

NOTES ON THE FAUNA OF THE CHIPOLA FORMATION — VIII

ON THE PRESENCE OF *ARCOPAGIA* (*JOHNSONELLA*) *FAUSTA* (PULTENEY)
WITH OBSERVATIONS ON THAT SPECIESHAROLD E. VOKES
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In her important monograph on "The Molluscan Fauna of the Alum Bluff Group of Florida" Gardner (1926-1950) includes a total of 483 species from the type area of the Chipola Formation: 137 Pelecypoda, 240 Gastropoda, 6 Scaphopoda. Of these, five species of Pelecypoda, six of Gastropoda and one of Scaphopoda were identified with species present in the Recent faunas, while two other pelecypod and three gastropod species are questionably referred to Recent forms. Most of the specimens in the latter group are worn, immature or fragmentary and the author makes clear her belief that adequate material would permit their separation from the modern species to which they have been tentatively ascribed.

In view of the low percentage (2.28%) of species certainly identified with elements of the Recent fauna it is of more than usual interest to be able to record the presence in this fauna of *Arcopagia* (*Johnsonella*) *fausta* (Pulteney), a relatively common element of the faunas of southern Florida, the West Indies and the Caribbean area. Furthermore, an examination of the literature reveals only two previous records of the occurrence of the species in the fossil faunas of Florida: Dall (1900b, p. 1031) reported "a single young valve . . . found in the Pliocene marl of the Caloosahatchee" and Hoerle (1970, p. 59) listed it as rare in the Pleistocene "Glades" fauna at the Belle Glade Rock Pit, Palm Beach County. Mrs. Hoerle has informed me that this record was based upon the presence of one adult and one juvenile right valve.

Recognition of the species in the Chipola (lower Miocene) collections and consideration of its apparent rarity in the reported fossil collections prompted a search of the Florida Cenozoic materials in the Tulane University and the Hoerle collections, with the results shown in Table 1.

Some concept as to the rarity of the species may be gained by noting that it occurs in but 5 of 34 localities of "Unit A" age in the Tulane and Hoerle collections; in but 1 of 27 collections from the Caloosahatchee Formation; 3 of the 50 Pinecrest collections; and 9 of 54 collections containing over 600,000 specimens from the type area of the Chipola Formation.

Genus *ARCOPAGIA* (Leach MS.)
Brown, 1827

Type species (by subsequent designation, Herrmannsen, 1846): *Tellina crassa* Pennant, 1776. Recent, Atlantic Coasts of Europe, south to Senegal

Subgenus *JOHNSONELLA* Afshar, 1969

Type species (by original designation): *Tellina fausta* Pulteney. Recent southeast Florida, the Florida Keys, Bahamas, West Indies, and north coasts of South and Central America, and islands off the east, north and west coasts of the Yucatan peninsula.

ARCOPAGIA (*JOHNSONELLA*) *FAUSTA*
(Pulteney)

Plate 1, figures 1-6

Pectunculus laevis, triquetra . . . , LISTER, 1687, Hist. syn. Method. Conchyliorum, v. 3, p. 266, fig. 102.

Tellina remies 'Linnaeus', BORN, 1780, Mus. Test. Caes. Vindob., p. 36, pl. 2, fig. 11 [non Linnaeus, 1758, p. 676, Indo-Pacific species]; CHEMNITZ, 1782, Neues System. Conchylien-Cabinet, v. 6, p. 121, pl. 12, fig. 112, "die westindische Sandtelline" [not fig. 113, "die ostindische Sandtelline" = *T. remies* Linné]; Gmelin, 1791, Syst. Nat., ed. 13, p. 3239 (part).

Tellina [plate heading] BRUGUIÈRE, 1798, Encycl. Méthod., pl. 290, fig. 2 [ident. by Deshayes, 1832, Encycl. Méthod., v. 3, p. 1014, as *Tellina remies*, "elle vit dans l'Océan américain"].

