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PALEONTOLOGY.—*The ostracode genus* Hemicythere *and its allies.* HARBANS S. PURI,[1] Florida Geological Survey. (Communicated by Alfred R. Loeblich, Jr.)

Hemicythere is a common ostracode genus occurring in the Cenozoic of North America; 27 species and a variety have so far been reported from North America, and 23 of these are valid. The genus is of considerable importance because of the stratigraphic significance of its species which could be easily used as excellent markers.

Five species, *H. arenicola* (Cushman), *H. concinna* (Jones), *H. crenulata* (Sars), *H. truitti* Tressler and Smith, and *H. strandentia* Tressler and Smith have been reported from the Atlantic Ocean. Eight species, *H. punctistriata* (Ulrich and Bassler), *H. confragosa* Edwards, *H. minuta* Edwards, *H. laevicula* Edwards, *H. conradi* Howe and McGuirt, *H. sellardsi* Howe and Neill, *H. calhounensis* Smith, and *H. dalli* Howe and Brown, and *H. dalli redbayensis* Howe and Brown have been described from the Miocene of the Gulf Coastal Plain. *H. dalli* and *H. dalli redbayensis* belong to *Cythromorpha* Hirschmann, *H. sellardsi* to *Caudites* Coryell and Fields, and *H. calhounensis* to *Procythereis* Skogsberg. *H. antillea* Van den Bold has been reported from the West Indies Miocene. *H. saginata* Stephenson and *H. amygdala* Stephenson have been reported from the Oligocene *Marginulina-Heterostegina-Discorbis* zones, and *H. kniffeni* Howe and Law from the Mariana Oligocene. Seven species, *H. phrygionia* Howe, *H. lienosa* Howe, *H. cribraria* Howe, *H. bellula* Howe, *H. mota* Howe, *H. aleatoria* Howe, and *H. lemniscata* Howe have been reported from the middle Eocene Avon Park limestone of Florida. Two species, *H. symmetrica* Van den Bold and *H. limbata* (Bosquet), have been reported from the Eocene of the West Indies. To amplify the characters of *Hemicythere* the genus is redescribed and its genotype, *H. villosa* (Sars) figured. A new species, *H. howei*, is described from the Miocene of Western Florida. The exact stratigraphic range of all the species of *Hemicythere* so far reported from North America is shown in the accompanying chart.

[1] The author expresses his gratitude to Henry V. Howe, director, School of Geology, Louisiana State University, Baton Rouge, for guidance and access to his type collection and library; to Robert O. Vernon, of the Florida Geological Survey, for the use of some of his samples; and to Celia Helena Fajardo for assistance in preparation of plates and manuscript. All types are catalogued in the Henry V. Howe collection, School of Geology, Louisiana State University.

HISTORY OF THE GENUS HEMICYTHERE AND ITS ALLIES

The genus *Hemicythere* was proposed by Sars (1925, p. 182) to include a number of species previously referred to *Cythereis* Jones and *Cythere* Müller. Sars placed the genus in an intermediate position between *Cythereis* and *Cythere*; closer in some respects to the latter. Sars did not designate a genotype but instead based the description of *Hemicythere* on eight Recent species from Norway, listed in order: *Cythere villosa* Sars, *Cythereis emarginata* Sars, *C. crenulata* Sars, *C. finmarchia* Sars, *Cythere quadridentata* Baird, *Cythereis angulata* Sars, *Cythere latimarginata* Speyer, *C. concinna* Jones, and *C. oblonga* Brady. As regards the generic characters of the carapace Sars (*op. cit.* p. 182) observed:

> Shell of very solid consistency, calcareous, resembling somewhat in shape that of *Cythere*. Valves more or less unequal, with the surface distinctly pitted or roughly reticulate, marginal zone closely striated, edges densely hairy in front. Hinge with closing teeth well developed. Eyes distinctly separated.

Blake (1933, p. 234) contended that *Hemicythere* be reduced to a subgeneric rank. Its generic nature has been estabilshed by Howe (1935, p. 27), Edwards (1944, p. 517), and subsequent authors. Edwards (*op. cit.*) designated *Cythere villosa* Sars (1865, p. 42)—first of the eight species described by Sars—as genotype.

Skogsberg (1928) divided what he supposed to be the genus *Cythereis* Jones into three subgenera: *Procythereis*, *Cythereis*, and *Pseudocythereis*. *Cythereis*, however, as shown by Triebel (1940), is a Cretaceous form. Forms included by Skogsberg under *Procythereis* actually belong to *Hemicythere*. Skogsberg thought it impossible to subdivide the genus "*Cythereis*" on the basis of shape and structure of the shell. He instead based his subgenera on the structure of the appendages and of the penis. Structure of the penis appeared to be more significant to Skogsberg (*op. cit.* p. 16) who thought this organ to have been the "seat of the initial morphological changes leading to speciation." Skogsberg did not give any shell description of the subgenus *Procythereis* since the carapace was broken in most of the specimens examined by him. He recognized two groups—*Torquata* and *Radiata* within *Procythereis*, characterised by "the shape and structure of the penis and by the course of the ductus in the genital verruca of the female." *Procythereis* shows sufficiently distinct characters to deserve a generic rank and is represented by *H. calhounensis* Smith from the Chipola Miocene. Skogsberg's description of the carapace of *Pseudocythereis* is lacking. However, it is clear from the description and figures of the subgenotype, *Cythereis* (*Pseudocythereis*) *spinifera* Skogsberg, that he was dealing with a form closer to *Paracytheretta* Triebel than *Hemicythere*. Forms included under the subgenus *Cythereis* by Skogsberg belong to a new genus and will be described in another paper.

