

FLORIDA FOSSIL INVERTEBRATES

Part 12

APRIL 2010

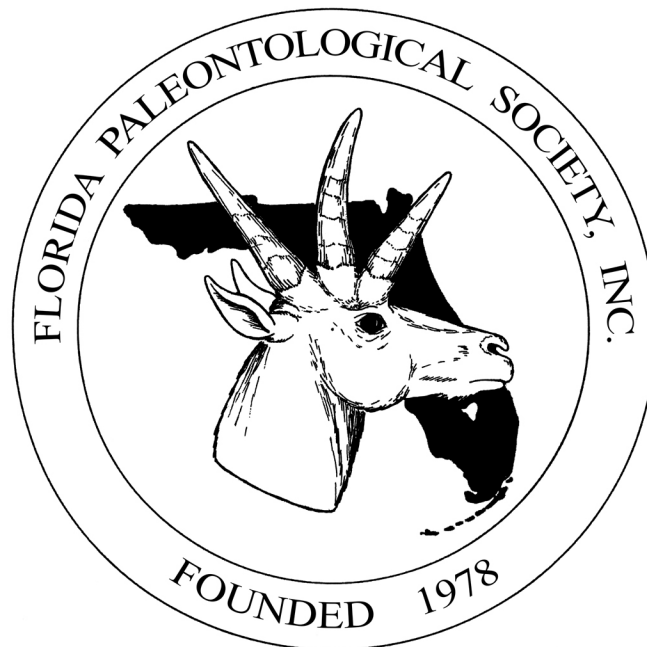
SINGLE ISSUE: \$10.00

MOLLUSCA Fort Thompson Formation (Late Pleistocene)

B. ALEX KITTLE AND ROGER W. PORTELL

Florida Museum of Natural History
University of Florida
P.O. Box 117800
Gainesville, FL 32611-7800
e-mail: bkittle@flmnh.ufl.edu; portell@flmnh.ufl.edu

A PUBLICATION OF THE FLORIDA PALEONTOLOGICAL SOCIETY, INC.



FLORIDA FOSSIL INVERTEBRATES

ISSN 1536-5557

Florida Fossil Invertebrates is a publication of the Florida Paleontological Society, Inc., and is intended as a guide for identification of the many common invertebrate fossils found within the state. Each part deals with a specific taxonomic group and contains a brief discussion of that group's life history (based on modern analogs) along with the pertinent geological setting. This series deals solely with published taxa; no new species descriptions are included. Some of the specimens figured in this series are on display at Powell Hall, the museum's Exhibit and Education Center. **This publication is made possible through the generous financial support of James and Lori Toomey.**

Available issues of *Florida Fossil Invertebrates*:

- Part 1.** Eocene echinoids (R. W. Portell and C. W. Oyen).
- Part 2.** Oligocene and Miocene echinoids (C. W. Oyen and R. W. Portell).
- Part 3.** Pliocene and Pleistocene echinoids (R. W. Portell and C. W. Oyen).
- Part 4.** Pliocene and Pleistocene decapod crustaceans (R. W. Portell and J. G. Agnew).
- Part 5.** Eocene, Oligocene, and Miocene fossil decapod crustaceans (R. W. Portell).
- Part 6.** Larger Foraminifera - Introduction, Biology, Ecology, Taxonomic and Stratigraphic Listings – Comments on Florida Fossil Assemblages (J. R. Bryan).
- Part 7.** Larger Foraminifera – Common Taxa – Late Middle Eocene to Oligocene (J. R. Bryan).
- Part 8.** Brachiopods (R. W. Portell and D. A. T. Harper).
- Part 9.** Mollusca – Shoal River Formation (Middle Miocene) (R. W. Portell, G. Polites, and G. Schmelz)
- Part 10.** Mollusca – Anastasia Formation (Late Pleistocene to Holocene) (R. W. Portell and B. A. Kittle)
- Part 11.** Eocene and Oligocene corals (R. W. Portell and S. K. Donovan) (expected publication in 2010)

The Florida Paleontological Society, Inc., a non-profit group of avocational and professional paleontologists, is dedicated to the advancement of paleontology in Florida. Annual dues are \$10.00 for Associate Membership (persons under age 18) and \$20.00 for Individual Membership and Institutional Subscriptions. Members receive the biannual Florida Paleontological Society Newsletter, Florida Fossil Invertebrates, and Fossil Species of Florida (discusses a single taxon per issue). Additionally, there are FPS sponsored fossil collecting trips (both invertebrate and vertebrate) in conjunction with our society's biannual meetings.

For more information on membership or to purchase publications please e-mail: fps@flmnh.ufl.edu or write to:

**Florida Paleontological Society, Inc.
Florida Museum of Natural History
P. O. Box 117800
University of Florida
Gainesville, FL 32611-7800**

MOLLUSCA

Fort Thompson Formation (Late Pleistocene)

B. Alex Kittle and Roger W. Portell

Florida Museum of Natural History, University of Florida, P.O. Box 117800, Gainesville,
FL 32611-7800 e-mail: bkittle@flmnh.ufl.edu; portell@flmnh.ufl.edu

INTRODUCTION

The series of *Florida Fossil Invertebrates* pertaining to the phylum Mollusca continues with fossil shells from the Upper Pleistocene Fort Thompson Formation and includes a partial identification guide (Plates 1-10) and a comprehensive species checklist (Table 1) that consists of 81 marine and one freshwater bivalves, one scaphopod (tusk shell), and 146 marine, 17 freshwater, and 20 terrestrial snails. The checklist was compiled from published occurrences, as well as specimens found in the Invertebrate Paleontology Collection of the Florida Museum of Natural History. Highly doubtful published records and synonyms have been removed. Some published records based on spoil collected material from mixed stratigraphic units or from “supposedly” Fort Thompson Formation sediments, although questionable, remain on the list at present. The authors are confident that this checklist will expand when recently collected bulk samples from several Fort Thompson Formation sites are processed.

The vast majority of the mollusk species listed herein can still be found living today along Florida’s coasts. However, some of the gastropods (e.g., *Pyrazisinus scalatus* (Heilprin, 1886) and *Turritella subannulata* Heilprin, 1886) are extinct.

Besides members of the phylum Mollusca, the Fort Thompson Formation contains several trace fossils (e.g., *Ophiomorpha* and *Entobia*) and corals (e.g., *Archohelia limonensis* Vaughan, 1919), numerous bryozoans (moss animals), arthropods (barnacles and crabs), and the occasional echinoderm remains (see Karrow et al., 1996; Portell et al., 1995; Portell and Schindler, 1991; Portell and Agnew, 2004). Vertebrate fossils recovered from the unit are common and include fishes (freshwater and marine), reptiles, birds, and mammals (see Karrow et al., 1996; DuBar, 1958b).

The naming of the Fort Thompson Formation began in 1919 when Florida's first State Geologist, Elias A. Sellards, formally proposed the "Fort Thompson beds" for stratigraphic sections observed in excavations in the Everglades and between Fort Thompson and Lake Okeechobee. He described the unit as alternating beds of freshwater, brackish, and marine marls and limestones underlying his proposed "Coffee Mill Hammock marl". He designated the type locality at Fort Thompson (along the Caloosahatchee River about 1.5 miles upstream of La Belle, Hendry County). Cooke and Mossom (1929) elevated the Fort Thompson beds to formational status and included Sellards's Coffee Mill Hammock marl as its upper member. DuBar (1958b) subdivided the Fort Thompson Formation into upper Coffee Mill Hammock Marl Member and lower Okaldakoochee Marl Member (later publications e.g., DuBar (1974) spelled it Okaloakoochee and Petuch (2007) lists it as Okaloacoochee). DuBar (1958b) described the upper unit as a "marine unit deposited in a bay or inlet environment" and the lower unit as "all freshwater and marine deposits that underlie the Coffee Mill Hammock marl" and goes on to state that "the entire formation represents deposition along a fluctuating shoreline".

The Fort Thompson Formation is primarily exposed along stream banks and in man-made excavations across southern, peninsular Florida. However, it is known to occur as far north as southwestern Brevard County along Florida's east coast (Morgan and Portell, 1996) and has been questionably recorded as far north as northwestern Citrus County (see FLMNH collections from Tulane University locality 790) along the state's west coast (see Figure 1). Typically, the deposit sits unconformably upon the Bermont Formation or where the Bermont is absent, the Caloosahatchee or Tamiami formations. At several FLMNH localities in Sarasota County, the unit also rests unconformably upon the Miocene Arcadia Formation. Furthermore, the Fort Thompson Formation shell beds are usually overlain by Holocene to Recent sand, soil, or as in the case of the Everglades "peaty muck" (Cooke and Mossom, 1929). The unit grades into the Anastasia Formation to the east and the Miami Limestone to the south-southeast (see Figure 2).

The precise time (or times) of deposition of the Fort Thompson Formation is much in need of further investigation. Using three shells from the Coffee Mill Hammock type locality, Puri and Vanstrum (1969) obtained $\text{Th}^{234}/\text{U}^{238}$ dates of 120,000 to 140,000 years. Karrow et al. (1996) reported Fort Thompson Formation age estimates of 120,000 to 130,000 years for marine deposits at Oldsmar 1 and reported 200,000 years for similar deposits at Oldsmar 2 (both in eastern Pinellas County). Two methods were employed at each site; amino acid analyses and uranium-series dating. Jones et al. (1995) used venerid clams from the Fort Thompson Formation at Leisey Shell Pit 1A and dated those deposits between 900,000 to 600,000 years using $\text{Sr}^{87}/\text{Sr}^{86}$ isotopes.