- Tellina fausta* PULTENEY, 1799, Cat. Dorsetshire, p. 92; DONOVAN, 1801, Nat. Hist. Brit. Shells, v. 3, pl. 98; MONTAGU, 1803, Test. Brit., v. 1, p. 64; MATON & RACKET, 1807, Trans. Linn. Soc., v. 8, p. 53, pl. 1, fig. 8; PENNANT, 1812, Brit. Zool., (new ed.), v. 4, p. 181; PULTENEY, 1813, Cat. Dorsetshire, ed. 2, p. 30, pl. 5, fig. 5; WOOD, 1815, Gen. Conch., p. 185; DILLWYN, 1817, Desc. Cat. Recent Shells, v. 1, p. 94; WOOD, 1818, Index Test., ed. 2, p. 21, sp. 74. [Considered as being a British species.]
- Tellina laevis* WOOD, 1815, Gen. Conch., p. 181, pl. 37, fig. 1 ["West Indies"].
- Tellina (Arcopagia) fausta* "Donovan." H. & A. ADAMS, 1856, Gen. Recent Moll., v. 2, p. 396; TRYON, 1869, Amer. Jour. Conch., v. 4, Appendix, p. 90; BOSS, 1966, Johnsonia, v. 4, no. 45, p. 251, pl. 134, fig. 2; pl. 135, figs. 1, 2.
- Tellina elliptica* SOWERBY, 1868, Conch. Icon., pt. 17, *Tellina*, pl. 43, fig. 251 [as *T. ellipsis* in index, 1869] [non *T. elliptica* Brown, 1814, nec Lamarck, 1818, etc.]
- Tellina (Cyclotellina) fausta* "Donovan." DALL, 1900, Proc. U.S. Natl. Mus., v. 23, p. 294 [November]; Dall, 1900, Wagner Free Inst. Sci., Trans., v. 3, pt. 5, p. 1031 [December].
- Cyclotellina (Cyclotellina) fausta* (Pulteney). THIELE, 1935, Handb. Syst. Weichtierkunde, v. 2, p. 913.
- Arcopagia (Cyclotellina) fausta* (Pulteney). ABBOTT, 1954, American Seashells, p. 428, pl. 40; ABBOTT, 1958, Acad. Nat. Sci., Phila., Mon. 11, p. 135.
- Arcopagia fausta* (Pulteney). WARMKE & ABBOTT, 1961, Caribbean Seashells, p. 197, pl. 41,

TABLE 1

Age	Formation	T.U. Locality	Specimens
Pleistocene	"Unit-A"	201	2 right valves (H)
"	"	727	1 pair (H)
"	"	759	1 right (H) + 2 left valves (T)
"	"	768	1 pair + 1 right (H) and 1 left valve (T)
"	"	803	1 left valve (H)
Pliocene	Caloosahatchee	202	1 right valve (T)
U. Miocene	"Pinecrest Beds"	797	2 pairs (T)
"	"	933	1 right + 1 left valve (H)
"	"	1000	4 pairs + 3 right and 1 left valves (T*)
L. Miocene	Chipola	548	1 right valve (T)
"	"	550	3 right + 2 left valves (T)
"	"	554	16 right + 9 left valves (T) + 3 left valves (H)
"	"	820	1 right (T) + 1 left (H) valves
"	"	821	3 right + 2 left valves (T) + 1 right + 2 left valves (H)
"	"	825	7 right + 2 left valves (T) + 1 left valve (H)
"	"	828	1 right valve (T)
"	"	999	4 right + 1 left valves (T)
"	"	1050	3 right valves (T)

T = Tulane University Collection

H = Hoerle Collection

*Mrs. Hoerle reports (in litt.) that she has found this species to be "relatively common, generally eroded and/or broken" at this locality.

fig. 1; HOERLE, 1970, Tulane Stud. Geol. & Paleont., v. 8, no. 2, p. 59.
Arcopagia (Johnsonella) fausta (Pultney [sic.]).
 AFSHAR, 1969, Geol. Soc. Amer., Mem. 119, p.
 47, pl. 15, figs. 6, 7; pl. 16, figs. 1-3.