Neviani (1928, pp. 72, 94) described "gruppo" (subgenus) *Auris* under "*Cythereis*". No genotype was designated by Neviani, and his description was based on the following 10 species, all from the Pliocene of Italy: *Cythere speyeri* Brady, *Cythereis* (*Auris*) *subspeyeri* Neviani, *Cypridina similis* Reuss, *Cytherina haueri* Roemer, *Cythere punctata* Münster, *Cythere venus* Seguenza, *Cythereis villosa* Sars, *Cythereis marsupis* Neviani, *Cythereis* (*Auris*) *micrometrica* Neviani, and *Cythereis* (*Auris*) *distinguenda* (new name for *Cythere oblonga* Brady, 1866, *not Cythere oblonga* McCoy, 1844). Neviani's figures appear to be *Hemicythere*, and he even included in *Auris*, *Cythereis villosa* Sars, the genotype of *Hemicythere*. *Auris* is here considered to be a synonym of *Hemicythere*.

The genus *Caudites* was proposed by Coryell and Fields (1937, pp. 10, 11) to include *Hemicythere*-like thick-shelled elongate, subtriangular forms with a thickened anterior rim and additional longitudinal and dorsal ridges. The genotype is *C. medialis* Coryell and Fields. *Hemicythere sellardsi* Howe and Neill belong to this genus. Only five species of this genus are known from North America and their distribution is shown in the accompanying table. A new species, *C. chipolensis* is described from the Chipola Miocene.

Elofson (1941, pp. 288, 289) described *Paracythereis* and *Heterocythereis* as subgenera of "*Cythereis*" (really of *Hemicythere*). The name *Paracytheris* is preoccupied by Jennings (1936, pp. 55, 56) and is therefore invalid. The group Elofson described consists of two species *C. concinna* Jones and *C. latimarginata* Speyer, both of which Sars (1925, pp. 188, 189) considered to be *Hemicythere*. Sars's (*op. cit.*) and Brady's (1868) figures, however, do not agree with Jones's (1857). Since Elofson neither described nor figured the carapace of his subgenotype *C. concinna* Jones, the author does not know for sure which *C. concinna* he referred to. Both of these species are here retained in the genus *Hemicythere* until Elofson's types could be examined. The carapace in *Heterocythereis* is quite similar to that of *Hemicythere* but is relatively thin and smooth. The muscle scar pattern of the subgenotype, *Cythere albomaculata* (Baird), is rather distinctive and consists of a vertical row of five scars, the spots immediately below the top being a pair; in front of the upper end of this row is another oblique row of three smaller scars. *Heterocythereis* is here raised to a generic rank.

Elofson (*op. cit.*) placed under *Eucythereis* Klie (1940) *Cythereis angulata* Sars, *Cythere convexa* Baird, *C. crenulata* Sars, *Cythereis emarginata* Sars, and *C. villosa* Sars. All these species are good *Hemicythere* and since Elofson included in *Eucythereis* even the genotype of *Hemicythere*, *Cythereis villosa*, *Eucythereis* of Elofson is here considered as a synonym of *Hemicythere*.

Two homeomorphic genera, *Cnestocythere* and *Schizocythere*, externally very much like *Hemicythere* but radically different in hinge structure and course of selvage are reported by Triebel (1950). Neither of these genera have as yet been discovered in the American Tertiaries.

Howe (1951, p. 17) described a new genus, *Urocythere*, from the middle Eocene Avon Park limestone of Florida with *U. attenuata* Howe as its genotype. This genus has the outline of *Caudites* Coryell and Fields but does not possess the surface ornamentation. It is more elongate than *Hemicythere* Sars, lacks the reticulate ornamentation and differs radically in the hinge structure and radial pore canals.

Hemicythere has hitherto been placed in the subfamily Cytherinae Dana. Sylvester-Bradley (1948, p. 793) included it in the family Trachyleberidae. In the opinion of the author the two genera, *Trachyleberis* and *Hemicythere*, are not nearly related and can not be included in Trachyleberidae. A new subfamily, Hemicytherinae, in the family Cytheridae Baird, is here proposed for the reception of the following related genera, with *Hemicythere* as its type genus: *Hemicythere* Sars, *Procythereis* Skosberg, *Caudites* Coryell and Fields, *Heterocythereis* Elofson, and *Urocythere* Howe.

LIST OF LOCALITIES

Listed below are the localities from which samples used were collected. References to locations contained in the text are indicated by the index number which precedes each entry.

