EARLY PLEISTOCENE FRESHWATER BIVALVES (MOLLUSCA:UNIONIDAE) FROM THE LEISEY SHELL PITS, HILLSBOROUGH COUNTY, FLORIDA

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ABSTRACT

Unionid valves are reported from the early Pleistocene Bermont Formation at the Leisey Shell Pits, Hillsborough County, Florida. Collected from the base of Leisey Shell Pit 3 were numerous valves of *Utterbackia* sp. cf. *U. imbecillis* (Say 1829) and *Megalonaias boykiniana* (Lea 1840) and from the base of Leisey Shell Pit 1 several valves of *Elliptoideus sloatianus* (Lea 1840) were collected. A matched pair of *Megalonaias* valves was also obtained from spoil at Leisey Shell Pit 1 and is most likely from the same horizon as the *Elliptoideus*. These southern Florida unionid remains represent the oldest Cenozoic freshwater bivalve fauna in the eastern United States. The fossil occurrence of *Megalonaias* and *Elliptoideus*, 320 kilometers south of their modern range limit in the panhandle of Florida, points to a major range contraction of these unionid species in peninsular Florida since the Pleistocene.

RESUMEN

Se reportan valvas unionidas provenientes de la formación de Bermont del Pleistoceno temprano en los depósitos de conchuelas de Leisey, en el condado de Hillborough, Florida. Se colectaron numerosas valvas de *Utterbackia* sp. cf. *U. imbecillis* (Say 1829) y de *Megalonaias boykiniana* (Lea 1840) desde la base del depósito de conchuelas de Leisey 3. Adicionalmente, se colectaron varias valvas de *Elliptoideus sloatianus* (Lea 1840) desde la base del depósito de conchuelas de Leisey 1. También se obtuvo un par concordante de valvas de *Megalonaias* desde desechos en el depósito de conchuelas de Leisey 1, y muy probablemente desde el mismo horizonte que *Elliptoideus*. Estos restos unionídeos del sur de Florida representan la fauna más antigua de vivalvos de agua dulce del Cenozoico del Este de los Estados Unidos. La ocurrencia fósil de *Megalonaias* y *Elliptoideus* 320 km más al sur que su rango actual en Florida no peninsular, señala una gran contracción durante el Pleistoceno en la distribución de estas especies unionídeas en Florida peninsular.

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INTRODUCTION

The unionid fossil record of the eastern United States is rather limited. Evidence of freshwater bivalves is primarily restricted to late Pleistocene (Wisconsinan) deposits (Henderson 1935; Modell 1957; Bogan and Grady 1991). Two reported unionid faunas support the ancient history of the diversity of freshwater bivalves in the eastern United States. One of these, the Fishhouse Local Fauna from New Jersey, is represented by 12 described species (Kat 1983; Bogan et al. 1989) and dates to about 125,000 YBP. The taxa recognized in this fauna are only a portion of those expected from an historic Atlantic Slope freshwater fauna. The other Pleistocene freshwater bivalve fauna is from Hamilton Cave, West Virginia, located on the headwaters of the Potomac River. On the basis of microtine rodent species, the Hamilton Cave deposits were dated from between 740,000 and 850,000 YBP (Irvingtonian II) (Bogan and Grady 1991). This fauna includes at least four species of unionids, all of which are found in the area today with one genus possibly having a more southern modern distribution. Other Pleistocene records of unionids from along the Atlantic Coast are of isolated valves (Bogan and Grady 1991).

Two species, *Elliptio caloosaensis* (Dall 1898) and *Elliptio pachyodon* Pilsbry 1953, have been described from older deposits (Pliocene) of southern Florida but are not considered to represent faunas. Each species was collected separately and no other freshwater bivalves were associated. Two Texas faunas older than the Leisey fauna are known from the Pliocene Reynosa Formation (Marshall 1929) and the late Miocene Catahoula Sandstone (MacNeil 1935).