Discussion: Although Lister (1687) had early given an excellent illustration of this species with the locality indicated as "Jamaic"; Chemnitz had figured it (1782) as "die westindische Sandtelline," a form of "*Tellina*" *remies* Linnaeus, "die ostindische Sandtelline"; and Gmelin (1791) had noticed, under the same specific name, that "in americanis flavedine intermistia, rugis minus evidentibus," many early British authors appear to have accepted without question Pultney's record of its occurrence in the fauna of the coast of Dorsetshire. And, as noted in the above synonymy, Wood (1815) even described the West Indian form as a separate species, *Tellina laevis*—a position that he maintained in 1818 in the *Index Testaceologicus*. Dillwyn (1817) appears to have been the first to conclude that but one species was involved, giving an extended synonymy, including the Lister illustration, and adding: "Inhabits the coasts of Jamaica. Lister. West Indies. Chemnitz. Coast of Dorsetshire. Pultney."

Fleming (1828, p. 436) apparently believed that Pultney's species was based upon a specimen of *Tellina crassa* Pennant, including it in his synonymy of that form. Dall (1900b, p. 1031), on the other hand, states that "this species was originally described as

British from adventitious specimens . . ." but gives no supporting evidence for the statement. The type is lost (*vide* Boss, 1966, p. 251) and it is not possible to be certain just which species was represented, although the figure given by Pultney in the second edition of his *Dorsetshire Catalogue* is somewhat more reminiscent of the West Indian than of the British shell.

There has been disagreement as to the systematic allocation of this species, apparently stemming from Dall's assignment of it to *Cyclotellina*, which he considered (1900a, p. 290) as a "section" of the "sub-genus" *Arcopagia*, basing this upon the fact that the pallial sinus is partly confluent with the pallial line and is "linked by a linear scar to the anterior adductor scar" (1900a, p. 294), rather than being obliquely ascending and free from the pallial line as it is in *Arcopagia crassa* (Pennant). While not specifically so stated, it is apparent that Dall was also influenced by what appears to have been a misinterpretation of the hinge structure of the left valve of *A. crassa*. In his first statement (1900a, p. 290) Dall placed *Arcopagia* in his key under the heading: "b. Hinge with two lateral laminae in the right valve, the laminae of the left valve more or less obsolete, or absent." In his second paper (1900b, p. 1011) he specifically notes for *Arcopagia*: ". . . the posterior left lateral absent, the anterior obsolete, other teeth normal."

Specimens of *A. crassa* in the writer's collection clearly show a small left posterior

PLATE 1

ARCOPAGIA (JOHNSONNELLA) FAUSTA (Pultney)

Figs. 1-4. Chipola Fm., lower Miocene, Florida, locality TU 554.

(1, 3) exterior and interior of left valve, USNM 646633; length 58.2 mm, height 47.8 mm, diameter 14.3 mm.

(2, 4) exterior and interior of right valve, USNM 646632; length 52.3 mm, height 43 mm, diameter 10.3 mm.

Figs. 5-6. Recent, near Michael's Rock, north side of Bonacca (Guanaja), Bay Islands, Honduras; USNM 702244.

(5) exterior of left valve, length 59 mm, height 50.1 mm, diameter 13.2 mm.

(6) exterior of right valve, length 58.9 mm, height 49.6 mm, diameter 10.2 mm; (diameter of paired valves, 22.0 mm).