1. Chipola, NE¼ NE¼ sec. 20, T. 1 N., R. 16 W., Washington County, Fla.
2. Chipola. SE¼ SE¼ sec. 8, T. 3 N., R. 16 W., Chimney Quarry, Washington County, Fla.
3. Chipola. SE¼ SE¼ sec. 5, T. 1 N., R. 16 W., Washington County, Fla.
4. Chipola. 1 mile below Scott's Bridge, NE¼ sec. 27, T. 2 N., R. 12 W., Bay County, Fla.
5. Chipola. In a ravine 200 yards east of Holmes Creek, NW¼ NE¼ sec. 28. T. 2 N., R. 16 W., Washington County, Fla.
6. Chipola. 220 yards below Walsingham Bridge, NE¼ sec. 15, T. 1 N., R. 13 W., Washington County, Fla.
7. Chipola. 1 mile below Gainer's Bridge, NW¼ sec. 34, T. 1 N., R. 13 W., Washington County, Fla.
8. Chipola. 1¾ miles below Scott's Bridge over Econfina Creek, NE ¼ NW¼ sec. 28, T. 2 N., R. 12 W., Bay County, Fla.
9. Chipola. At Red Hill Still, NE¼ NW¼ sec. 20, T. 1 N., R. 16 W., Washington County Fla.
10. Chipola. Lassiter Landing on Choctawhatchee River, SE¼ SE¼ sec. 13, T. 2 N., R. 17 W., Washington County, Fla.
11. Chipola. Ten Mile Creek, 4 miles south of Willis, Calhoun County, Fla.
12. Type Chipola. Ten Mile Creek, from bridge to ½ mile below bridge on the Marianna-Clarksville Road, 2376 feet south of NW corner of sec. 12, T. 1 N., R. 10 W., 22 miles south of Marianna, Calhoun County, Fla.
13. Chipola. NE¼ SW¼ sec. 28, T. 2N., R. 16 W., Washington County, Fla.
14. Chipola. SW¼ NE¼ sec. 31, T. 2 N., R. 16 W., Washington County, Fla.
15. Type Oak Grove. At old sawmill near Oak Grove on right bank of Yellow River, 300 feet south of NW corner of NE¼ NE¼ sec. 20, T. 5 N., R. 23 W., about 100 yards below bridge on Laurel Hill-Oak Grove road, Okaloosa County, Fla.
16. Oak Grove. Senterfiet's or Tanner's Mill (abandoned), sec. 14, T. 5 N., R. 23 W., 4 miles southwest of Laurel Hill, Okaloosa County, Fla.
17. Shoal River. Small gully, 50 feet south of road and 150 feet east of bridge over White's Creek on Eucheeanna-Knox Hill Road, NE¼ SE¼ SW¼ sec. 23, T. 2 N., R. 18 W., one mile west of Valley Church, Walton County, Fla.
18. Type Shoal River. Small branch ¼ mile southwest of residence of J.T.G. McClellan, SE¼ NW¼ sec. 4, T. 3 N., R. 21 W., about ⅜ mile west of shell bluff, Walton County, Fla.
19. Shoal River. Bottom of old fluorspar prospect shaft at a depth of 50 to 55 feet, about 4½ miles south of Argyle, Walton County, Fla.
20. Shoal River. Under bridge over Shoal River, 2¾ miles north of Mossyhead, SE corner of sec. 35, T. 4 N., R. 21 W., Walton County, Fla.
21. Type *Yoldia* zone. Frazier's farm (formerly Spencer farm), SE¼ sec. 18, T. 2 N., R. 19 W., Walton County, Fla.
22. *Yoldia* zone. Chester Spence farm, NE¼ NE¼ sec. 17, T. 2 N., R. 19 W., Walton County, Fla.
23. *Arca* zone. Road cut leading to an abandoned bridge on east bank of Alaqua Creek on Permenter's farm, sec. 17, T. 1 N., R. 19 W., Walton County, Fla.
24. *Arca* zone. W. E. Collin's farm, SE¼ NE¼ sec. 15, T. 2 N., R. 15 W., Washington County, Fla.
25. *Arca* zone. SW¼ NE¼ SW¼ sec. 16, T. 2 N., R. 15 W., Washington County, Fla.
26. *Arca* zone. NW¼ SE¼ sec. 16, T. 2 N., R. 15 W., spring head 100 yards east of road, Washington County, Fla.
27. *Arca* zone. SW¼ NW¼ sec. 15, T. 2 N., R. 15 W., Washington County, Fla.
28. *Arca* zone. SE¼ SW¼ NE¼ sec. 15, T. 2 N., R. 15 W., Washington County, Fla.
29. *Arca* zone. NW¼ SW¼ sec. 15, T. 2 N., R. 15 W., Washington County, Fla.
30. *Arca* zone. NE¼ SW¼ sec. 16, T. 2 N., R. 15 W., Washington County, Fla.
31. *Arca* zone. Flournoy's old mill, NE¼ NE¼ sec. 34, T. 3 N., R. 18 W., Holmes County, Fla.
32. *Arca* zone. In a steephead in the SW¼ NE¼ SW¼ sec. 16, T. 2 N., R. 15 W., along a small

ravine running west into south-side branch, Washington County, Fla.

33. *Arca* zone. Jim Kennedy Branch, 1 mile east of Red Bay, Walton County, Fla.
34. *Arca* zone. John Anderson's farm, sec. 10, T. 2 N., R. 17 W., ¾ mile east of Red Bay, Walton County, Fla.
35. *Arca* zone. At small spring head in E. Gomillion's field near Red Bay, Walton County, Fla.
36. Choctawhatchee. Pit of West Florida Power Co., just east of road at Power Dam, about 300 feet east of the Hydroelectric power plant near Ward, Liberty County, Fla.
37. *Ecphora* zone? 300 feet above Walsingham Bridge over Econfina Creek, NE¼ sec. 15, T. 1 N., R. 13 W., Washington County, Fla.
38. *Ecphora* zone. ¼ mile above Walsingham Bridge, SW¼ sec. 11, T. 1 N., R. 13 W., Washington County, Fla.
39. *Ecphora* zone. ¼ mile above Walsingham Bridge, SE¼ sec. 10, T. 1 N., R. 13 W., Washington County, Fla.
40. *Ecphora* zone? 220 yards above Walsingham Bridge, Econfina Creek, NE¼ sec. 15, T. 1 N., R. 13 W., Washington County, Fla.
41. *Ecphora* zone. Jackson Bluff, near top of section, Ocklocknee River, Leon County, Fla.
42. *Ecphora* zone. Jackson Bluff, Top shell bed, Ocklocknee River, Leon County, Fla.
43. *Ecphora* zone. *Pecten* Bed. Jackson Bluff, Ocklocknee River, Leon County, Fla.
44. *Ecphora* zone. Jackson Bluff, Ocklocknee River, Leon County, Fla.
45. *Ecphora* zone. Upper shell bed at Alum Bluff on the east side of the Apalachicola River, S½ NE¼ sec. 24, T. 1 N., R. 8 W., about 4 miles north of Bristol, Liberty County, Fla.
46. *Ecphora* zone. Cut in road leading to Watson's Landing, about 2 miles north of Alum Bluff and the same distance from the Apalachicola River, 2000 feet north and 100 feet west of SE corner of sec. 7, T. 1 N., R. 7 W., Liberty County, Fla.
47. *Ecphora* zone. Harvey Creek, ½ mile above old well at "Swimming Hole," 5 feet below water, Leon County, Fla.
48. *Cancellaria* zone. Gully pond, southeast of Greenhead, Washington County, Fla., on the Sales-Davis Lumber Co. property in the center of N½ NW¼ NE¼ sec. 14, T. 1 N., R. 14 W., at approximate elevation of 59 feet.
49. *Cancellaria* zone. 1 mile above Walsingham Bridge over Econfina Creek, NW¼ SW¼ sec. 11, T. 1 N., R. 13 W., Washington County, Fla.
50. *Cancellaria* zone. ¼ mile below Gainer's Bridge, Econfina Creek, SW¼ SE¼ sec. 33, T. 1 N., R. 13 W., Washington County, Fla.
51. *Cancellaria* zone. Borrow pit just east of the power dam at Jackson Bluff, Ocklocknee River, 500 feet east of NW corner, sec. 21, T. 1 S., R. 4 W., Leon County, Fla.
52. *Cancellaria* zone. NE¼ sec. 16, T. 1 S., R. 13 W., on Moccasin Creek beneath bridge, Bay County, Fla.
53. *Cancellaria* zone. Blue Sink, corner of NE¼ sec. 14, T. 1 N., R. 14 W., Washington County, Fla.
54. *Cancellaria* zone. ⅜ mile above Gainer's Bridge on Econfina Creek, NE¼ SE¼ sec. 33, T. 1 N., R. 13 W., Washington County, Fla.
55. *Cancellaria* zone. ½ mile above Gainer's Bridge on Econfina Creek, SE¼ NE¼ sec. 33, T. 1 N., R. 13 W., Washington County, Fla.
56. *Cancellaria* zone. In a small stream south of and under Gainer's Bridge in SW¼ SE¼ sec. 33, T. 1 N., R. 13 W., Washington County, Fla.
57. *Cancellaria* zone. In a small sink south of a community road in NW¼ SW¼ sec. 7, T. 1 N., R. 13 W., Washington County, Fla.
58. *Cancellaria* zone. Clarke's Pond, NE¼ SE¼ SW¼ sec. 12, T. 1 N., R. 12 W., Washington County, Fla.
59. Recent. Shore sand, Dogs Bay, near Roundstone County, Galway, Ireland. Arther Earland collection.