The purpose of this paper is to document the occurrence of the oldest unionid fauna in the eastern United States. Four identifiable freshwater bivalve taxa were collected from the Leisey Shell Pits, located on the southeast edge of Tampa Bay, Hillsborough County, Florida (W1/2, Sec.15, T32S, R18E, Ruskin Quadrangle, USGS 7.5 minute series; Fig. 1). Most specimens were collected from freshwater exposures at the base of the lowermost marine shell unit at Leisey Shell Pits 1 and 3 (Fig. 2). On the basis of the marine molluscan fauna, Hulbert and Morgan (1989) placed this lowermost shell bed (lower shell bed of Portell et al., this volume) in the early Pleistocene Bermont Formation.

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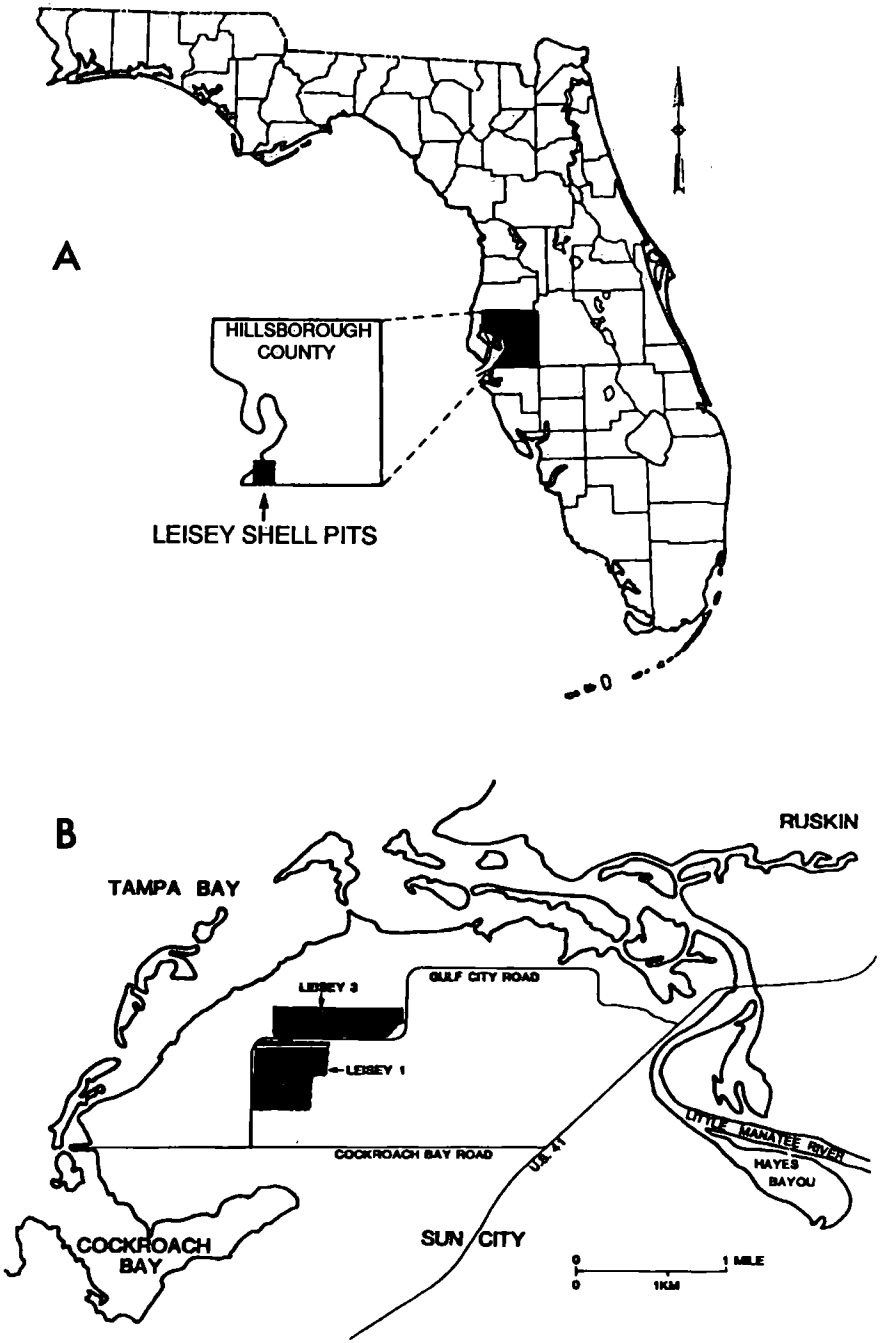