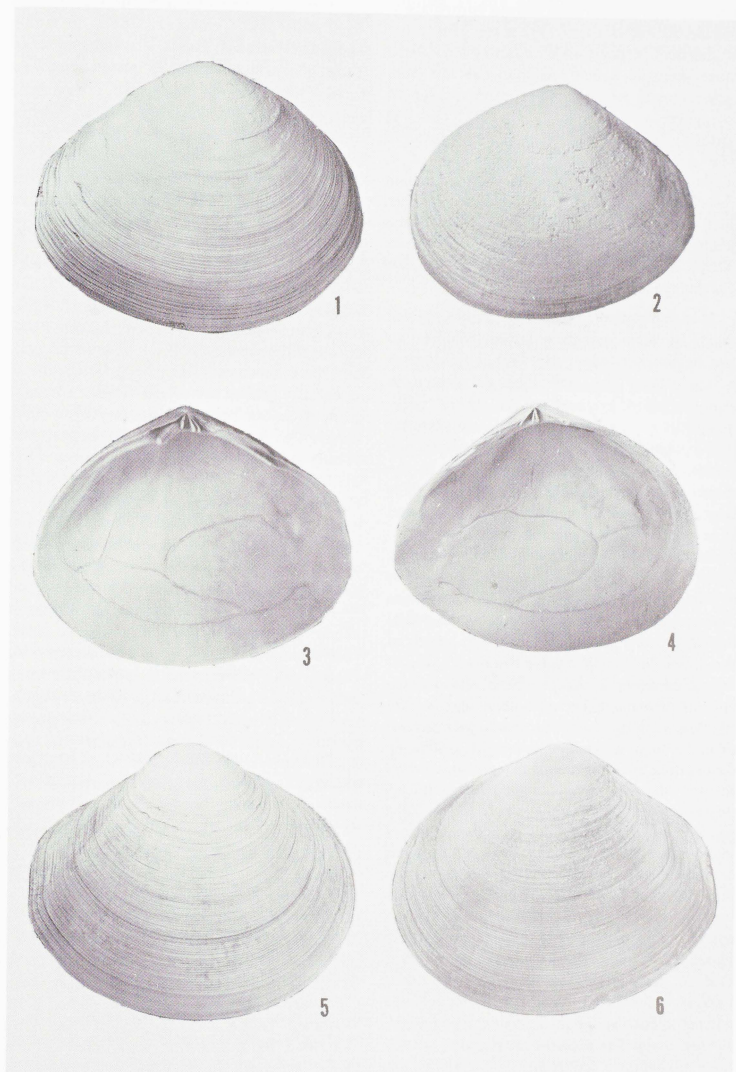


PLATE 1

lateral tooth on the valve margin immediately behind the end of the nymph plate. This tooth is identical in position with, and even a little more strongly developed than the left posterior lateral of specimens of *A. fausta* of comparable size (pl. 1, fig. 3). The left anterior lateral in *A. crassa* is also located in the same relative position as is that of *A. fausta*, and is also a little more strongly developed than is that of the latter species, being a bit more elongate and hence less triangular in profile when viewed from above. Thus, in all essential hinge features the two species are almost wholly similar.

It is also worth noting that in both species the right valve is slightly larger (one half to one millimeter longer and higher) and more inflated than the left. The difference in semi-diameter averages about three millimeters in specimens of about 60 mm length.

As observed by Dall, the principle difference between the two species lies in the nature of the pallial sinus. In *A. crassa* it is large, obliquely ascending with a rounded apex, and wholly removed from the pallial line through its entire length; in *A. fausta* the sinus is discrepant in shape in the two valves and is somewhat longer in the left valve than in the right but in both it intersects the pallial line at a point posterior to the half-length of the sinus. In the right valve the dorsal side of the sinus ascends sharply from the anterior end of the posterior adductor scar before turning, with an almost ninety degree angulation, to form a relatively straight, obliquely descending anterior dorsal margin which then rounds sharply to a similarly descending, postero-ventral trend to the pallial line. That of the left valve also rises initially, but to a lesser extent than the right sinus and then has a rather broadly rounded, rather than angulate crest leading to a less oblique postero-ventral dorsal margin that terminates in a rounded anterior extremity that is noticeably closer to the anterior adductor scar than is that of the right valve. The anterior end of both structures is connected with the anterior adductor scar by a distinct linear line (see pl. 1, figs. 3, 4). The differences in shape, which tend to become more pronounced with development of the individual, are well shown by Afshar (1969, pl. 16, figs. 2, 3).