SYSTEMATIC DESCRIPTIONS

Order Ostracoda Latreille

Suborder Podocopa Sars

Family Cytheridae Baird

Hemicytherinae Puri, n. subfam.

Type genus: *Hemicythere* Sars.

Carapace of firm consistancy, calcareous, usually somewhat almond-shaped, smooth, pitted, reticulate or with longitudinal and dorsal ridges; valves inequal. Hinge of right valve with knob-like anterior tooth, postjacent socket which is continued as a groove to an outwardly directed tooth at the posterior cardinal angle. Pore canals numerous, long, closely spaced. Muscle scar pattern consists of a vertical row of four with additional three or four scars in an oblique row situated anteriorly.

The subfamily comprises the following genera: *Hemicythere* Sars, *Procythereis* Skogsberg, *Caudites* Coryell and Fields, *Heterocythereis* Elofson, and *Urocythere* Howe.

Genus **Hemicythere** Sars

Hemicythere Sars, 1925, p. 182; Klie, 1929, p. 282; Tressler, 1941, p. 100; Edwards, 1944, p. 517; Van den Bold, 1946, p. 28.

Auris Neviani, 1928, pp. 72, 94.

Genotype (by subsequent designation by Edwards, 1944): *Cythere villosa* Sars, 1865, p. 42. Recent, Norway.

Carpace usually almond-shaped, solid, with a semiconcave posterior dorsal margin; smooth pitted or reticulate; valves usually unequal in size.