Figure 1. (A) General location map of the Leisey Shell Pits, Hillsborough County, Florida. (B) Specific location map of Leisey Shell Pit 1 and 3.

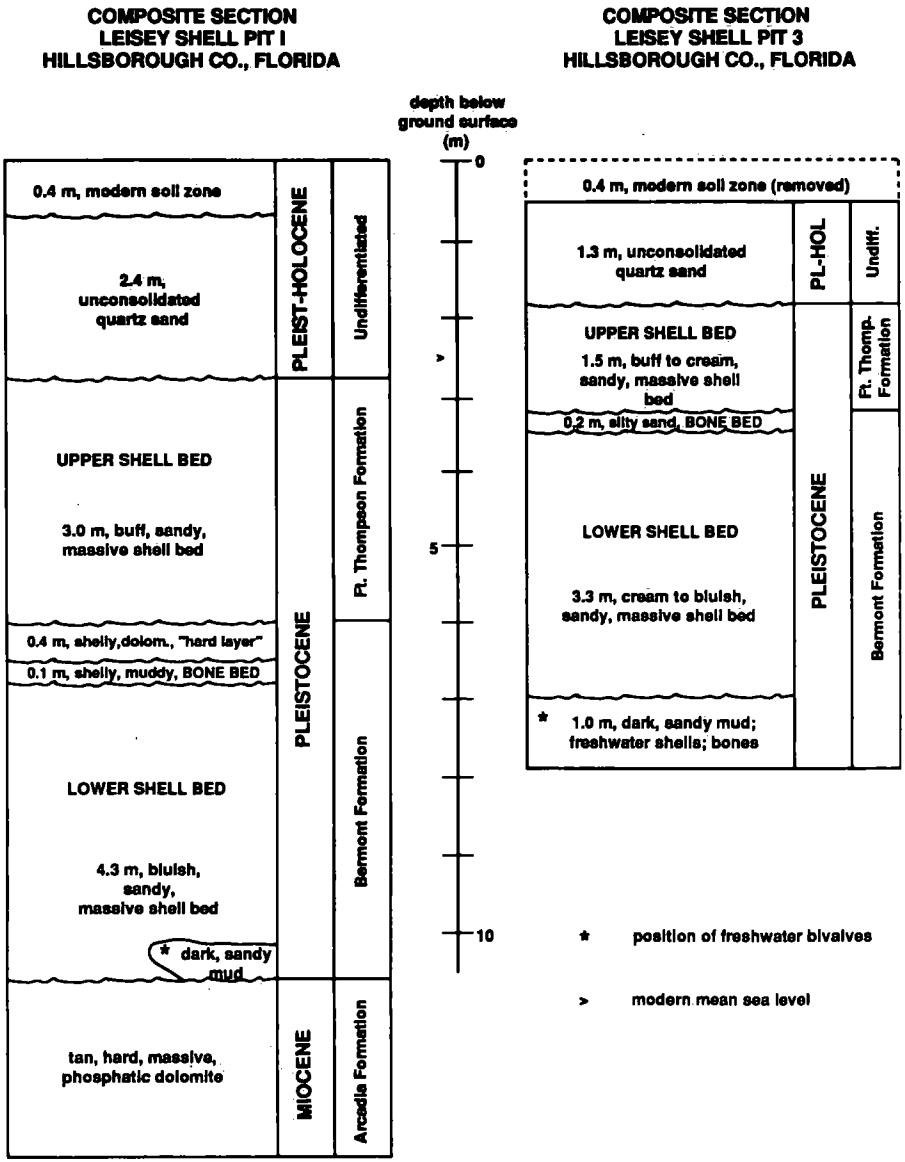

Figure 2. Composite geologic sections of Leisey Shell Pit 1 and 3 modified slightly from Hulbert and Morgan (1989). The position from which the freshwater bivalves were collected is also shown.