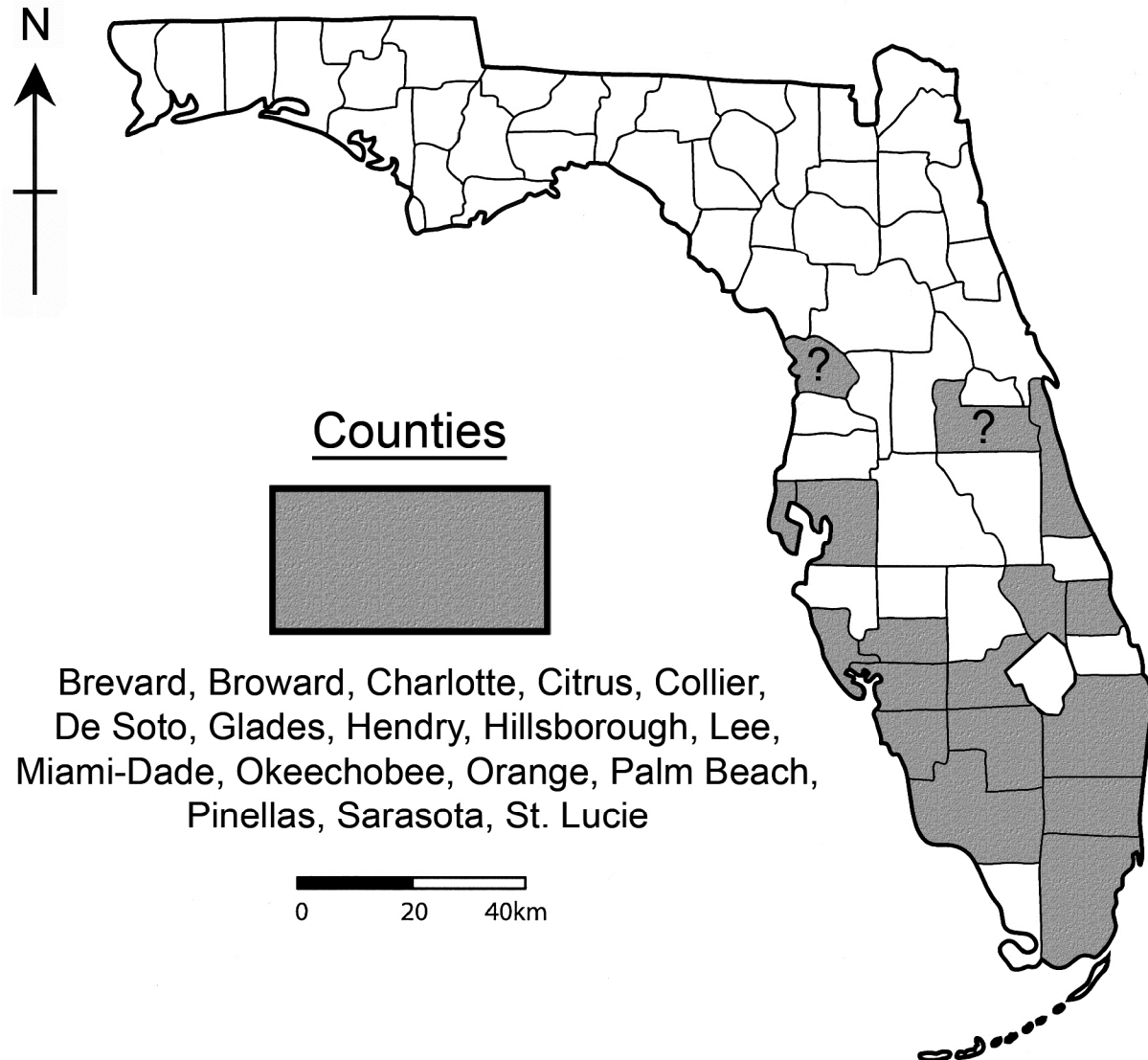


Figure 1. Counties with reported Fort Thompson Formation (Late Pleistocene) surface exposures, including areas along coastline and rivers (either above or below water level). Occurrence data, from the Invertebrate Paleontology Collection in the Florida Museum of Natural History, were used to augment published records. Questionable county records denoted with question mark (?).

EPOCH	STRATIGRAPHIC UNIT				
HOLOCENE	SATILLA FORMATION	ANASTASIA FORMATION	UNDIFFERENTIATED SEDIMENTS		
LATE PLEISTOCENE			FORT THOMPSON FORMATION	MIAMI LIMESTONE	KEY LARGO LIMESTONE

Figure 2. Late Pleistocene to Holocene stratigraphic units of Florida. The Satilla Formation is primarily found in Nassau County and the Anastasia Formation occurs at or near the surface along the east coast from St. Johns to Palm Beach counties. The Miami and Key Largo Limestones are known from the southernmost portion of the peninsula (see DuBar, 1974 for generalized distribution map). For Fort Thompson Formation occurrences see Figure 1.

PLATE 1

ARCIDAE

- 1) *Anadara floridana* (Conrad, 1869); UF 175319; external view of left valve; 0.75x.
- 2) *Anadara floridana* (Conrad, 1869); UF 175319; internal view of left valve; 0.75x.

NOETIIDAE

- 3) *Arcopsis adamsi* (Dall, 1886); UF 10758; external view of left valve; 2x.
- 4) *Arcopsis adamsi* (Dall, 1886); UF 10758; internal view of left valve; 2x.

MYTILIDAE

- 5) *Brachiodontes exustus* (Linnaeus, 1758); UF 37408; external view of right valve; 2x.
- 6) *Brachiodontes exustus* (Linnaeus, 1758); UF 37408; internal view of right valve; 2x.
- 7) *Musculus lateralis* (Say, 1822); UF 29481; external view of left valve; 3x.
- 8) *Musculus lateralis* (Say, 1822); UF 29481; internal view of left valve; 3x.

PTERIIDAE

- 9) *Pteria colymbus* (Roding, 1798); UF 10442; external view of left valve hinge; 1x.
- 10) *Pteria colymbus* (Roding, 1798); UF 10442; internal view of left valve hinge; 1x.

OSTREIDAE

- 11) *Ostrea equestris* Say, 1834; UF 37503; external view of right valve; 1x.
- 12) *Ostrea equestris* Say, 1834; UF 37503; internal view of larger right valve and attached smaller left valve; 1x.

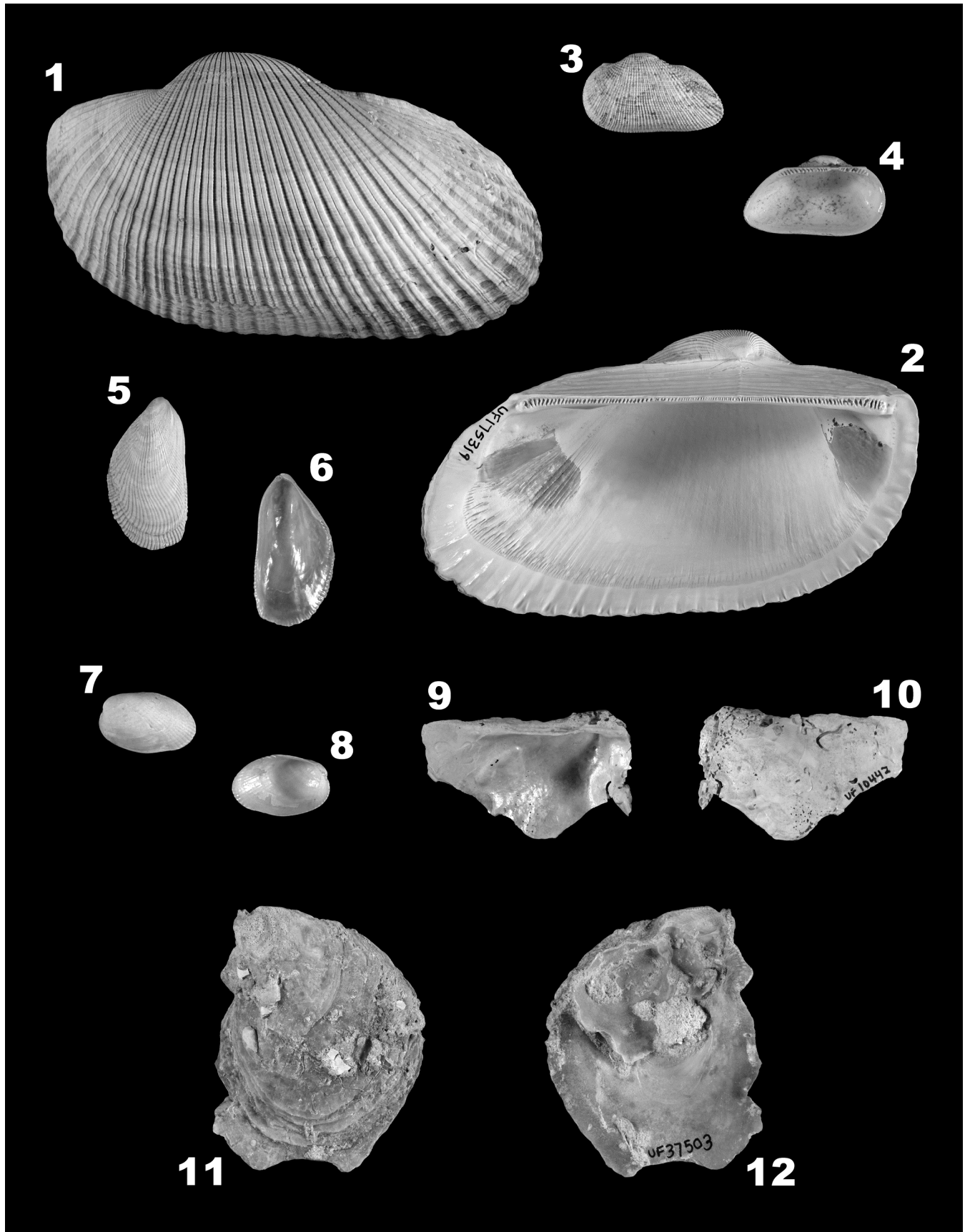


PLATE 2

CRASSATELLIDAE

- 1) *Crassinella lunulata* (Conrad, 1834); UF 10432; external view of right valve; 3x.
- 2) *Crassinella lunulata* (Conrad, 1834); UF 10432; internal view of right valve; 3x.
- 3) *Eucrassatella speciosa* (A. Adams, 1854); UF 175301; external view of right valve; 1x.
- 4) *Eucrassatella speciosa* (A. Adams, 1854); UF 175301; internal view of right valve; 1x.

LUCINIDAE

- 5) *Anodontia alba* Link, 1807; UF 17384; external view of left valve; 1x.
- 6) *Anodontia alba* Link, 1807; UF 17384; internal view of left valve; 1x.
- 7) *Callucina keenae* Chavan, 1971; UF 175295; external view of right valve; 3x.
- 8) *Callucina keenae* Chavan, 1971; UF 175295; internal view of right valve; 3x.
- 9) *Codakia orbicularis* (Linnaeus, 1758); UF 172723; external view of right valve; 1x.
- 10) *Codakia orbicularis* (Linnaeus, 1758); UF 172723; external view of right valve; 1x.
- 11) *Lucina pensylvanica* (Linnaeus, 1758); UF 10764; external view of right valve; 1x.
- 12) *Lucina pensylvanica* (Linnaeus, 1758); UF 10764; internal view of right valve; 1x.
- 13) *Lucinisca nassula* (Conrad, 1846); UF 29573; external view of right valve; 3x.
- 14) *Lucinisca nassula* (Conrad, 1846); UF 29573; internal view of right valve; 3x.