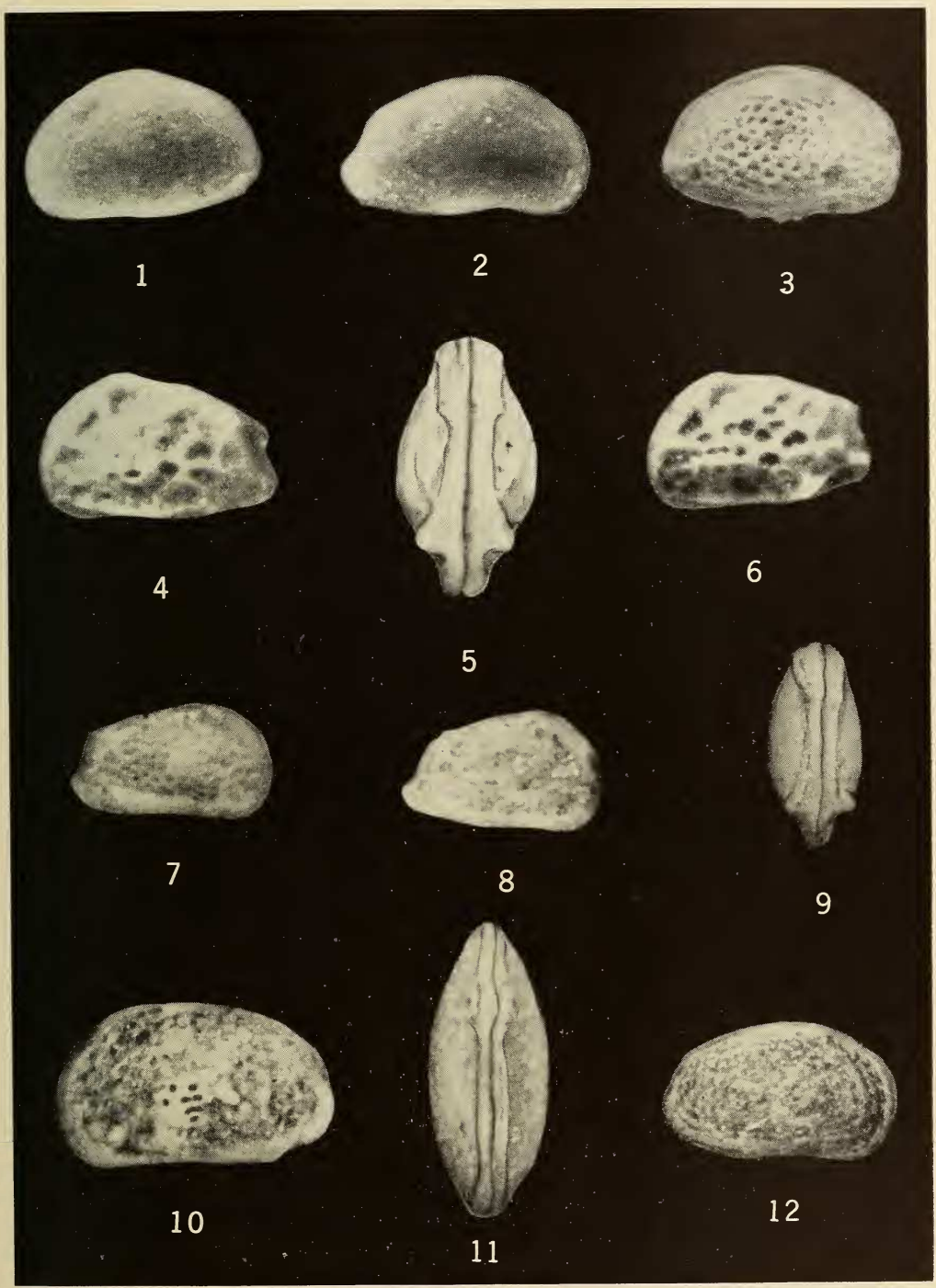

PLATE 1.—Genus *Hemicythere*. All figures × 67.5. Specimen numbers refer to the Henry V. Howe type collection at the Louisiana State University. Figs. 1, 2, *Hemicythere laevicula* Edwards, locality 42 (1, left valve, plesiotype no. 2467; 2, right valve, plesiotype no. 2468); Fig. 3, *H. amygdala* Stephenson, locality 1 (right valve view of a complete carapace, plesiotype no. 2469); Figs. 4–6, *H. confragosa* Edwards (4, left valve view of a complete carapace, plesiotype no. 2470, locality 42; 5, dorsal view of a complete carapace, plesiotype no. 2471, locality 43; 6, left valve, plesiotype no. 2472, locality 43); Figs. 7–9, *H. howei* Puri, n. sp. (7, right valve view, holotype no. 2473, locality 27; 8, right valve view of a complete specimen, paratype no. 2474, locality 43; 9, dorsal view of paratype no. 2474); Figs. 10–12, *H. villosa* (Sars), locality 59 (10, left valve, plesiotype no. 2475; 11, dorsal view of a complete carapace, plesiotype no. 2476; 12, right valve, plesiotype no. 2477).

Hinge of the right with a knoblike anterior tooth, broad postjacent socket which is continued as a strong, outwardly directed tooth at posterior cardinal angle. Marginal area broad; inner margin and line of concrescence coincide; pore canals numerous, closely spaced, nearly straight. Muscle scar pattern consists of a vertical row of five scars with additional two to three scars situated anteriorly.

Range: Eocene to Recent.

The following species are considered to be good *Hemicythere:*

H. amygdala Stephenson, 1944, p. 158.
H. angulata (Sars) (*Cythere angulata* Sars, 1865, p. 46).
H. antillea Van den Bold, 1946, p. 101.
H. arenicola (Cushman) (*Cythereis arenicola* Cushman, 1906, p. 379).
H. balatonica (Zalanyi) (*Cythereis balatonica* Zalanyi, 1913, p. 126).
H. borealis (Brady) (*Cythere borealis* Brady, 1868, p. 31).
H. brunnea (Brady) (*Cythere brunnea* Brady, 1898, p. 442).
H. californiensis Le Roy, 1943, p. 366.
H. californiensis hispida Le Roy, 1943, p. 367.
H. cimbaeformis (Seguenza) (*Cythere cimbaeformis* Seguenza, 1882, p. 22).
H. concinna (Jones) (*Cythere concinna* Jones, 1857, p. 29).
H. confragosa Edwards, 1944, p. 518.
H. conradi Howe and McGuirt, in Howe *et al.*, 1935, p. 27.
H. conveza (Baird) (*Cythere conveza* Baird, 1850, p. 174).
H. conveza turgida (Zalanyi) (*Cythere conveza turgida* Zalanyi, 1913, p. 126).
H. crenulata (Sars) (*Cythere crenulata* Sars, 1865, p. 39).
H. emarginata (Sars) (*Cythereis emarginata* Sars, 1865, p. 38).
H. expunctata (Zalanyi) (*Cythereis expunctata* Zalanyi, 1913, p. 126).
H. finmarchica (Sars) (*Cythereis finmarchica* Sars, 1865, p. 41).
H. jollaensis LeRoy, 1943, p. 365.
H. kerguelensis (Brady) (*Cythere kerguelensis* Brady, 1880, p. 78).
H. knifteni Howe and Law, 1936, p. 67.
H. kolesnikovi (Schneider) (*Cythereis kolesnikovi* Schneider, 1939, p. 198).
H. laevicula Edwards, 1944, p. 518.
H. latimarginata (Speyer) (*Cythere latimarginata* Speyer, 1863, p. 22).
H. lattorifiana (Lienenklaus) (*Cythereis lattorifiana* Lienenklaus, 1900, p. 513).
H. limbata (Bosquet) (*Cythere limbata* Bosquet, 1852, p. 78).
H. margaritifera (G. W. Müller) (*Cythereis margaritifera* G. W. Müller, 1894, p. 368).
H. marginata (Norman) (*Cythere marginata* Norman, 1862, p. 47).
H. mehesi (Zalanyi) (*Cythereis mehesi* Zalanyi, 1913).
H. merita (Zalanyi) (*Cythereis merita* Zalanyi, 1913).
H. minuta Edwards, 1944, p. 519.
H. oblonga (Brady) (*Cythere oblonga* Brady, 1866, p. 373, not *Cythere oblonga* McCoy, 1844) = *Cythereis (Auris) distinguenda* Neviani, 1928 (new name for *Cythere oblonga* Brady, 1866).
H. palosensis LeRoy, 1943, p. 365.
H. perforata (Zalanyi) (*Cythereis perforata* Zalanyi, 1913, p. 141).
H. pulchella (Brady) (*Cythere pulchella* Brady, 1868, p. 404).
H. punctistriata (Ulrich and Bassler) (*Cythere punctistriata* Ulrich and Bassler, 1904, p. 108).
H. quadridentata (Baird) (*Cythere quadridentata* Baird, 1850, p. 413).
H. saginata Stephenson, 1944, p. 158.
H. sarmatica (Zalanyi) (*Cythereis sarmatica* Zalanyi, 1913, p. 127).
H. schreteri (Zalanyi) (*Cythereis schreteri* Zalanyi, 1913, p. 130).
H. speyeri (Brady) (*Cythere speyeri* Brady, 1868, p. 222).
H. stolonifera (Brady) (*Cythere stolonifera* Brady, 1880, p. 89).
H. strandentia Tressler and Smith, 1948, p. 19.
H. subangusta (Zalanyi) (*Cythereis subangusta* Zalanyi, 1913).
H. symmetrica Van den Bold, 1946, p. 102.
H. truitti Tressler and Smith, 1948, p. 18.
H. villosa (Sars) (*Cythereis villosa* Sars, 1865, p. 42).