Donax lunulata Lamarck, the type species of *Cyclotellina* Cossmann, 1886, to which Dall had referred *A. fausta*, is a relatively small form, generally less than 25 mm in length. As figured by Deshayes (1824, pl. 11, figs. 3, 4; reproduced in *Treatise on Invert. Paleontology*, Part N, Bivalvia, p. N614, fig. E 104-4a, 4b) and by Cossmann and Pissarro (1904, pl. 7, sp. 35-41) the hinge of the right valve has lateral teeth that are much more elongate and lamellar than are those of both *A. crassa* and *A. fausta*, and both anterior and posterior laterals tend to be closely parallel with the margins of the valves, rather than slightly transverse in position. The illustrations given by Afshar (1969, pl. 22, figs. 1-4) do not show the details of the hinge at all well, but they do reveal that the pallial sinus is essentially similar to that of the left valves of adult *A. fausta* but are unlike that of the right valves, not being discrepant in shape. The extent to which this may be a function of the small size of the shell is difficult to judge, especially since, as indicated above, the differences in shape are not strongly pronounced in small, immature specimens of *A. fausta* that are of the same general dimensions as the adult specimens of *Cyclotellina lunulata*.

In summary: *A. fausta*, the type species of the subgenus *Johnsonella*, has a hinge structure that agrees closely with that present in *A. crassa*, type of *Arcopagia*, but differs in all details of the pallial sinus; the latter structure, on the other hand appears to be rather similar to that present in "*Donax*" *lunulata*, the type species of *Cyclotellina*, but the hinges differ in the shape and position of the lateral teeth.

ECOLOGIC AND PALEOECOLOGIC CONSIDERATIONS.—According to Boss (1966, p. 253): "Robertson (1961) has noted that *Tellina fausta* at Bimini lives in a coarse sand substrate at a depth of one foot, mostly among *Thalassia* rhizomes. Abbott (1958, p. 135) reported the occurrence of this species at Grand Cayman in water 4-6 feet deep over clear sand. The maximum depth record is 15 fathoms." In his localized list of specimens examined he noted the occurrence of the species off Santa Lucia, Cuba, in 2-4 fathoms, and in Falmouth Harbor, Antigua, in 3-6 fathoms.

The writer has not been able to locate the original record of the occurrence at 15 fathoms and, in view of the apparent preference of this species for much shallower waters, is inclined to wonder whether the record may not have been based upon a shell that had been transported to the deeper environment subsequent to the death of the individual. This latter factor seems to have been significant with respect to the occurrence of the specimens from the Chipola Formation; all 63 valves collected were disassociated, with no paired valves being found.

At five of the nine localities from which these valves were collected they were associated with *Miltha chipolana* (Dall), including paired as well as disassociated valves. The recent species of *Miltha* prefer somewhat deeper waters than the Recent *Arcopagia fausta*. When the manuscript was prepared for "Observations on the Genus *Miltha* . . ." (Vokes, 1969) the only depth record for *Miltha childrenae* (Gray) of which the writer was aware was for the isolated valves dredged by the U.S. Fisheries M/V *Oregon* from 28 fathoms off Sao Luis, Est. Maranhão, Brazil. Subsequently while in Brazil he became acquainted with a paper by Kempf and Matthews (1968, p. 89) in which *M. childreni* [sic] is listed as occurring "E. Para R.; Maranhão: Ceará; R. G. Norte—21-55 meters [approximately 11-28 fathoms]." In addition, in the collections of the Museo Oceanográfico de Rio Grande do Sul, there are paired valve specimens taken off Ceará in 14 fathoms and off Sao Luis, Maranhão in 17 and 28 fathoms. If one makes the unprovable assumption that the fossil forms had the same depth requirements as do the Recent representatives, this association would seem to imply that the deposits at those Chipola localities, where the association included paired valves of *Miltha*, were emplaced at a depth greater than the 6 fathoms from which living specimens of *A. fausta* have been recorded or 15 fathoms if the deepest record noted above be based upon a living specimen—possibly at depths in the 20 to 28 fathoms range. Tulane locality 554, from which 28 of the 63 valves of *A. fausta* were collected, almost three times as many as were

found at any other single locality, did not yield any representation of *Miltha*. A relatively shallower water depth seems most probable.