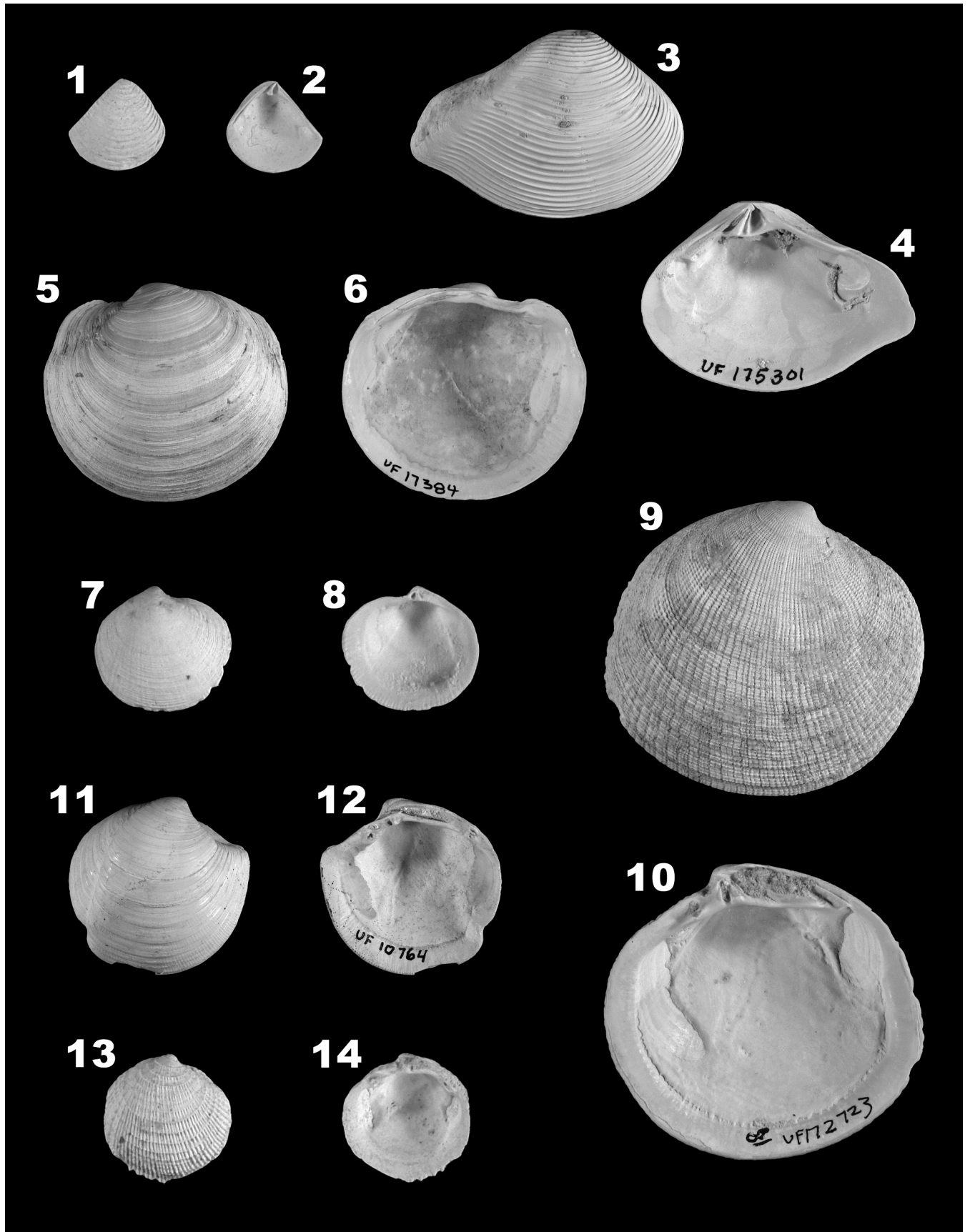


PLATE 3

UNGULINIDAE

- 1) *Diplodonta punctata* (Say, 1822); UF 149308; external view of right valve; 2x.
- 2) *Diplodonta punctata* (Say, 1822); UF 149308; internal view of right valve; 2x.

CHAMIDAE

- 3) *Arcinella cornuta* (Conrad, 1866); UF 10759; external view of right valve; 1x.
- 4) *Arcinella cornuta* (Conrad, 1866); UF 10759; internal view of right valve; 1x.
- 5) *Chama congregata* Conrad 1833; UF 175270; external view of left valve; 2x.
- 6) *Chama congregata* Conrad 1833; UF 175270; internal view of left valve; 2x.

HIATELLIDAE

- 7) *Panopea bitruncata* (Conrad, 1872); UF 13582; external view of right valve; 0.5x.
- 8) *Panopea bitruncata* (Conrad, 1872); UF 13582; internal view of right valve; 0.5x.

Notes: **1)** Sean Roberts (FLMNH) assisted with digital photography using a Sony DSC-R1 (10.3 megapixel resolution). **2)** For more information about specimens figured herein and images used in previous issues of the Florida Fossil Invertebrates series, please see our regularly updated web site located at www.flmnh.ufl.edu/invertpaleo/galleries.htm.

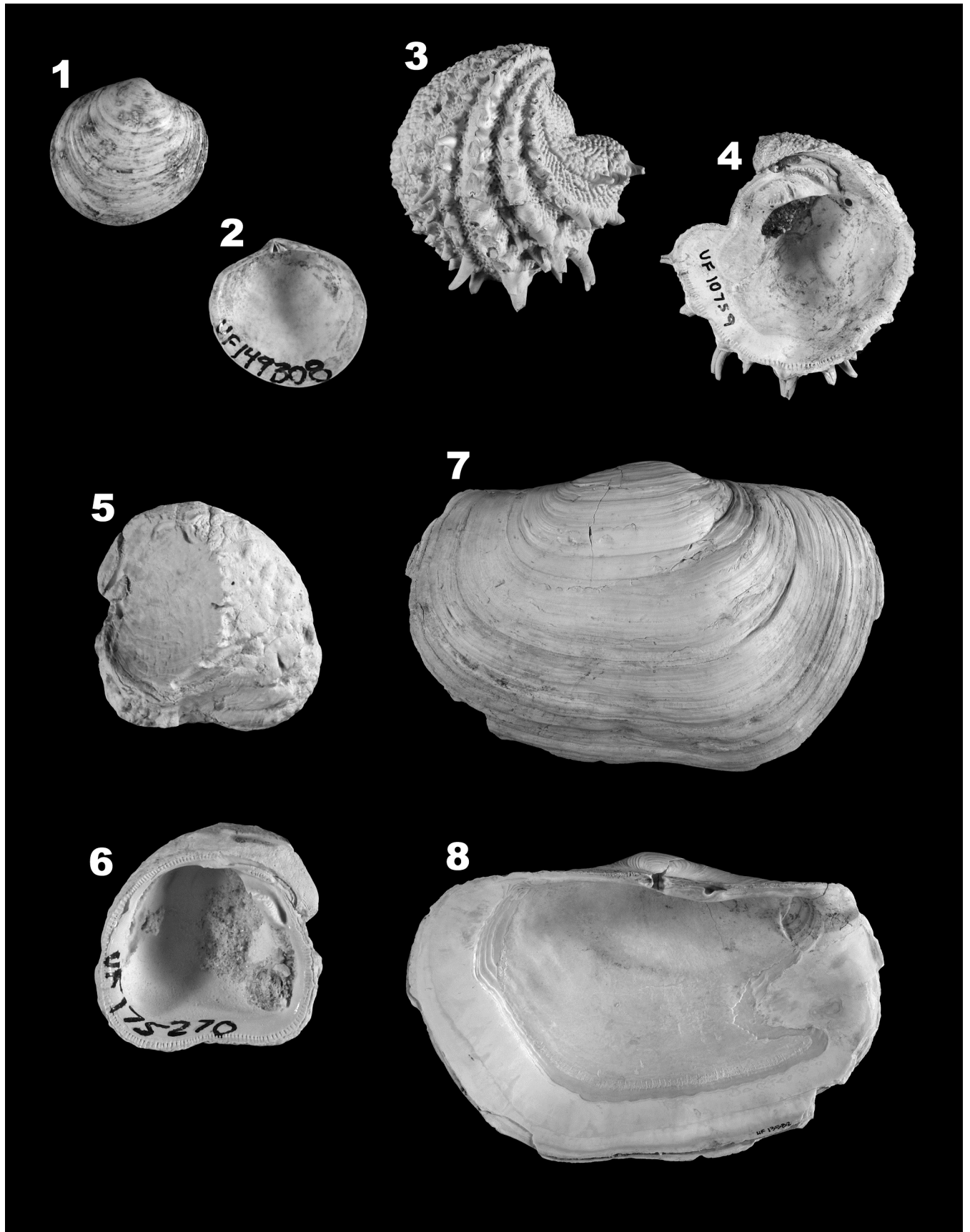


PLATE 4

GASTROCHAENIDAE

- 1) *Lamychaena hians* (Gmelin, 1791); UF 17455; external view of right valve; 2x.
- 2) *Lamychaena hians* (Gmelin, 1791); UF 17455; internal view of right valve; 2x.

CARDIIDAE

- 3) *Dallocardia muricata* (Linnaeus, 1758); UF 175287; external view of right valve; 1x.
- 4) *Dallocardia muricata* (Linnaeus, 1758); UF 175287; internal view of right valve; 1x.
- 5) *Dinocardium robustum* (Lightfoot, 1786); UF 37470; external view of right valve; 0.75x.
- 6) *Dinocardium robustum* (Lightfoot, 1786); UF 37470; internal view of right valve; 0.75x.
- 7) *Trachycardium egmontianum* (Shuttleworth, 1856); UF 38086; external view of left valve; 1x.
- 8) *Trachycardium egmontianum* (Shuttleworth, 1856); UF 38086; internal view of left valve; 1x.

