat Key, Florida. Recent.	
5.	<i>Chicoreus brevifrons</i> (Lamarck) X 1 _____	192
	USNM 654370; height 77 mm, diameter, excluding spines, 39 mm. Locality unknown. Recent.	
6.	<i>Chicoreus florifer</i> (Reeve) X 1 _____	194
	USNM 654374; height 61 mm, diameter, excluding spines, 32 mm. Locality unknown. Recent.	

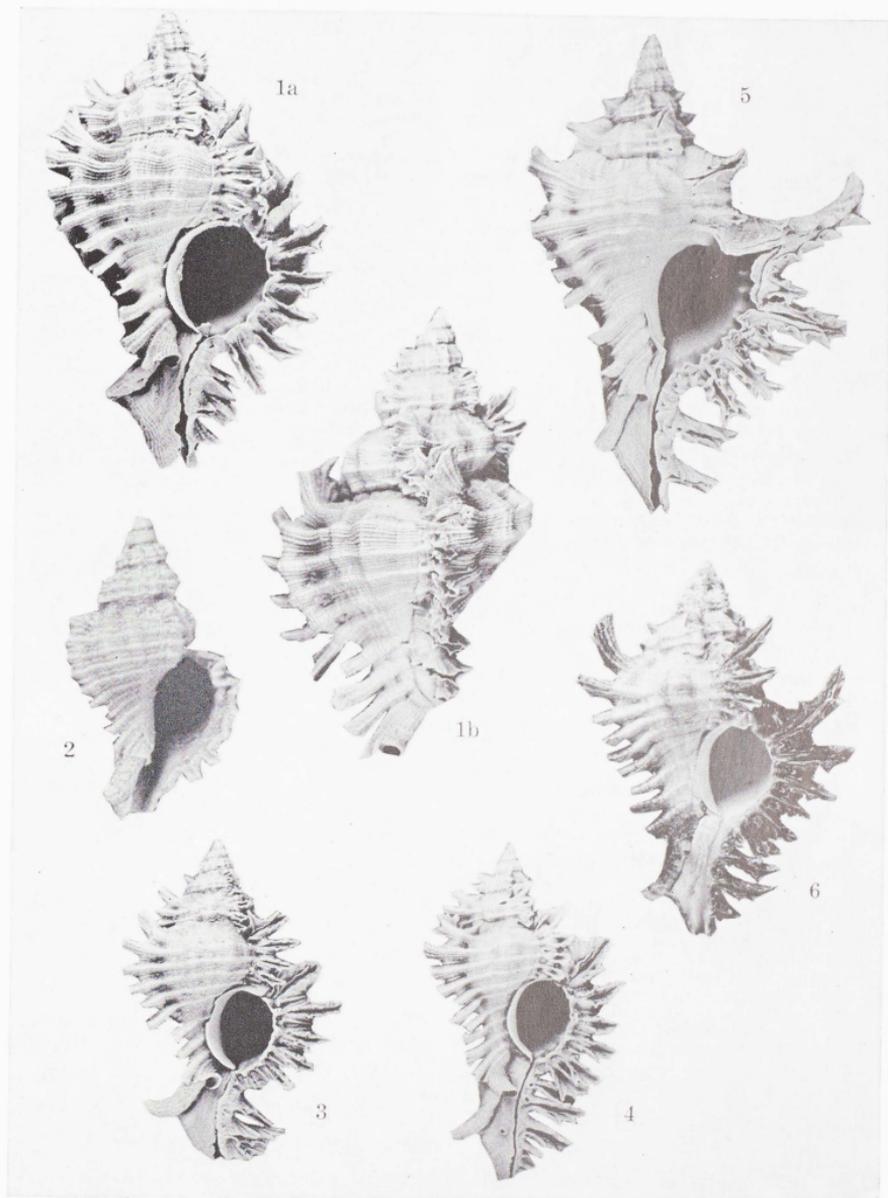


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