Similar conclusions may be drawn from the association of but two isolated valves associated with several paired + disassociated valves of *Miltha carmenae* at TU locality 201 in the Pleistocene "Unit A" deposits at Belle Grade, Florida, contrasted with the presence of one paired-valve specimen of *A. fausta* and only individual valves of *M. carmenae* at TU locality 727 in the same formation.*

The basic assumption of differing depth requirements for *A. fausta* and species of *Miltha* appears to break down when applied to the upper Miocene "Pinecrest Beds" of southern Florida. Paired valves of *A. fausta* and of *M. caloosaensis* (Dall) are found in collections from both TU 797 and 1000. Both of these are spoil bank collections based upon material drag-lined from below present ground water levels and it may be that they came from different levels in the pits; if this is not the case then it might be suggested that water depths in the six to eight fathom range obtained during the time of deposition of the strata at these localities.

LOCALITY DESCRIPTIONS

The following are all Tulane University fossil localities:

"Unit A," Pleistocene:

- 201. Spoil banks at Belle Glade Rock Pit, just south of Belle Glade (at Belle Glade Camp), Palm Beach Co., Florida.
- 727. Borrow pits, 2.2 miles east of U.S. Highway 27, 15 miles south of South Bay, Palm Beach Co., Florida.
- 759. Spoil banks, north side of Caloosahatchee River, two miles west of Ortona Lock (NE ¼ Sec. 29, T42S, R30E), Glades Co., Florida.

*Mrs. Emily H. Vokes informs me that the muricid species at locality 201 suggest a minimum depth in the 20-30 fathom range, (see Hoerle, 1970, p. 63, fig. 2).

768. Spoil banks, north side of Caloosahatchee River, about 5.5 miles west of Ortona Lock (NW ¼ Sec. 35, T42S, R20E), Glades Co., Florida. Material from this site includes both "Unit A" and Caloosahatchee Fmtn. faunas, mixed.
803. Spoil banks, south side of Caloosahatchee River, two miles west of Ortona Lock (NE ¼ Sec. 29, T42S, R30E), Glades Co., Florida.

Caloosahatchee Fmtn., Pliocene:

202. South bank of Caloosahatchee River, about two miles west of La Belle (SE ¼ Sec. 12, T43S, R28E), Hendry Co., Florida.

"Pinecrest Beds," upper Miocene:

797. Borrow pit material exposed during construction of "Alligator Alley," 13.3 miles east of Florida Highway 29 (T49S, R32E), Collier Co., Florida.
933. Borrow pit material exposed during construction of "Alligator Alley," 21.5 miles east of Florida Highway 29, Collier Co., Florida.
1000. Borrow pit at east end of 17th street, (T36S, R19E), about 8 miles east of U.S. Highway 30 at Sarasota, Sarasota Co., Florida.

Chipola Fmtn., late lower Miocene:

548. West bank, Chipola River, about 0.5 mile downstream from mouth of Farley Creek, (NW ¼ Sec. 29, T1N, R9W), Calhoun Co., Florida.
550. East bank, Chipola River, ¼ mile below mouth of Ten-Mile Creek (NE ¼ Sec. 20, T1N, R9W), Calhoun Co., Florida.
554. East bank of Chipola River immediately below power line crossing (SW ¼ Sec. 17, T1N, R9W), Calhoun Co., Florida.
820. Farley Creek, at bridge of Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W), Calhoun Co., Florida.
821. Farley Creek, 0.1 mile east of bridge at Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W), Calhoun Co., Florida.
825. Farley Creek at abandoned mill about one quarter mile west of bridge at Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W), Calhoun Co., Florida.
828. Farley Creek, just upstream from mouth of unnamed tributary about three-quarters of a mile west of bridge at Florida Highway 275 (SE ¼ Sec. 20, T1N, R9W), Calhoun Co., Florida.

999. Farley Creek, about 900 feet downstream from bridge at Florida Highway 275 (SW ¼ Sec. 21, T1N, R9W), Calhoun Co., Florida.
1050. West bank of Chipola River immediately below power line crossing, and directly across river from loc. 554 (SW ¼ Sec. 17, T1N, R9W), Calhoun Co., Florida.

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