provided notes on the stratigraphy of the south Florida marine deposits. Steven Stanley, Johns Hopkins

University, Baltimore, Maryland, is thanked for discussing the complexities of the Plio-Pleistocene stratigraphy and the problems of dating these deposits. Thomas M. Cronin, U.S. Geological Survey, Reston, Virginia, discussed the problems of sea level fluctuations and the difficulties in dating various outcrops. Warren Allmon, Paleontological Research Institute, Ithaca, New York, also discussed his views of the dating of the Pleistocene fossiliferous deposits of south Florida. George M. Davis and Gary Rosenberg, Department of Malacology, Academy of Natural Sciences of Philadelphia, are thanked for providing access to the Academy collections. We acknowledge the support of National Science Foundation Grant BSR9002689. An earlier version of this paper was presented at the American Malacological Union Annual Meeting, Woods Hole, Massachusetts, June 1990 (Bogan and Portell 1990). This is University of Florida Contribution to Paleobiology number 388.

MATERIALS AND METHODS

The 37 unionid valves discussed here were collected between 1984 and 1990 (Table 1). Frank Garcia collected the pair of *Megalonaias boykiniana* valves (Figure 3) from spoil and Gary Morgan collected the five valves of *Elliptoideus sloatianus* and one valve of *Megalonaias boykiniana* from *in situ* freshwater lenses at the base of Leisey Shell Pit 1. Roger Portell and Kevin Schindler collected a total of 30 valves of *Utterbackia* sp. cf. *U. imbecillis*, cf. *Utterbackia* sp., *Megalonaias boykiniana*, and *Villosa* sp. from the base of the lowermost shell bed at Leisey Shell Pit 3. All specimens were stabilized using Butvar 76 thinned with acetone and the fragile valves of *Utterbackia* were left on matrix. Individual valves were compared to Recent specimens housed in the Malacology Collection and the Pliocene fossil material in the Invertebrate Paleontology Collections of the Florida Museum of Natural History and the Academy of Natural Sciences of Philadelphia. The taxonomy utilized in this report follows that of Turgeon et al. (1988). A list of all unionid specimens with identification, description of valve, and from which Leisey Shell Pit the material was collected is presented in

Table 1. Summary of freshwater bivalves from the Leisey Shell Pits. Number of valves signified with a "v".

Taxa	Leisey Pit 1	Leisey Pit 3
Utterbackia cf. *U. imbecillis*	-	15 v
cf. *Utterbackia* sp.	-	1 v
Elliptoideus sloatianus	5 v	-
Megalonaias boykiniana	3 v	10 v
Villosa sp.	-	1 v
Indeterminate Unionidae	2 v	-
Total	10 v	27 v