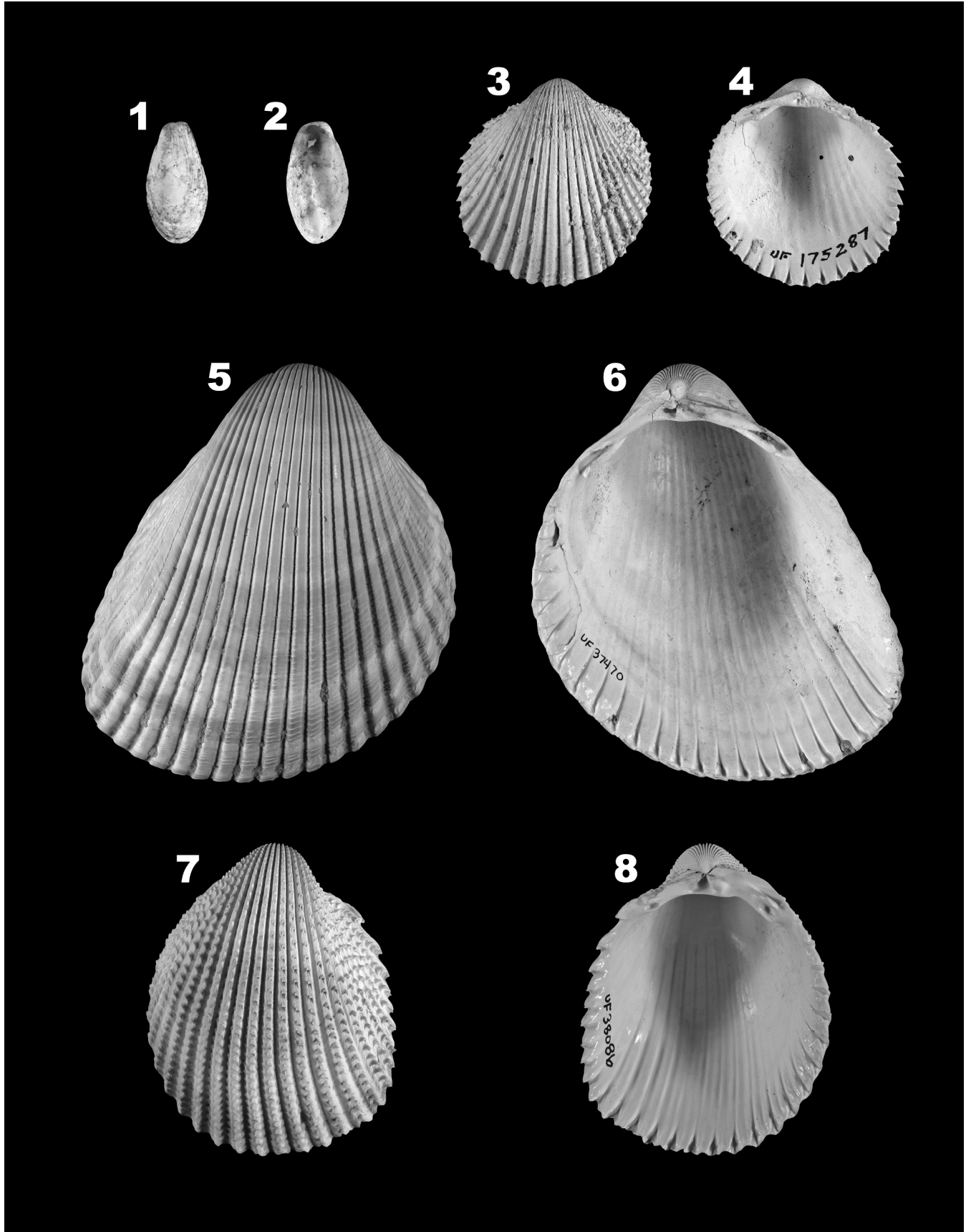


PLATE 5**VENERIDAE**

- 1) *Anomalocardia cuneimeris* (Conrad, 1846); UF 100208; external view of right valve; 2x.
- 2) *Anomalocardia cuneimeris* (Conrad, 1846); UF 100208; internal view of right valve; 2x.
- 3) *Cyclinella tenuis* (Recluz, 1852); UF 29590; external view of right valve; 2x.
- 4) *Cyclinella tenuis* (Recluz, 1852); UF 29590; internal view of right valve; 2x.
- 5) *Dosinia discus* (Reeve, 1850); UF 17379; external view of left valve; 1x.
- 6) *Dosinia discus* (Reeve, 1850); UF 17379; internal view of left valve; 1x.
- 7) *Dosinia elegans* (Conrad, 1846); UF 17381; external view of left valve; 1x.
- 8) *Dosinia elegans* (Conrad, 1846); UF 17381; internal view of left valve; 1x.
- 9) *Macrocallista maculata* (Linnaeus, 1758); UF 3873; external view of left valve; 1x.
- 10) *Macrocallista maculata* (Linnaeus, 1758); UF 3873; internal view of left valve; 1x.

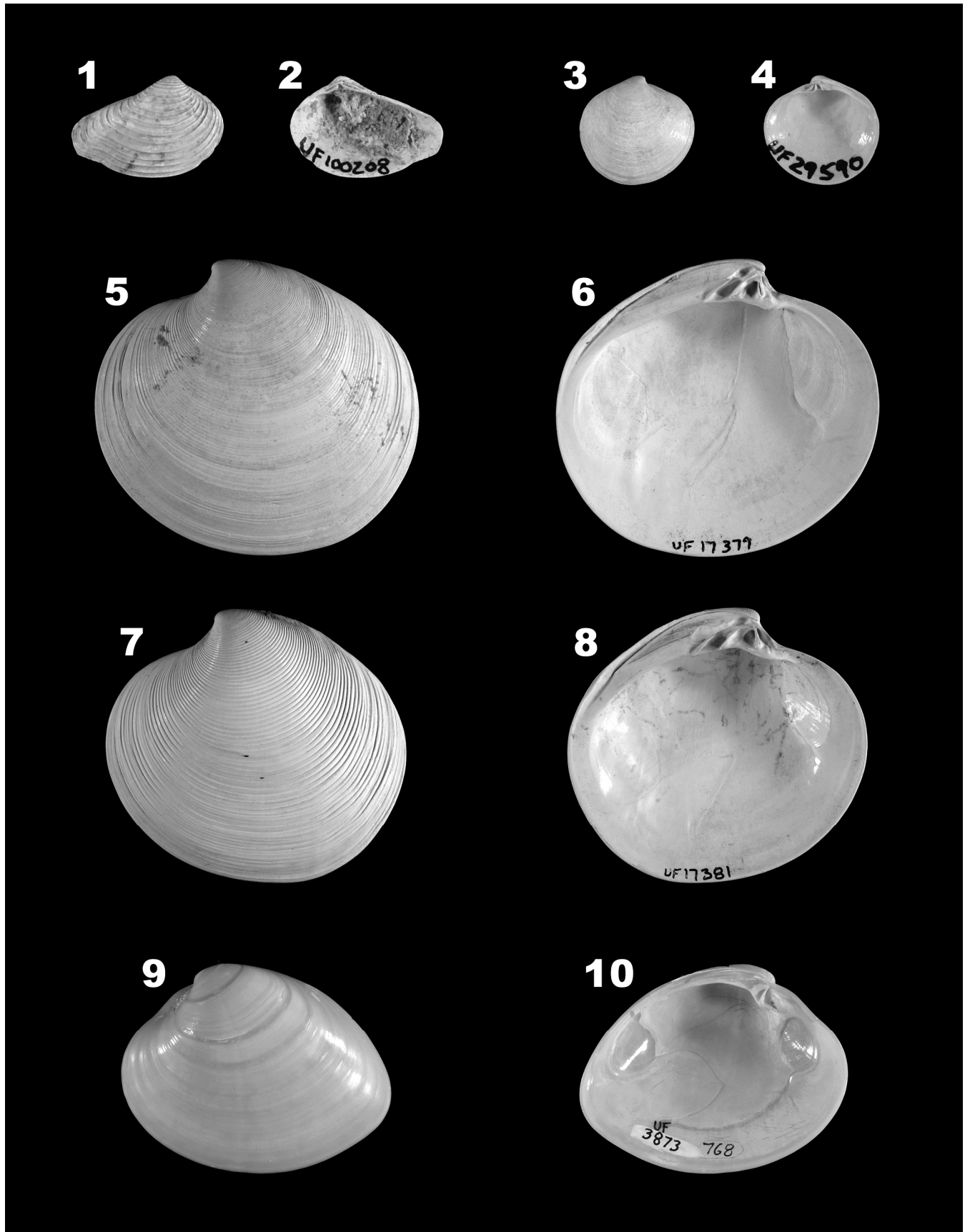


PLATE 6

VENERIDAE

- 1) *Macrocallista nimbosa* (Lightfoot, 1786); UF 17459; external view of left valve; 0.75x.
- 2) *Macrocallista nimbosa* (Lightfoot, 1786); UF 17459; internal view of left valve; 0.75x.
- 3) *Pitar simpsoni* (Dall, 1895); UF 50283; external view of right valve; 3x.
- 4) *Pitar simpsoni* (Dall, 1895); UF 50283; internal view of right valve; 3x.
- 5) *Transennella conradina* (Dall, 1884); UF 23313; external view of left valve; 5x.
- 6) *Transennella conradina* (Dall, 1884); UF 23313; internal view of left valve; 5x.

TELLINIDAE

- 7) *Eurytellina alternata* (Say, 1822); UF 37497; external view of left valve; 1x.
- 8) *Eurytellina alternata* (Say, 1822); UF 37497; internal view of left valve; 1x.
- 9) *Tellidora cristata* (Recluz, 1842); UF 17383; external view of right valve; 1x.
- 10) *Tellidora cristata* (Recluz, 1842); UF 17383; internal view of right valve; 1x.

SEMELIDAE

- 11) *Abra aequalis* (Say, 1822); UF 86163; external view of right valve; 3x.
- 12) *Abra aequalis* (Say, 1822); UF 86163; internal view of right valve; 3x.
- 13) *Semele bellastriata* (Conrad, 1837); UF 175091; external view of left valve; 3x.
- 14) *Semele bellastriata* (Conrad, 1837); UF 175091; internal view of left valve; 3x.
- 15) *Semele proficua* (Pulteney, 1799); UF 37509; external view of left valve; 1x.
- 16) *Semele proficua* (Pulteney, 1799); UF 37509; internal view of left valve; 3x.

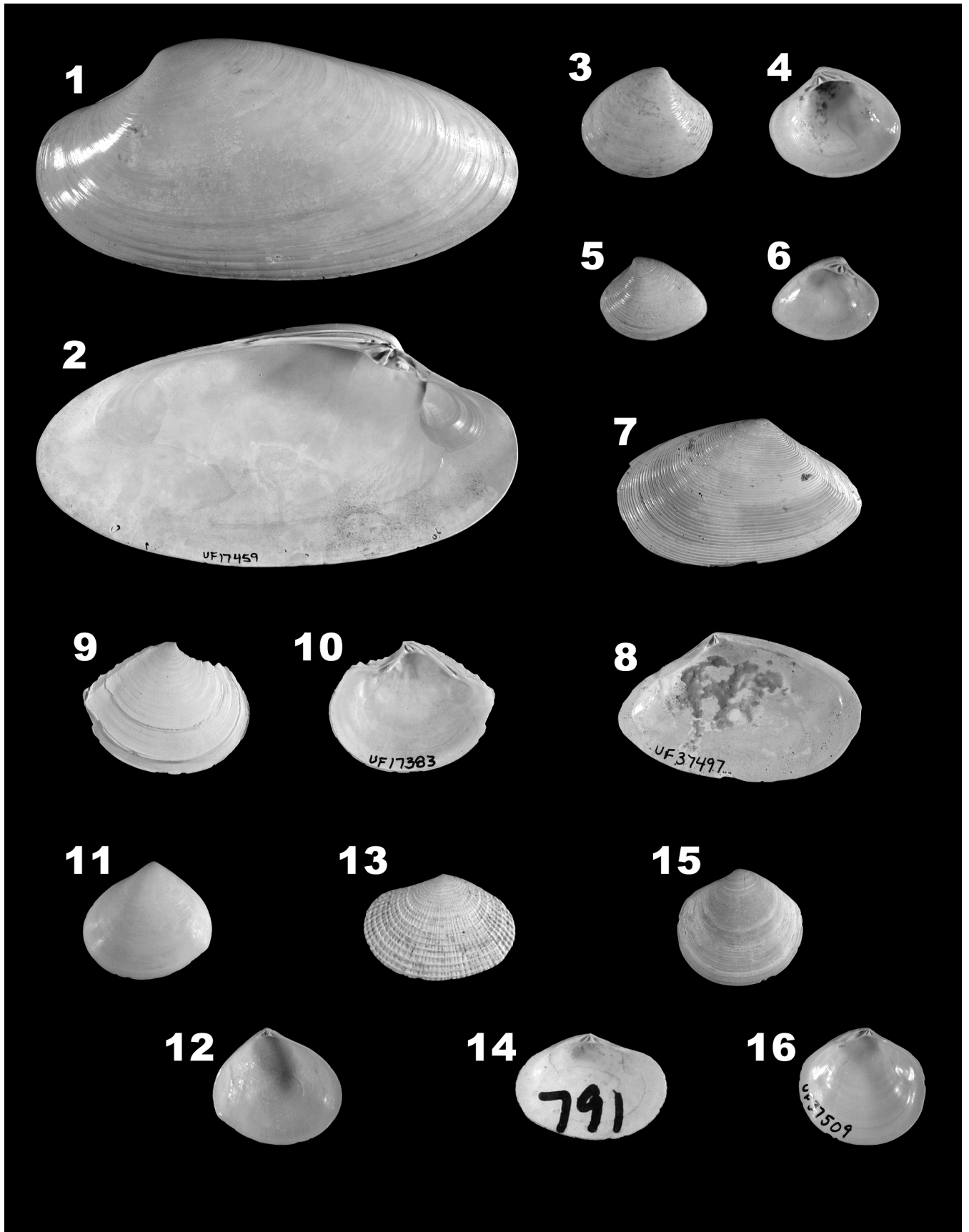


PLATE 7

MACTRIDAE

- 1) *Mulinia lateralis* (Say, 1822); UF 17489; external view of left valve; 3x.
- 2) *Mulinia lateralis* (Say, 1822); UF 17489; internal view of left valve; 3x.
- 3) *Raeta plicatella* (Lamarck, 1818); UF 172944; external view of right valve; 3x.
- 4) *Raeta plicatella* (Lamarck, 1818); UF 172944; internal view of right valve; 3x.