The following species have been erroneously assigned to *Hemicythere*:

H. calhounensis Smith, 1941, p. 280.
H. dalli Howe and Brown, in Howe *et al.*, 1935, p. 28.
H. dalli redbayensis Howe and Brown, in Howe *et al.*, 1935, p. 29.
H. sellardsi Howe and Neill, in Howe *et al.*, 1935, p. 29.

Hemicythere laevicula Edwards

Pl. 1, Figs. 1, 2

Hemicythere laevicula Edwards, 1944, p. 518, pl. 86, figs. 27–30.

This species was originally described from the Duplin marl of North Carolina. It is very close to *H. conradi* but differs in its less strong ornamentation and somewhat elongate nature of the carapace.

Dimensions of the plesiotype no. 2468, a right valve: Length 0.625 mm; height 0.371 mm; plesiotype no. 2467, a left valve: Length 0.608 mm; height 0.371 mm. Both the figured specimens came from locality 42. This species also occurs at *Ecphora* zone localities 39, 41, and 47 and *Arca* zone locality 27 and questionably at locality 30.

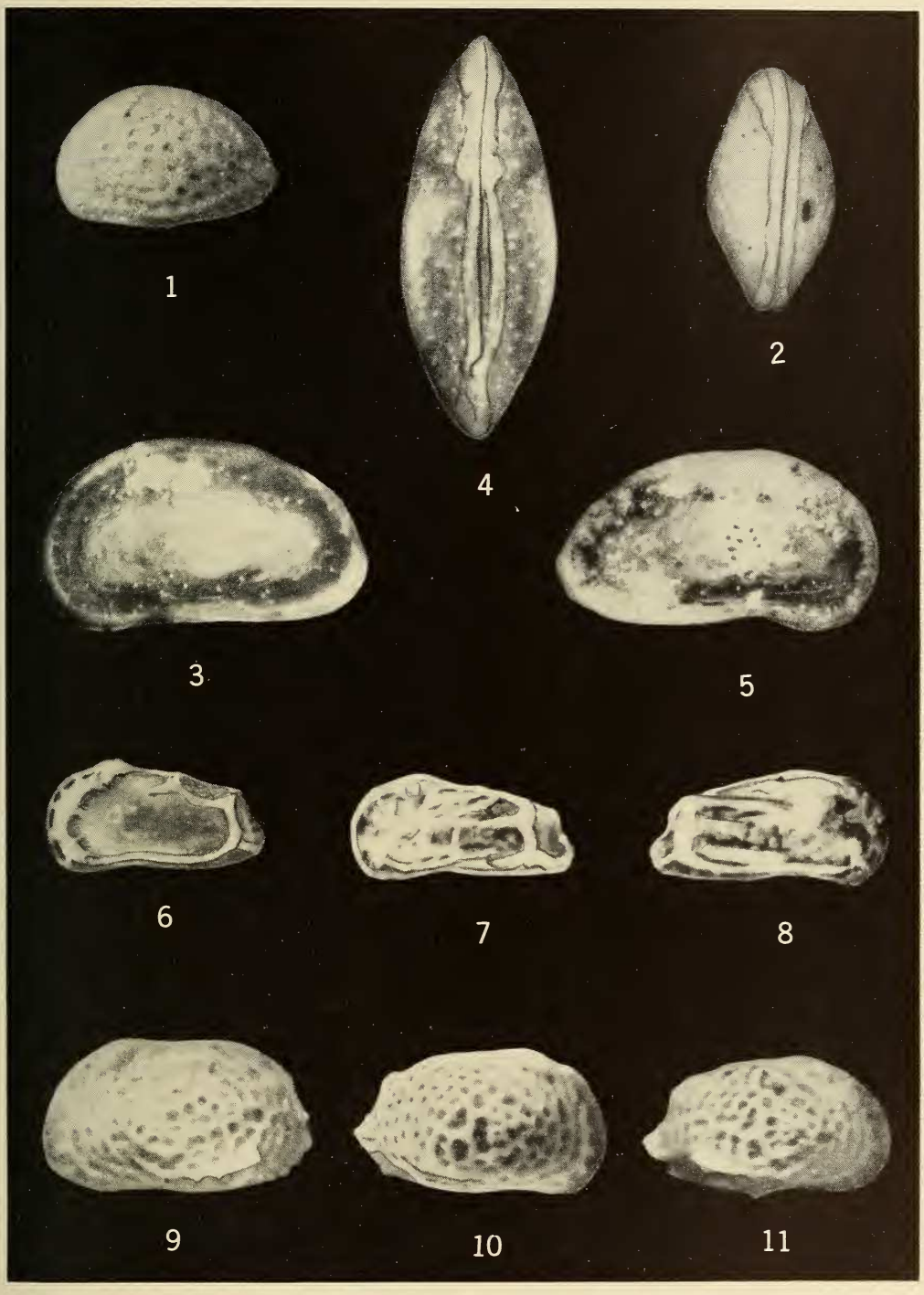

PLATE 2.—*Hemicythere* and related genera. All figures × 67.5. Specimen numbers refer to the Henry V. Howe type collection at the Louisiana State University. Figs. 1, 2, *Hemicythere conradi* Howe and McGuirt, locality 43 (1, left valve view of a complete specimen, plesiotype no. 2478; 2, dorsal view of plesiotype no. 2478); Figs. 3–5, *Heterocythereis* sp., locality 59 (3, left valve, plesiotype no. 2479; 4, dorsal view of a complete carapace, plesiotype no. 2480; 5, right valve, plesiotype no. 2481); Fig. 6, *Caudites sellardsi* (Howe and Neill) (left valve view of a complete specimen, plesiotype no. 2482, locality 24); Figs. 7, 8, *C. chipolensis* Puri, n. sp., locality 6 (7, left valve, holotype no. 2483; 8, right valve, paratype no. 2484); Figs. 9–11, *Procythereis calhounensis* (Smith), locality 1 (9, left valve, plesiotype no. 2485; 10, right valve, plesiotype no. 2486; 11, right valve, plesiotype no. 2487).