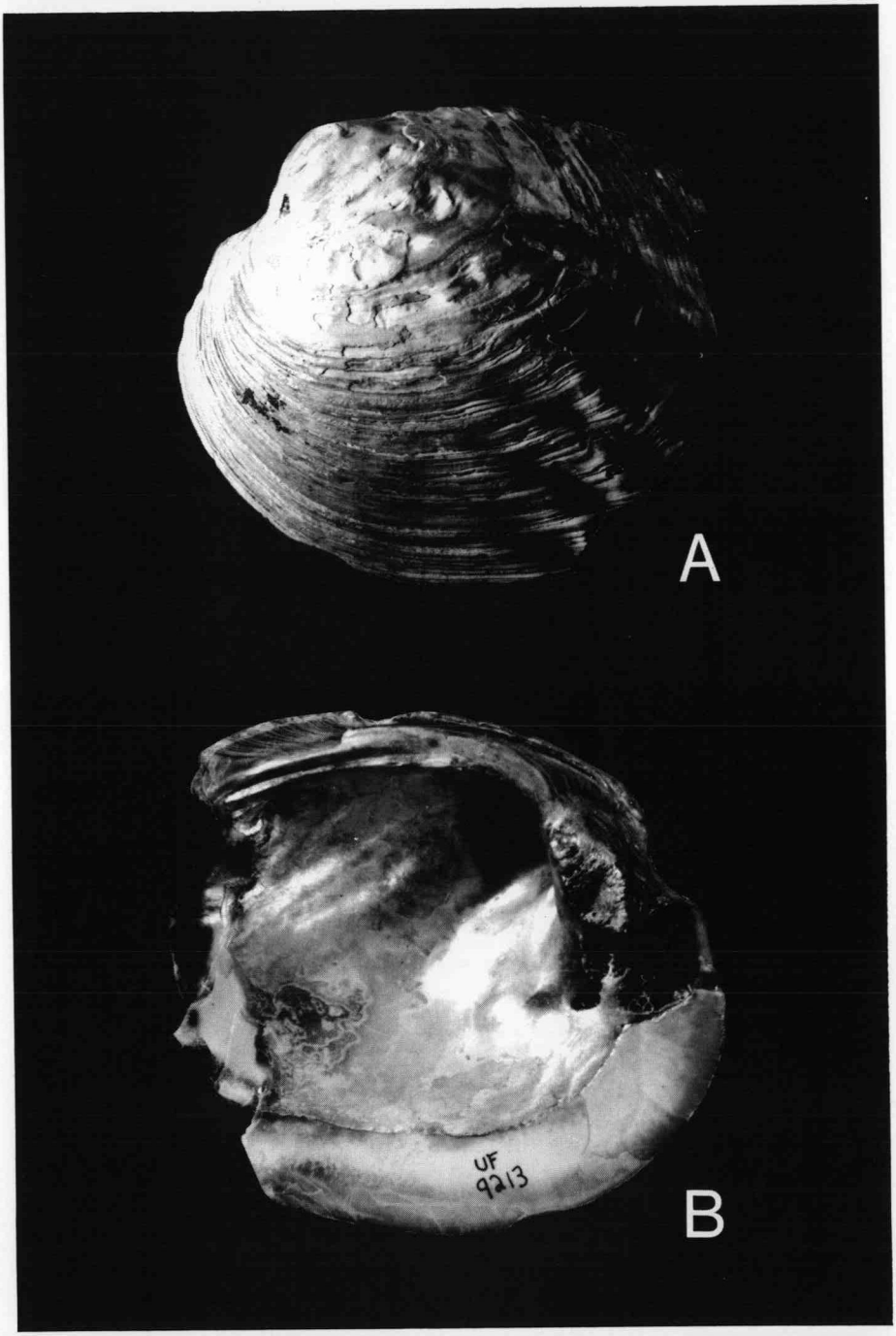

Figure 3. *Megalonaias boykiniana* (Lea), UF 9213. (A) external view of left valve, (B) internal view of left valve. Valve length is 11.7 cm and height is 10.5 cm.

Appendix 1. All of the specimens discussed in this paper are reposited in the Invertebrate Paleontology Division at the Florida Museum of Natural History, Gainesville, Florida.

AGE OF FAUNA

The *in situ* freshwater bivalves from the base of the lowermost shell bed at Leisey Shell Pit 1 are from below the lowest strontium sample with a reported date of 2.4 myr and the *Utterbackia* are from below the lowest strontium sample taken at Leisey Shell Pit 3 with a reported date of 2.07 myr (Jones et al., this volume). The date of 2.4 myr is too old if these deposits are actually Pleistocene in age. The strontium date of 2.07 myr with an associated minimum error of ± 0.57 myr results in a minimum age of 1.5 myr. The paleomagnetic samples from the Leisey Shell Pits are interpreted as being reversed and are not from the Olduvai subchron but probably represent the Matuyama Magnetochron with a date less than 1.6 myr (MacFadden, this volume). The suggested age of the vertebrate assemblage is ca 1.5 - 1.0 myr (Morgan and Hulbert, this volume). Based on the date for the beginning of the Pleistocene of 1.6 myr (Berggren et al. 1985), the range of error for the strontium dates, and the paleomagnetic data, the age of the unionid samples is probably early Pleistocene, with an age of 1.6 - 1.0 myr. For a detailed discussion of the stratigraphy of the Leisey Shell Pits, see the companion papers in this volume by Morgan and Hulbert, Portell et al., Jones et al., and MacFadden.