DREISSENIDAE

- 5) *Mytilopsis leucophaeata* (Conrad, 1831); UF 29490; external view of right valve; 3x.
- 6) *Mytilopsis leucophaeata* (Conrad, 1831); UF 29490; internal view of right valve; 3x.

MYIDAE

- 7) *Sphenia tumida* Lewis, 1968; UF 29609; external view of left valve; 4x.

CORBULIDAE

- 8) *Caryocorbula contracta* (Say, 1822); UF 10443; external view of right valve; 4x.
- 9) *Caryocorbula contracta* (Say, 1822); UF 10443; internal view of right valve; 4x.

PHOLADIDAE

- 10) *Martesia striata* (Linnaeus, 1758); UF 22933; four specimens bored into wood; 1x.

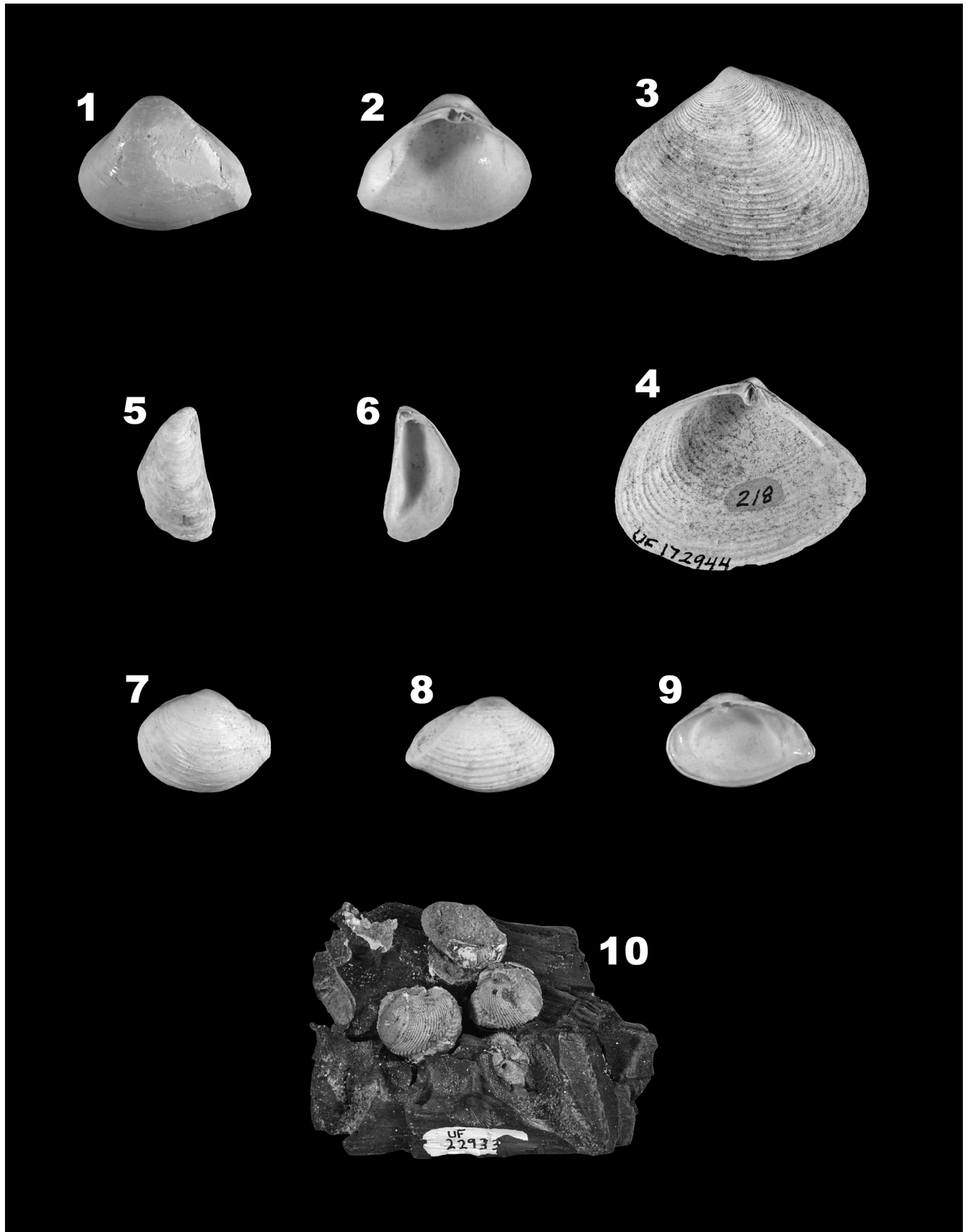


PLATE 8

FISSURELLIDAE

- 1) *Diodora cayenensis* (Lamarck, 1822); UF 17453; dorsal view; 2x.

TURBINIDAE

- 2) *Astralium phoebium* (Roding, 1798); UF 175275; dorsal view; 2x.
3) *Astralium phoebium* (Roding, 1798); UF 175275; ventral view; 2x.
4) *Astralium phoebium* (Roding, 1798); UF 175275; apertural view; 2x.

TROCHIDAE

- 5) *Tegula fasciata* (Born, 1778); UF 175309; apertural view (note the predatory snail borehole); 3x.

NERITIDAE

- 6) *Neritina virginea* (Linnaeus, 1758); UF 20984; apertural view; 3x.

VIVIPARIDAE

- 7) *Viviparus georgianus* (I. Lea, 1834); UF 5764; apertural view; 2x.

AMPULLARIIDAE

- 8) *Pomacea paludosa* (Say, 1829); UF 5765; apertural view; 1x.

CERITHIIDAE

- 9) *Bittium varium* (Pfeiffer, 1840); UF 10383; apertural view; 6x.
10) *Cerithium atratum* (Born, 1778); UF 174283; apertural view; 2x.
11) *Cerithium muscarum* Say, 1832; UF 100157; apertural view; 2x.

POTAMIDIDAE

- 12) *Pyrazisinus scalatus* (Heilprin, 1886); UF 22931; apertural view; 1x.

MODULIDAE

- 13) *Modulus modulus* (Linnaeus, 1758); UF 180850; apertural view; 2x.

TURRITELLIDAE

- 14) *Turritella subannulata* Heilprin, 1886; UF 10395; apertural view; 4x.
15) *Vermicularia spirata* (Phillipi, 1836); UF 100196; apertural view; 3x.

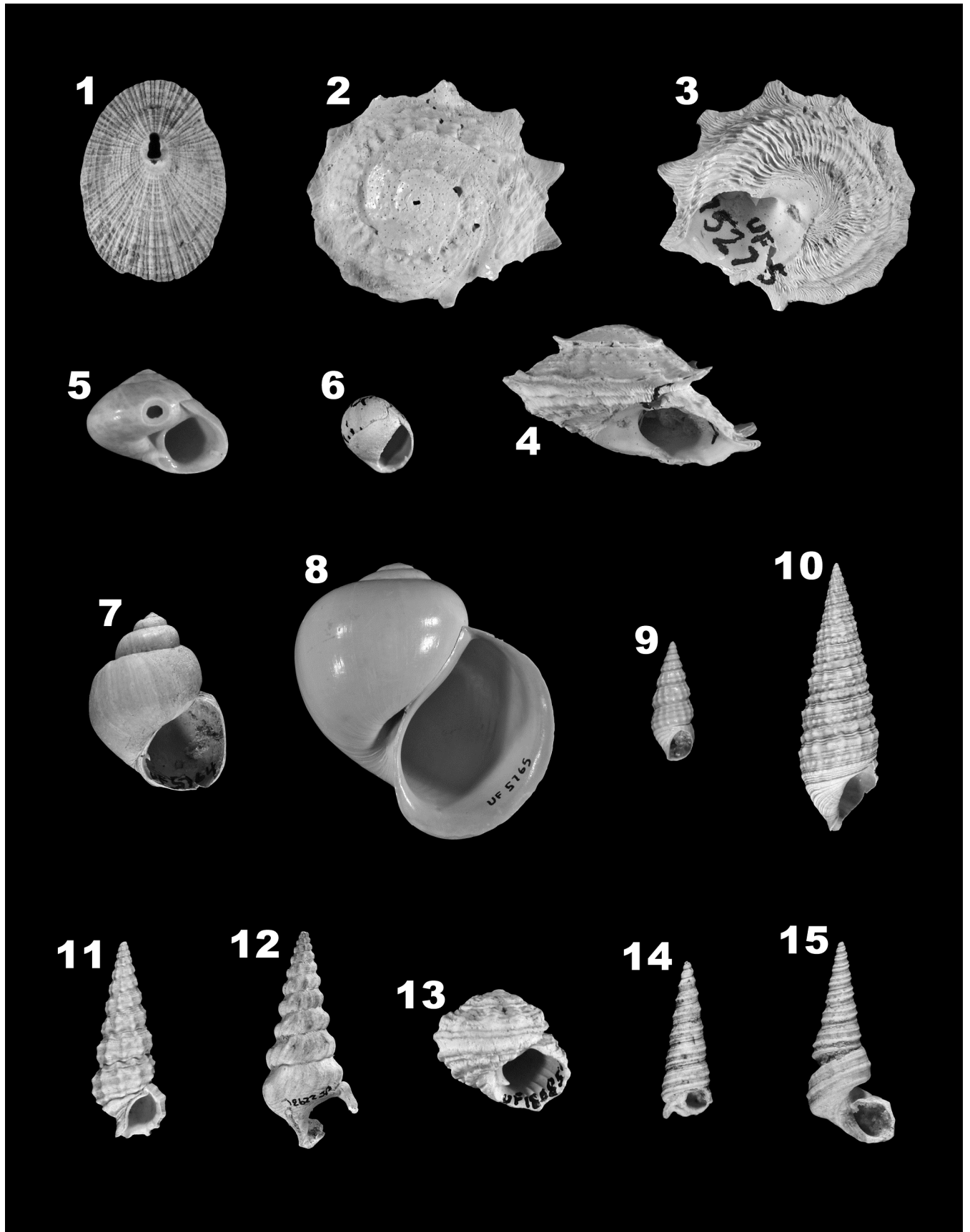


PLATE 9

STROMBIDAE

- 1) *Strombus alatus* Gmelin, 1791; UF 17435; apertural view; 4x.

CALYPTRAEIDAE

- 2) *Bostrycapulus aculeatus* (Gmelin, 1791); UF 10379; dorsal view; 3x.
- 3) *Crucibulum striatum* Say, 1824; UF 10377; dorsal view; 3x.

TRIVIIDAE

- 4) *Pusula pediculus* (Linnaeus, 1758); UF 180870; apertural view; 2x.

NATICIDAE

- 5) *Naticarius canrena* (Linnaeus, 1758); UF 175278; dorsal view; 2x.

FICIDAE

- 6) *Ficus communis* Roding, 1798; UF 175312; dorsal view; 3x.

MURICIDAE

- 7) *Calotrophon ostrearum* (Conrad, 1846); UF 23935; dorsal view; 2x.
- 8) *Stramonita haemastoma* (Linnaeus, 1767); UF 22928; dorsal view; 1x.

BUCCINIDAE

- 9) *Gemophos tinctus* (Conrad, 1846); UF 38090; apertural view; 2x.