Hemicythere conradi Howe and McGuirt
Pl. 2, Figs. 1, 2

Hemicythere conradi Howe and McGuirt, in Howe *et al.*, 1935, p. 27, pl. 3, figs. 31–34, pl. 4, fig. 17; Edwards, 1944, p. 518, pl. 86, figs. 17, 18.

Carapace small, subovate in side view. Dorsal margin moderately arched, ventral margin slightly concave near the middle. Anterior end broadly rounded below, obliquely rounded dorsally; posterior end narrow and compressed. Both anterior and posterior margins bear low rounded rim. Surface of the carapace ornamented with reticulate pattern of rounded ridges separating elongate, rounded pits.

Dimensions of the plesiotype no. 2478, a complete carapace from locality 43: Length 0.557 mm; height 0.405 mm.

This species was originally reported from beds of Chipola to Choctawhatchee in age. It also occurs at the *Arca* zone localities 24, 26, 27, 28, 29, and 30; *Ecphora* zone localities 37, 38, 39, 40, 42, 43, 44, 47, and *Cancellaria* zone localities 48, 49, 50, 53, 54, 55, 57, and 58.

Hemicythere confragosa Edwards
Pl. 1, Figs. 4–6

Hemicythere confragosa Edwards, 1944, p. 518, pl. 86, figs. 23–26.

This species resembles *H. conradi* but could easily be distinguished from it by its much stronger ornamentation. It was originally described from the Duplin marl of North Carolina but also occurs at Florida localities 39, 41, 42, and 47.

Dimensions of plesiotype no. 2470, a complete specimen: Length 0.540 mm; height 0.338 mm; plesiotype no. 2471, a complete carapace: Length 0.608 mm; height 0.371 mm; plesiotype no. 2472, a left valve: Length 0.591 mm; height 0.354 mm. The figured specimens came from *Ecphora* zone localities 42 and 43.

Hemicythere amygdala Stephenson
Pl. 1, Fig. 3

Hemicythere amygdala Stephenson, 1944, p. 158, pl. 28, figs. 8, 9.

This species is very similar to *H. conradi* from which it differs in its more ovate form in side view, more closely spaced pitting pattern and more obscure cardinal angles. This species was originally described from the *Marginulina-Heterostegina-Discorbis* zones of Texas.

Dimensions of the plesiotype no. 2469, a complete specimen from locality 1: Length 0.591 mm; height 0.371 mm. This species also occurs at the Chipola localities 2, 3, 4, 5, 6, 7, 11, and 13; Oak Grove localities 15 and 16; and Shoal River locality 17.

Hemicythere howei Puri, n. sp.
Pl. 1, Figs. 7–9

Carapace small, thickest near the middle, in side view subovate. Dorsal margin straight, ventral margin slightly convex near the middle. Anterior end broadly rounded, posterior end sharply triangular. Surface of the carapace finely reticulate. There is a thickened marginal rim present which is generally more pronounced at the ventral margin. Hinge normal for the genus.

Dimensions of holotype no. 2473, a complete carapace: Length 0.507 mm; height 0.304 mm; paratype no. 2474, a complete carapace: Length 0.490 mm; height 0.304 mm. The figured specimens came from the *Arca* zone locality 27 and *Ecphora* zone locality 43.

This species is close to *H. conradi*, but it can easily be distinguished from it by its marginal thickened rim, finely reticulate ornamentation, and angular shape.

Genus **Caudites** Coryell and Fields

Caudites Coryell and Fields, 1937, p. 10; Van den Bold, 1946, p. 31.

Genotype: Caudites medialis Coryell and Fields, 1937, p. 11. Miocene, Gatun formation, Panama.

Carapace small, thick-shelled, elongate, subtriangular. The anterior with a thickened rim and with additional longitudinal and dorsal ridges. Surface largely smooth. Anterior end broadly rounded; posterior rather drawn out. The valves decidedly compressed. Hinge similar to *Hemicythere*.

Range: Eocene to Recent.

Caudites sellardsi (Howe and Neill)
Pl. 2, Fig. 6

Hemicythere sellardsi Howe and Neill, in Howe *et al.*, 1935, pp. 29, 30, pl. 2, figs. 6, 10.

This species was based on a single complete carapace from the Choctawhatchee locality 34. It is an excellent marker of the *Arca* zone and has also been found at localities 23, 24, 25, 28, and 30.

Dimensions of the plesiotype no. 2482, a complete carapace from locality 24: Length 0.557 mm; height 0.287 mm.

Caudites chipolensis Puri, n. sp.
Pl. 2, Figs. 7, 8

Carapace small, compressed subtriangular in outline. Anterior end broadly rounded, posterior end much narrower; dorsal and ventral margins sinuous and converging towards the posterior. Three prominent transverse raised ribs emerge at the posterior rostrum and continue for three-fourths of the distance toward the anterior end before they merge with the anterior slope. There is usually a thickened rim around the margins. A number of short, transverse ribs produce subreticulate effect.

Dimension of holotype no. 2483, a left valve: Length 0.591 mm; height 0.287 mm; paratype no. 2484, a right valve: Length 0.625 mm; height 0.304 mm. Both the figured specimens came from Chipola locality 6. It also occurs at Chipola localities 4 and 12 and is an excellent marker for the Chipola formation.

C. chipolensis resembles *C. sellardsi* but could easily be identified from it by three transverse ribs, more pronounced subreticulate pattern of ornamentation, and slightly larger carapace.

Genus **Procythereis** Skosberg

Cythereis (*Procythereis*) Skosberg, 1928, p. 17.