DISCUSSION

The modern unionid fauna of the panhandle and peninsular Florida has been surveyed, and problems with the identification of individual species examined (Athearn 1964; Butler 1989; Clench and Turner 1956; Heard 1977, 1979; Johnson 1965, 1967, 1968, 1969, 1972, 1977; Sepkoski and Rex 1974; and van der Schalie 1940a,b). These reports document a decrease in the diversity of unionid species from the major river systems of the Florida Panhandle to the east and south into peninsular Florida: Apalachicola River (33 species); Ochlockonee River (20 species); Suwannee River (13 species); Waccasassa River (2 species); Withlacoochee River (9 species); Hillsborough River (9 species); Peace River (8 species); and Alafia River (6 species). This pattern of decreasing diversity in the unionid bivalve fauna from west to east along the Gulf Coast of Florida is also apparent in the freshwater fish fauna (Gilbert 1987; Swift et al. 1986: fig. 7.4). The distributional analysis of the fish fauna fits very closely with that of the unionids as presented by Sepkoski and Rex (1974). This similarity may be

explained by the host/parasite relationship of freshwater fish and the unionid larval stage.

The unionid genera, *Utterbackia* and *Villosa* are currently found in lakes on the Gulf Coast of Florida and in backwater areas of coastal plain rivers, typically in sand bottoms with little or no current (Johnson 1972). *Elliptoideus* and *Megalonaias* are much larger species and appear to be restricted to large rivers and streams. *Elliptoideus sloatianus* is presently confined to the Ochlockonee and Apalachicola River systems of Florida (Clench and Turner 1956:174-175). The fossil occurrence of these two large river species about 320 kilometers south of their known modern range is significant and documents a much wider former range. Their presence in the Tampa Bay area can only be explained by a much larger river draining this area during the early Pleistocene when sea level would have been lower than today. Based on the stratigraphic position of the unionid-bearing sediments (see Fig. 2), the sea level must have been a minimum of six to ten meters lower than present which could have allowed a river system to extend significantly farther to the west. The flat Coastal Plain would have presented opportunities for the transfer of species during flood conditions and by the confluence of many of the coastal rivers creating large complex drainages. One possible explanation for the disappearance of these species from peninsular Florida is that the present drainage basin in the Tampa Bay area is not of adequate size to support a large river and hence the species or its host fishes. The unionid fauna of peninsular Florida has decreased in diversity due to rising sea levels which caused the drowning of the lower reaches of the western rivers and severe restrictions of drainage basins.

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APPENDIX 1

The following is a list of all unionid specimens with identification, description of valve and from which Leisey Shell Pit the material was collected.

Utterbackia sp. cf. *U. imbecillis* (Say 1829). All specimens have a straight hinge line with the beak below the level of the hinge.

Leisey Shell Pit 3:

UF 31472. 1 right valve fragment of hinge line and disc very distinct, wavy beak sculpture.

UF 31473. 1 left valve fragment with hinge line, enough of the disc remains to show inflation of the shell, very distinct wavy beak sculpture, on matrix.

UF 31474. 1 right valve fragment with hinge line, good wavy beak sculpture, on matrix.

UF 31475. 1 right valve fragment with hinge line and disc, faint evidence of wavy beak sculpture, on matrix.

UF 31489. 1 left valve fragment with hinge line, good wavy beak sculpture, on matrix.