MELONGENIDAE

- 10) *Busycotypus canaliculatus* (Linnaeus, 1758); UF 22929; apertural view; 0.75x.

NASSARIIDAE

- 11) *Nassarius albus* (Say, 1826); UF 174749; apertural view (note the predatory snail borehole); 3x.

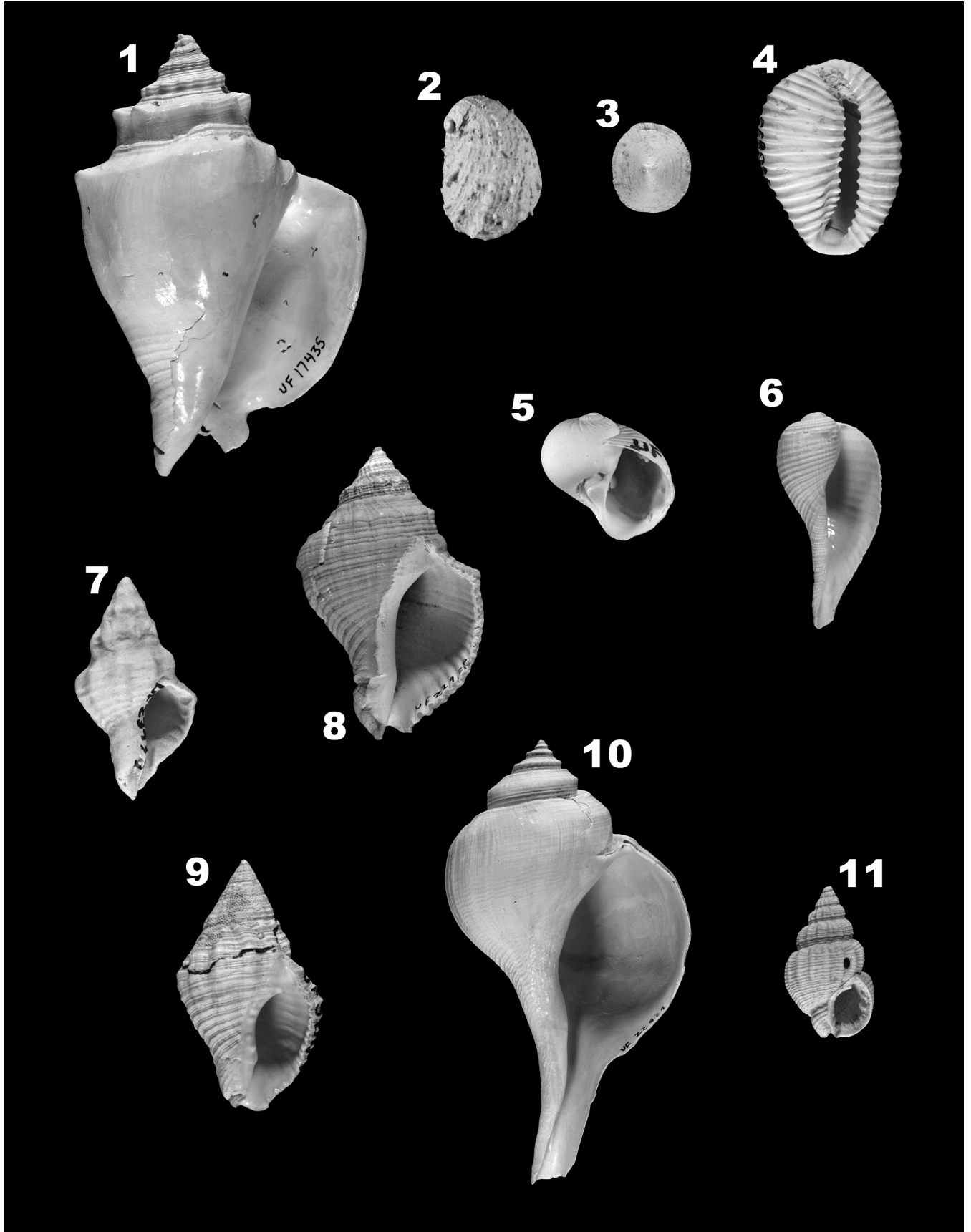


PLATE 10**FASCIOLARIIDAE**

- 1) *Fasciolaria tulipa* (Linnaeus, 1758); UF 174539; apertural view; 0.75x.
- 2) *Triplofusus giganteus* (Kiener, 1840); UF 17493; apertural view; 0.75x.

COLUMBELLIDAE

- 3) *Columbella mercatoria* (Linnaeus, 1758); UF 174810; apertural view; 2x.

OLIVIDAE

- 4) *Oliva sayana* Ravenel, 1834; UF 17387; apertural view; 1x.
- 5) *Olivella pusilla* (Marrat, 1871; UF 10452; apertural view; 4x.

MARGINELLIDAE

- 6) *Prunum apicinum* (Menke, 1828); UF 10456; apertural view; 3x.

TEREBRIDAE

- 7) *Terebra dislocata* (Say, 1822); UF 17448; apertural view; 1x.

CONIDAE

- 8) *Conus jaspideus* Gmelin, 1791; UF 175302; apertural view; 2x.
- 9) *Conus spurius* Gmelin, 1791; UF 42323; apertural view; 1x.

BULLIDAE

- 10) *Bulla occidentalis* A. Adams, 1850; UF 10407; apertural view; 2x.

PLANORBIDAE

- 11) *Planorbella scalaris* (Jay, 1839); UF 10408; apertural view; 3x.

SPIRAXIDAE

- 12) *Euglandina rosea* (Ferussac, 1818); UF 5727; apertural view; 2x.

POLYGYRIDAE

- 13) *Daedalochila uvulifera* (Shuttleworth, 1852); UF 5732; dorsal view; 2x.
- 14) *Daedalochila uvulifera* (Shuttleworth, 1852); UF 5732; apertural view; 2x.
- 15) *Polygyra septemvolva* Say, 1818; UF 31408; dorsal view; 2x.
- 16) *Polygyra septemvolva* Say, 1818; UF 31408; apertural view; 2x.

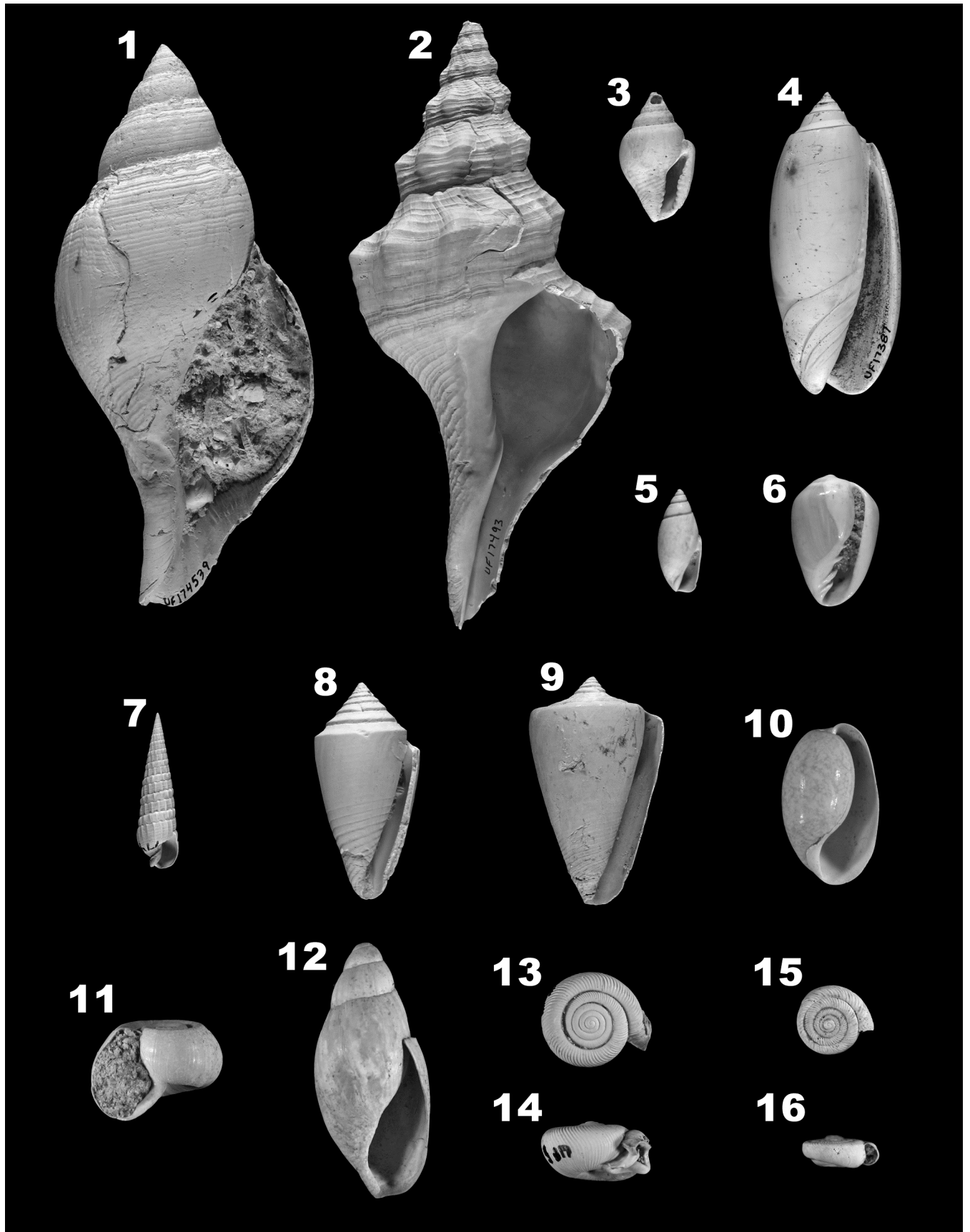


Table 1. List of published and FLMNH Invertebrate Paleontology Collection Mollusca from the Upper Pleistocene Fort Thompson Formation of Florida. The classification arrangement for bivalves is based on Mikkelsen and Bieler (2008) and for gastropods based on Turgeon et al. (1998). Many doubtful records and synonyms have been removed. However, some published records listed below were based solely on spoil collected specimens from mixed stratigraphic units and therefore remain questionable. Notation **cf.** (confer) means compare to. Species figured herein are followed by bolded Plate (**PL**) number.