Genotype (by original designation): *Cythereis* (*Procythereis*) *torquata* Skosberg, 1928, p. 19. Recent, Tierra del Fuego.

Shell a *Hemicythere* with a nearly straight dorsal margin which nearly parallels the sinuous ventral margin. Anterior end obliquely rounded; posterior angular below and above, truncated just below middle. Surface pitted to almost reticulate, with a strong alate ridge near the ventral margin which bears a row of oblique excavations on its upper side. Hinge similar to *Hemicythere*.

On the basis of soft parts, Skosberg subdivided *Procythereis* into two groups: *Torquata* and *Radiata*.

Range: Miocene to Recent.

Procythereis calhounensis (Smith)
Pl. 2, Figs. 9–11

Hemicythere calhounensis Smith, 1941, pp. 280, 281, pl. 1, fig. 7; pl. 2, fig. 11.

Carapace subquadrate, stout, and fat. Inflated ventrally with an ala. Dorsal margin slightly convex, ventral margin slightly sinuous; both margins converging posteriorly. Anterior end broadly rounded, somewhat produced ventrally, posterior narrow. Surface of the carapace reticulate, the pits being arranged in a linear series in curved rows. Hinge similar to *Hemicythere*.

Dimensions of plesiotype no. 2485, a left valve: Length 0.695 mm; height 0.371 mm; plesiotype no. 2486, a right valve: Length 0.608 mm; height 0.371 mm; plesiotype no. 2487, a right valve: Length 0.608 mm; height 0.354 mm. All figured specimens came from Chipola locality 1.

This species was originally described from the Chipola locality 12. It is an excellent Chipola marker and occurs at localities 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, and 13.

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RANGE OF HEMICYTHERE IN AMERICA

SPECIES OF HEMICYTHERE	FORMATIONS												
	Eocene		Oligocene		Miocene								Recent
	Avon Park limestone	West Indies	Mariana	*Marginulina-Heterostegina-Discorbis* z.	West Indies	Chipola	Oak Grove	Shoal River	*Voldia* zone	*Arca* zone	Calvert	Duplin	North Atlantic
arenicola													XXX
concinna													XXX
crenulata													XXX
strandentia													XXX
truitti													XXX
confragosa												XXX	
laevicula												XXX	
minuta												XXX	
howei										XXX		XXX	
punctistriata											XXX		
conradi						XXX	XXX	XXX	XXX	XXX		XXX	
antillea					XXX								
amygdala				XXX									
saginata				XXX									
kniffeni			XXX										
limbata		XXX											
symmetrica		XXX											
aleatoria	XXX												
bellula	XXX												
cribraria	XXX												
lemniscata	XXX												
lienosa	XXX												
phrygionia	XXX												
mota	XXX												

RANGE OF CAUDITES IN AMERICA

(Species listed under the generic name under which they were originally described)

SPECIES	FORMATIONS					
	Lower Eocene, Guatemala	Chipola Miocene, Florida	*Arca* zone Miocene, Florida	Gatun Miocene, Panama	Pleistocene, Southern California	Recent, Panama
Cythere rectangularis Brady, 1869, p. 153						XXX
Caudites fragilis LeRoy, 1943, p. 372					XXX	
Caudites medialis Coryell and Fields, 1937, p. 11				XXX		
Hemicythere sellardsi Howe and Neill, in Howe *et al.*, 1935, p. 29			XXX			
Caudites chipolensis Puri, n. sp.		XXX				
Caudites nipeensis Van den Bold, 1946, p. 103	XXX					

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BOTANY.—*Floral morphology of* Ixophorus unisetus (*Presl*) *Schlecht.* ERNEST R. SOHNS,[1] U. S. National Museum. (Communicated by Agnes Chase.)

Ixophorus, a monotypic genus in the tribe Paniceae (Gramineae), is placed among those grasses regarded as highly specialized. The spikelets are 2-flowered; the lower floret is staminate and the upper floret is perfect (but the rudimentary stamens of this floret are nonfunctional). This grass is related to *Setaria*, *Setariopsis*, *Chamaeraphis*, *Paratheria*, *Pennisetum*, the section *Paurochaetium* of *Panicum* and other genera having their spikelets surrounded and/or subtended by sterile branches. The spikelet (or spikelets), with surrounding or subtending bristle (or bristles), constitutes the fascicle.

The taxonomic position of this grass has been in doubt. The genus has been confused with other panicoid genera. The purpose of this paper is to clarify the morphology of the fascicle of this interesting species.

[1] Part of a thesis, "The Floral Morphology of *Cenchrus*, *Pennisetum*, *Setaria* and *Ixophorus*," submitted to the faculty of the Graduate School of Indiana University in partial fulfillment of the requirements for the degree doctor of philosophy. The writer is grateful to Dr. Paul Weatherwax for suggesting the problem and for helpful suggestions throughout the investigation.

Historical.—The species was first described by J. S. Presl (1830) as *Urochloa uniseta*, based on a specimen collected by Thaddaeus Haenke in Mexico. Schlechtendal (1861–1862), apparently having access only to Presl's description and to a drawing of a species of *Urochloa* from the Isle de France (*pl. 11, f. 1*, in the Atlas of Beauvois, Ess. Agrost. 1812) established the genus *Ixophorus*. He was not certain whether to assign the plant to a genus or to a section of *Panicum*, viz., ". . .so bilde ich aus diesen Pflanzen eine eigene Abtheilung, welche man Gattung oder *Panicum*-Section nach Belieben nennen mag, und bezeichne sie mit einem eigenen Namen: *Ixophorus*." Nevertheless, Schlechtendal properly described the genus (p. 420–421) and the combination was made in the index (p. 747). The resemblance of this species to *Panicum* led Trinius (1834) to transfer Presl's species to *Panicum*. Fournier (1886) transferred the species to *Setaria*. Vasey (1893), in naming grasses collected by Palmer in Sonora and Colima, Mexico, described Presl's species under *Panicum* (*P. pringlei*). *Setaria* is a name which was first applied to a genus of lichens by Acharius and later to a genus of grasses by Beauvois (Hitchcock, 1925). Beauvois' name has been conserved, but the homonym caused