UF 31491. 1 right valve hinge fragment, thin shell, with distinct beak sculpture of v and straight line sculpture.

UF 31492. 1 left valve fragment with hinge line and disc, no beak sculpture observed, also what appears to be periostracum retained, on matrix.

UF 31493. 1 left valve fragment of hinge line with clear concentric beak sculpture.

UF 31494. 1 left valve fragment of hinge line with wavy beak sculpture.

UF 31495. 2 fragments of same right valve central disc area, no hinge line.

UF 31496. 1 fragment of right valve disc area, no hinge area or beak, somewhat inflated shell.

UF 31498. 1 fragment of left valve disc area, no hinge area or beak, inflated shell.

UF 31499. 1 left valve fragment with hinge line and beak, beak at hinge line, wavy beak sculpture.

UF 39661. 1 left valve, nearly complete, lacking posterior and ventral margins.

cf. *Utterbackia* sp.

Leisey Shell Pit 3:

UF 31490. 1 valve fragment, resembles other *Utterbackia* specimens, on matrix.

Elliptoideus sloatianus (Lea 1840).

Leisey Shell Pit 1:

UF 39671. 2 right valves with hinge line and disk area of shell, lacking posterior and ventral margins.

UF 39670. 1 left and 1 right valve with hinge line and disk area of shell, lacking posterior and ventral margins.

UF 39669. 1 right valve with hinge line and disk area of shell, lacking posterior and ventral margins.

Megalonaias boykiniana (Lea 1840)

Leisey Shell Pit 1:

UF 39668. 1 left valve with external sculpture and deep beak cavity, missing posterior and ventral margins.

UF 9213. 1 right and 1 left valve, a pair, complete except for the posterior margin, external surface of shell with sculpture intact.

Leisey Shell Pit 3:

UF 31476. 1 left valve fragment with outside intact, missing dorsal and posterior edges, lateral teeth and interdentum missing.

UF 31477. 1 right valve fragment with outside intact, missing dorsal and posterior margins, lateral teeth and interdentum missing.

UF 31478. 1 right valve fragment with umbo area and pseudocardinal teeth present and part of the disc of the shell, some exterior surface of the shell remains, interdentum and lateral teeth missing.

UF 31479. 1 left valve fragment with umbo and part of the disc preserved, lacking the interdentum and lateral teeth, some external surface remains.

UF 31480. 1 valve fragment with umbo and disc to ventral margin, lacking lateral teeth, with some external surface intact.

UF 31481. 1 left valve fragment with umbo and disc, lacking interdentum and lateral teeth, no external surface remaining.

UF 31482. 1 right valve umbonal fragment with pseudocardinal teeth and beak cavity but lacking the lateral teeth, no external surface remains.

UF 31483. 1 right valve umbo and disc fragment lacking interdentum and lateral teeth, no external surface remains.

UF 31484. 1 right valve umbo fragment lacking interdentum and lateral teeth, no external surface remains.

UF 31485. 1 left valve umbonal and disc fragment with pseudocardinal teeth and posterior section of the valve, lacking lateral teeth.

UF 31486. 11 shell fragments associated with the valves of *Megalonaias* - 3 fragments are from valves just ventral and posterior to the umbo, 2 have pedal retractor muscle scars.

Villosa sp.

Lelsey Shell Pit 3:

UF 31488. 1 right valve with umbo area with broken pseudocardinal and lateral teeth and some of the disc remaining.

Indeterminate Unionidae

Lelsey Shell Pit 1:

UF 39667. 1 left valve with anterior portion of lateral teeth, broken pseudocardinal teeth, missing anterior, posterior and ventral margins, no external surface remains. Based on the hinge area and the thickness of the shell, this fragment resembles *Elliptio crassidens* (Lamarck 1819).

Lelsey Shell Pit 3:

UF 31497. 1 right valve missing anterior, posterior and ventral margins, hinge line present but eroded, valve thickened anteriorly and thinning posteriorly. This valve resembles specimens of *Obovaria* but is too fragmentary for identification.