<p style="text-align: center;">BIVALVIA</p> <p>NUCULIDAE <i>Nucula proxima</i> Say, 1822</p> <p>NUCULANIDAE <i>Nuculana acuta</i> (Conrad, 1832)</p> <p>ARCIDAE <i>Anadara floridana</i> (Conrad, 1869) (PL 1) <i>Anadara transversa</i> (Say, 1822)</p> <p>NOETIIDAE <i>Arcopsis adamsi</i> (Dall, 1886) (PL 1) <i>Noetia</i> sp. cf. <i>platyura</i> (Dall, 1898) <i>Noetia ponderosa</i> (Say, 1822)</p> <p>GLYCYMERIDIDAE <i>Tucetona pectinata</i> (Gmelin, 1791)</p> <p>MYTILIDAE <i>Brachidontes exustus</i> (Linnaeus, 1758) (PL 1) <i>Musculus lateralis</i> (Say, 1822) (PL 1)</p> <p>PTERIIDAE <i>Pteria colymbus</i> (Roding, 1798) (PL 1)</p> <p>OSTREIDAE <i>Crassostrea virginica</i> (Gmelin, 1791) <i>Ostrea equestris</i> Say, 1834 (PL 1)</p> <p>PECTINIDAE <i>Argopecten gibbus</i> (Linnaeus, 1758) <i>Argopecten irradians</i> (Lamarck, 1819) <i>Euvola ziczac</i> (Linnaeus, 1758)</p> <p>PLICATULIDAE <i>Plicatula gibbosa</i> Lamarck, 1801</p> <p>ANOMIIDAE</p>	<p><i>Anomia simplex</i> d'Orbigny, 1853</p> <p>CRASSATELLIDAE <i>Crassinella acuta</i> Dall, 1903 <i>Crassinella lunulata</i> (Conrad, 1834) (PL 2) <i>Eucrassatella speciosa</i> (Adams, A., 1854) (PL 2)</p> <p>CARDITIDAE <i>Carditamera</i> sp. cf. <i>arata</i> (Conrad, 1832) <i>Carditamera floridana</i> Conrad, 1838 <i>Pleuromeris tridentata</i> (Say, 1826)</p> <p>LUCINIDAE <i>Anodontia alba</i> Link, 1807 (PL 2) <i>Callucina keenae</i> Chavan, 1971 (PL 2) <i>Codakia orbicularis</i> (Linnaeus, 1758) (PL 2) <i>Divalinga quadrisulcata</i> (d'Orbigny, 1846) <i>Lucina pensylvanica</i> (Linnaeus, 1758) (PL 2) <i>Luciniscia nassula</i> (Conrad, 1846) (PL 2) <i>Parvilucina crenella</i> (Dall, 1901) <i>Phacoides pectinata</i> (Gmelin, 1791) <i>Radiolucina amianta</i> (Dall, 1901) <i>Stewartia floridana</i> (Conrad, 1833)</p> <p>UNGULINIDAE <i>Diplodonta punctata</i> (Say, 1822) (PL 3) <i>Phlyctiderma semiasperum</i> (Philippi, 1836)</p> <p>CHAMIDAE <i>Arcinella cornuta</i> (Conrad, 1866) (PL 3) <i>Chama congregata</i> Conrad, 1833 (PL 3)</p> <p>LASAEIDAE <i>Mysella planulata</i> (Stimpson, 1851) <i>Orobitella floridana</i> (Dall, 1899)</p> <p>HIATELLIDAE <i>Panopea bitruncata</i> (Conrad, 1872) (PL 3)</p>
---	--

GASTROCHAENIDAE

Lamychaena hians (Gmelin, 1791) **(PL 4)**

SPORTELLIDAE

Ensitellops protectus (Conrad, 1841)

SPHAERIIDAE

Musculium securis (Prime, 1852)

CARDIIDAE

Dallocardia muricata (Linnaeus, 1758)

(PL 4)

Dinocardium robustum (Lightfoot, 1786)

(PL 4)

Laevicardium mortoni (Conrad, 1831)

Laevicardium serratum (Linnaeus, 1758)

Trachycardium egmontianum

(Shuttleworth, 1856) **(PL 4)**

VENERIDAE

Anomalocardia cuneimeris (Conrad, 1846)

(PL 5)

Chione elevata (Say, 1822)

Cyclinella tenuis (Recluz, 1852) **(PL 5)**

Dosinia discus (Reeve, 1850) **(PL 5)**

Dosinia elegans (Conrad, 1846) **(PL 5)**

Macrocallista maculata (Linnaeus, 1758)

(PL 5)

Macrocallista nimbose (Lightfoot, 1786) **(PL**

6)

Mercenaria campechiensis (Gmelin, 1791)

Parastarte triquetra (Conrad, 1846)

Pitar morrhuanus (Dall, 1902)

Pitar simpsoni (Dall, 1895) **(PL 6)**

Timoclea grus (Holmes, 1858)

Transennella conradina (Dall, 1884) **(PL 6)**

TELLINIDAE

Angulus texanus (Dall, 1900)

Eurytellina alternata (Say, 1822) **(PL 6)**

Merisca aequistriata (Say, 1824)

Tellidora cristata (Recluz, 1842) **(PL 6)**

SEMELIDAE

Abra aequalis (Say, 1822) **(PL 6)**

Cumingia tellinoides (Conrad, 1831)

Ervilia polita Dall, 1898

Semele bellastrata (Conrad, 1837) **(PL 6)**

Semele proficua (Pulteney, 1799) **(PL 6)**

SOLECURTIDAE

Tagelus divisus (Spengler, 1794)

MACTRIDAE

Mactrotoma fragilis (Gmelin, 1791)

Mulinia lateralis (Say, 1822) **(PL 7)**

Raeta plicatella (Lamarck, 1818) **(PL 7)**

Rangia cuneata (Sowerby I, 1831)

DREISSENIDAE

Mytilopsis leucophaeata (Conrad, 1831)

(PL 7)

MYIDAE

Sphenia tumida Lewis, 1968 **(PL 7)**

CORBULIDAE

Caryocorbula caribaea (d'Orbigny, 1853)

Caryocorbula contracta (Say, 1822) **(PL 7)**

PHOLADIDAE

Cyrtopleura costata (Linnaeus, 1758)

Martesia striata (Linnaeus, 1758) **(PL 7)**

SCAPHOPODA

DENTALIDAE

Dentalium sp. cf. *laqueatum* (Verrill, 1885)

GASTROPODA

FISSURELLIDAE

Diodora cayenensis (Lamarck, 1822)

(PL 8)

Lucapina suffusa (Reeve, 1850)

TURBINIDAE

Astrarium phoebium (Roding, 1798) **(PL 8)**

Turbo castanea Gmelin, 1791

TROCHIDAE

Tegula fasciata (Born, 1778) **(PL 8)**

CALLIOSTOMATIDAE

Calliostoma jujubinum (Gmelin, 1791)

Calliostoma tampaense (Conrad, 1846)

NERITIDAE

Neritina usnea (Roding, 1798)

Neritina virginea (Linnaeus, 1758) **(PL 8)**

Smaragdia viridis (Linnaeus, 1758)

VIVIPARIDAE

Viviparus georgianus (I. Lea, 1834) (PL 8)

AMPULLARIIDAE

Pomacea paludosa (Say, 1829) (PL 8)

CERITHIIDAE

Bittium varium (Pfeiffer, 1840) (PL 8)

Cerithium atratum (Born, 1778) (PL 8)

Cerithium eburneum Bruguiere, 1792

Cerithium guinaicum Philippi, 1849

Cerithium lutosum Menke, 1828

Cerithium muscarum Say, 1832 (PL 8)

BATILLARIIDAE

Batillaria minima (Gmelin, 1791)

POTAMIDIDAE

Cerithidea costata (da Costa, 1778)

Cerithidea scalariformis (Say, 1822)

Pyrazisinus gravesae (Petuch, 1994)

Pyrazisinus scalatus (Heilprin, 1886) (PL 8)

Pyrazisinus ultimus (Petuch, 2004)

MODULIDAE

Modulus calusa Petuch, 1988

Modulus modulus (Linnaeus, 1758) (PL 8)

Modulus pacei Petuch, 1987

TURRITELLIDAE

Torcula acropora (Dall, 1889)

Turritella subannulata Heilprin, 1886 (PL 8)

Vermicularia spirata (Phillipi, 1836) (PL 8)

LITTORINIDAE

Littorina angulifera (Lamarck, 1822)

RISSOIDAE

Schwartziella catesbyana (d'Orbigny, 1842)

Schwartziella chesnelii (Michaud, 1830)

HYDROBIIDAE

Tryonia aequicostata (Pilsbry, 1889)

TORNIDAE

Anticlimax pilsbryi (McGinty, 1945)

Cyclostremiscus pentagonus (Gabb, 1873)

Solariorbis infracaratus (Gabb, 1881)

Vitrinella floridana Pilsbry & McGinty, 1946

VITRINELLIDAE

Episcynia inornata (d'Orbigny, 1842)

CAECIDAE

Caecum imbricatum Carpenter, 1858

Caecum pulchellum Stimpson, 1851

Caecum strigosum Folin, 1868

Meioceras nitidum (Stimpson, 1851)

STROMBIDAE

Lobatus costatus (Gmelin, 1791)

Lobatus gigas (Linnaeus, 1758)

Lobatus raninus (Gmelin, 1791)

Strombus alatus Gmelin, 1791 (PL 9)

CALYPTRAEIDAE

Bostrycapulus aculeatus (Gmelin, 1791)

(PL 9)

Calyptraea centralis (Conrad, 1841)

Crepidula convexa Say, 1822

Crepidula fornicata (Linnaeus, 1758)

Crepidula maculosa Conrad, 1846

Crepidula plana Say, 1822

Crucibulum auricula (Gmelin, 1791)

Crucibulum striatum Say, 1824 (PL 9)

XENOPHORIDAE

Xenophora conchyliphora (Born, 1780)

CYPRAEIDAE

Macrocypraea cervus (Linnaeus, 1771)

OVULIDAE

Cymbovula acicularis (Lamarck, 1811)

Cyphoma gibbosum (Linnaeus, 1758)

TRIVIIDAE

Hespererato maugeriae (Gray, 1832)

Niveria sp. cf. *suffusa* (Gray, 1827)

Pusula pediculus (Linnaeus, 1758) (PL 9)

Pusula radians (Lamarck, 1811)

NATICIDAE

Naticarius canrena (Linnaeus, 1758) (PL 9)

Neverita duplicata (Say, 1822)

Polinices lacteus (Guilding, 1834)

Polinices porcellanus (d'Orbigny, 1839)

Polinices uber (Valenciennes, 1832)

Sinum perspectivum (Say, 1831)

Tectonatica pusilla (Say, 1822)

CASSIDAE

Cassis madagascariensis Lamarck, 1822
Semicassis granulatum (Born, 1778)

TONNIDAE

Tonna galea (Linnaeus, 1758)

FICIDAE

Ficus communis Roding, 1798 (PL 9)

CERITHIOPSISIDAE

Cerithiopsis greeni (Adams, C.B., 1839)
Seila adamsii (Lea, H.C., 1845)

TRIPHORIDAE

Marshallora nigrocincta (Adams, C.B., 1839)

EPITONIIDAE

Epitonium lamellosum (Lamarck, 1822)

MURICIDAE

Calotrophon ostrearum (Conrad, 1846) (PL 9)
Chicoreus dilectus (Adams, A., 1855)
Eupleura caudata (Say, 1822)
Eupleura sulcidentata Dall, 1890
Eupleura tampaensis (Conrad, 1846)
Favartia cellulosa (Conrad, 1846)
Hexaplex fulvescens (Sowerby, 1834)
Phyllonotus pomum (Gmelin, 1791)
Stramonita haemastoma (Linnaeus, 1767) (PL 9)
Urosalpinx cinerea (Say, 1822)
Urosalpinx perrugata (Conrad, 1846)

TURBINELLIDAE

Turbinella wheeleri Petuch, 1994
Vasum muricatum (Born, 1778)

BUCCINIDAE

Bailya intricata (Dall, 1884)
Cantharus multangulus (Philippi, 1848)
Gemophos tinctus (Conrad, 1846) (PL 9)
Solenosteira cancellaria (Conrad, 1846)

MELONGENIDAE

Busycotypus canaliculatus (Linnaeus, 1758) (PL 9)
Busycotypus spiratus (Lamarck, 1816)
Melongena corona (Gmelin, 1791)
Melongena melongena (Linnaeus, 1758)

Sinistrofulgur sinistrum (Hollister, 1958)
Sinistrofulgur perversum (Linnaeus, 1758)

NASSARIIDAE

Nassarius acutus (Say, 1822)
Nassarius albus (Say, 1826) (PL 9)
Nassarius bidentatus Emmons, 1858
Nassarius vibex (Say, 1822)

FASCIOLARIIDAE

Fasciolaria liliium Fischer, G., 1807
Fasciolaria tulipa (Linnaeus, 1758) (PL 10)
Polygona angulata (Roding, 1798)
Triplofusus giganteus (Kiener, 1840) (PL 10)

COLUMBELLIDAE

Astyris lunata (Say, 1826)
Columbella mercatoria (Linnaeus, 1758) (PL 10)
Columbella rusticooides Heilprin, 1886
Costoanachis avara (Say, 1822)
Nitidella nitida (Lamarck, 1822)
Parvanachis obesa (Adams, C.B., 1845)

OLIVIDAE

Oliva bollingi Clench, 1934
Oliva sayana Ravenel, 1834 (PL 10)
Olivella mutica (Say, 1822)
Olivella pusilla (Marrat, 1871) (PL 10)

CYSTISCIDAE

Granulina ovuliformis (d'Orbigny, 1842)

MARGINELLIDAE

Dentimargo eburneolus (Conrad, 1834)
Prunum apicinum (Menke, 1828) (PL 10)
Prunum bellum (Dall, 1890)
Prunum guttatum (Dillwyn, 1817)

MITRIDAE

Mitra semiferruginea Reeve, 1845

CANCELLARIDAE

Cancellaria reticulata (Linnaeus, 1767)
Trigonostoma tenerum (Philippi, 1848)

TEREBRIDAE

Hastula cinerea (Born, 1778)
Terebra concava Say, 1826
Terebra dislocata (Say, 1822) (PL 10)
Terebra protexta (Conrad, 1846)

Terebra vinosa Dall, 1889

TURRIDAE

Kurtziella cerina (Kurtz & Stimpson, 1851)
Pilsbryspira leucocyma (Dall, 1884)
Pyrgocythara plicosa (Adams, C.B., 1850)
Pyrgospira tampaensis (Bartsch & Rehder, 1939)

CONIDAE

Conus sp. cf. *largillerti* Kiener, 1845
Conus jaspideus Gmelin, 1791 (PL 10)
Conus spurius Gmelin, 1791 (PL 10)

ARCHITECTONICIDAE

Architectonica nobilis Roding, 1798

PYRAMIDELLIDAE

Boonea seminuda (Adams, C.B., 1839)
Longchaeus suturalis Lea, H.C., 1843
Odostomia acutidens Dall, 1884
Odostomia laevigata (d'Orbigny, 1841)
Turbonilla hemphilli Bush, 1899

ACTEONIDAE

Japonactaeon punctostriatus (Adams, C.B., 1840)

CYLICHNIDAE

Acteocina canaliculata (Say, 1826)
Acteocina candei (d'Orbigny, 1841)

BULLIDAE

Bulla occidentalis Adams, A., 1850 (PL 10)

ELLOBIIDAE

Melampus bidentatus Say, 1822
Melampus coffea (Linnaeus, 1758)
Melampus monile (Bruguiere, 1789)

LYMNAEDIDAE

Fossaria cubensis (Pfeiffer, 1839)
Pseudosuccinea columella (Say, 1817)

PHYSIDAE

Physella heterostropha (Say, 1817)

PLANORBIDAE

Biomphalaria havanensis (Pfeiffer, 1839)
Gyraulus parvus (Say, 1817)
Micromenetus alabamensis (Pilsbry, 1895)
Micromenetus dilatatus (Gould, 1847)

Planorbella conanti (Dall, 1890)
Planorbella disstoni (Dall, 1890)
Planorbella duryi (Wetherby, 1879)
Planorbella scalaris (Jay, 1839) (PL 10)

ANCYLIDAE

Ferrissia hendersoni (Walker, 1908)
Hebetoncyclus excentricus (Morelet, 1851)
Laevapex peninsulae (Pilsbry, 1903)

CARYCHIIDAE

Carychium mexicanum Pilsbry, 1891

PUPILLIDAE

Gastrocopta contracta (Say, 1822)
Gastrocopta pentodon (Say, 1822)
Gastrocopta rupicola (Say, 1821)
Pupoides albilabris (Adams, C.B., 1842)
Vertigo milium (Gould, 1840)
Vertigo ovata Say, 1822

STROBILOPSIDAE

Strobilops hubbardi Brown, A.D., 1861
Strobilops texanianus Pilsbry and Ferriss, 1906

SPIRAXIDAE

Euglandina rosea (Ferussac, 1818) (PL 10)

ZONITIDAE

Glyphyalinia indentata (Say, 1823)
Hawaiiia minuscula (Binney, A., 1841)
Nesovitrea dallilana (Pilsbry and Simpson, 1889)
Zonitoides arboreus (Say, 1816)

POLYGYRIDAE

Daedalochila uvulifera (Shuttleworth, 1852)
PL 10
Polygyra cereolus (Muhlfeld, 1816)
Polygyra septemvolva Say, 1818 (PL 10)

PERTINENT REFERENCES

- Cooke, C. W. and S. Mossom. 1929. Geology of Florida. Florida Geological Survey, Twentieth Annual Report: 29-228.
- Daley, G. M. 2002. Creating a paleoecological framework for evolutionary and paleoecological studies: An example from the Fort Thompson Formation (Pleistocene) of Florida. *Palaios*, 17: 419-434.
- Dall, W. H. 1890-1903. Contributions to the Tertiary fauna of Florida, with especial references to the Miocene Silex-beds of Tampa and the Pliocene beds of the Caloosahatchie River: Transactions of the Wagner Free Institute of Science. Philadelphia, 3(1-6): 1654 pp., 60 pls.
- DuBar, J. R. 1958a. Stratigraphy and paleontology of the Late Neogene strata of the Caloosahatchie River area of southern Florida. Florida Geological Survey Bulletin, 40: 267 pp.
- DuBar, J. R. 1958b. Neogene stratigraphy of southwestern Florida. Transactions of the Gulf Coast Association of Geological Societies, 8: 129-155.
- DuBar, J. R. 1962. Neogene biostratigraphy of the Charlotte Harbor area in southwestern Florida. Florida Geological Survey Bulletin, 43: 83 pp.
- DuBar, J. R. 1974. Summary of the Neogene stratigraphy of southern Florida. Pp. 206-221 in R. Q. Oaks and J. R. DuBar (eds.). Post-Miocene Stratigraphy Central and Southern Atlantic Coastal Plain. Utah State University Press, Logan, Utah.
- Jones, D. S., P. A. Mueller, T. Acosta, and R. D. Shuster. Strontium isotopic stratigraphy and age estimates for the Leisey Shell Pit faunas, Hillsborough County, Florida. Pp. 94-105 in R. C. Hulbert, Jr., G. S. Morgan, and S. D. Webb (volume eds.). Paleontology and geology of the Leisey Shell pits, Early Pleistocene of Florida. Bulletin of the Florida Museum of Natural History, 37(1).
- Karrow, P. F., G. S. Morgan, R. W. Portell, E. Simmons and K. Aufferberg. Middle Pleistocene (early Rancholabrean) vertebrates and associated marine and non-marine invertebrates from Oldsmar, Pinellas County, Florida. Pp. 97-133 in K. M. Stewart & K. L. Seymour (eds.). Palaeoecology and palaeoenvironments of Late Cenozoic mammals: tributes to the career of C.S. (Rufus) Churcher. *University of Toronto Press*.
- Lewis, J. E. 1968. Taxonomy and paleoecology of a new species of *Sphenia* (Bivalvia; Myidae) from the Pleistocene of Florida. *Tulane Studies in Geology and Paleontology*, 6(1): 23-32.
- Lyons, W. G. 1991. Post-Miocene species of *Latirus* Montfort, 1810 (Mollusca: Fascioliariidae) of southern Florida, with a review of regional marine biostratigraphy. *Bulletin of the Florida Museum of Natural History*, 35(3): 131-208.
- Mansfield, W. C. 1939. Notes on the upper Tertiary and Pleistocene mollusks of peninsular Florida. Florida Geological Survey Bulletin, 18: 75 pp.

- Mikkelsen, P. M. and R. Bieler. 2008. *Seashells of Southern Florida: Living Marine Mollusks of the Florida Keys and Adjacent Regions, Bivalves*. Princeton University Press, Princeton, New Jersey, 503 pp.
- Morgan, G. S. and R. W. Portell. 1996. The Tucker Borrow Pit: Paleontology and stratigraphy of a Plio-Pleistocene fossil site in Brevard County, Florida. *Papers in Florida Paleontology*, 7: 1-25.
- Olsson, A. A. and A. Harbison. 2008. Pliocene Mollusca of southern Florida with special reference to those from north Saint Petersburg. *The Academy of Natural Sciences of Philadelphia, Monograph* 8, 457 pp.
- Petuch, E. J. 1994. *Atlas of Florida Fossil Shells (Pliocene and Pleistocene Marine Gastropods)*. The Graves Museum of Archaeology and Natural History, Dania Florida, with Chicago Spectrum Press, Evanston, IL, 394 pp.
- Petuch, E. J. and C. Roberts. 2007. *The Geology of the Everglades and adjacent areas*. CRC Press. Boca Raton, 212 pp.
- Portell, R.W. and K.S. Schindler. 1991. *Menippe mercenaria* (Decapoda: Xanthidae from the Pleistocene of Florida. *Papers in Florida Paleontology*, 3: 1-8.
- Portell, R. W., K. S. Schindler, and D. Nicol. 1995. Biostratigraphy and paleoecology of the Pleistocene invertebrates from the Leisey Shell Pits, Hillsborough County Florida. Pp. 127-164 *in* R. C. Hulbert, Jr., G. S. Morgan, and S. D. Webb (volume eds.). *Paleontology and geology of the Leisey Shell pits, Early Pleistocene of Florida*. *Bulletin of the Florida Museum of Natural History*, 37(1).
- Puri, H. S. and V. V. Vanstrum 1969. Geologic history of the Miocene and younger sediments in south Florida. Pp. 70-86 *in* J. R. DuBar and S. S. DuBar (eds.). *Late Cenozoic stratigraphy of southwestern Florida*. Gulf Coast Association of Geological Societies, Society of Economic Mineralogists and Paleontologists, Miami Beach, Guidebook Field Trip 4.
- Rosenberg, G. 2009. Malacolog 4.1.1: A database of western Atlantic marine Mollusca. [WWW database (version 4.1.1)] URL:<http://www.malacolog.org/>.
- Turgeon, D. D., J. F. Quinn, Jr., A. E. Bogan, E. V. Coan, F. G. Hochberg, W. G. Lyons, P. M. Mikkelsen, R. J. Neves, C. F. E. Roper, G. Rosenberg, B. Roth, A. Scheltema, F. G. Thompson, M. Vecchione, and J. D. Williams. 1998. *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks*. 2nd edition. American Fisheries Society, Special Publication 26, Bethesda, Maryland.
- Vokes, E. H. 1967. Cenozoic Muricidae of the Western Atlantic Region: Part III – *Chicoreus* (*Phyllonotus*). *Tulane Studies in Geology and Paleontology*, 5(3): 133-166.