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MALACOLOGY DATA NET

Contents

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MALACOLOGY DATA NET

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Hard clam harvesting season in the coastal waters of Georgia

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Abstract

Under current law in Georgia, the harvesting of the hard clam, *Mercenaria mercenaria* (Linnaeus 1758), is prohibited annually from April 1 to June 30. A closed season is designed to ensure that clams are allowed the opportunity to spawn before removal from the population by commercial harvesting. In the opinion of the authors, a closed clam season in the coastal waters of Georgia is unwarranted. Reasons are discussed.

Introduction

The hard clam, *Mercenaria mercenaria* (Linnaeus 1758) represents a new fishery for the commercial fishermen in the coastal waters of Georgia. Although a commercial clam fishery existed at the turn of the century with peak landings occurring in 1908, the fishery collapsed by 1932 (Walker 1984). From 1935 to 1981, there were only 5 years in which clam harvests were reported. Since 1981, a renewed interest, by local and out-of-state clammers, in harvesting clams in Georgia has developed with slow but steadily increasing landings being reported.

Prior to 1984, a closed clam season (May 16 to August 14) existed in Georgia to protect spawning populations. The origin of this clam season is uncertain, but we assume this season was established to ensure that clam populations were allowed to spawn before harvesting. Presumably, this season was established in accordance with what was known about the reproductive biology of clam populations in more northern waters, the hub of the U. S. hard clam fishery. In the traditional clamming areas of the northeastern U. S., the major clam spawning season occurs during summer (Belding 1931; Loosanoff 1937; Landers 1954). In 1984 a study on the reproductive biology of Georgia hard clams showed that the major spawning period occurred in the spring with a second spawning occurring in the fall (Pline 1984). Thus in 1984, the closed season was changed to April 1 to June 30 by the Georgia General Assembly under recommendation from the Department of Natural Resources.

Once again, due primarily to economic pressures, there is considerable debate over the closed clamming season (Littlenecks, the most valuable commercial size class of clams, still commanding premium prices in April and a major clam market is the 4th of July trade). Discussion here is limited to those biological parameters directly related to hard clams. We also recognize that other biological parameters of the environment should be considered in the decision to open or close areas to the harvest of shellfish, such as the prevalence of toxic *Vibrios*, rainfall, and freshwater run-offs. However the Department of Natural Resources has the authority to close any or all areas if water quality parameters deteriorate, regardless whether the clam season is open or closed.

Discussion

If the hard clam fishery in the coastal waters of Georgia is to continue to grow, then one of the most important aspects of this debate is the reproductive biology of the clam. The gametogenetic cycle of the hard clam in Wassaw Sound, Georgia, was determined from March 1981 to May 1982 (Pline 1984). Reproductively active clams were present from March to December. Major spawning occurred in spring with a second smaller spawning peak in the fall. Unfortunately, this study was performed after the severe drought of 1980. What effects, if any, the drought with its increased salinity had on the reproductive cycle of the clam population is unknown. In December 1983, we began collecting monthly gonad samples for 2.5 years from a clam population at Little Tybee Island in Wassaw Sound. The results of this work show a continuous gametogenic cycle throughout the study period. A synchronized polymodal breeding pattern was evident, with three (Spring, Fall, and Winter) annual spawning peaks (Heffernan *et al.* in preparation). Thus, in Georgia, clams are spawning during three seasons rather than just over summer as in clam populations in the northeastern United States.

Clams are approximately two to three years old (Walker 1987) and have passed through at least one, but probably several spawnings before reaching harvestable size. A minimum legal size limit of 44.4 mm in shell length (25.4 mm in total shell thickness with valves appressed) for the harvesting of hard clams in Georgia waters is in effect. Hard clams may become sexually mature males at a shell length of 4 to 6 mm (Loosanoff 1936; 1937). Once clams obtain a shell length of 6 to 7 mm, all are sexually functional males and can be induced to spawn (Loosanoff 1936). Hard clams develop exclusively as males during their first year (Merrill and Tubiash 1970; Purchon 1977). A 50:50 ratio of males to females occurs during the second year (Merrill and Tubiash 1970; Saila and Pratt 1973; Purchon 1977; Eversole *et al.* 1980) and this ratio continues through the third year (Eversole *et al.* 1980). This ratio may remain constant throughout the life span of the hard clam which may be up to 40 years (Walker 1987). The reproductive potential (i.e., volume of gonadal material) increases with the size of the clam (Peterson 1983). Furthermore, the volume of gonadal material increases with clam size as described by a power function (Peterson 1983).

Another reason for seasonal closures of clam beds is to allow better recruitment. The rationale is that clamming by digging is detrimental to successful recruitment. In Georgia, clamming is done by hand or hand raking within the intertidal zone or in pools of water within the creek systems. However, recent studies question whether clamming interferes with recruitment (Peterson *et al.* 1987). Peterson *et al.* found no differences in local recruitment between sandflat plots harvested at two different intensities of mechanical clam harvesting ("clam kicking") and plots harvested by hand-raking or at the control plots.

In Georgia, most clam populations tend to occur deep into the creek systems of the marsh. Although populations may be, at times, dense (up to 150 clams per meter square), the total area of a population is often quite small (40 to 100 square meters). Generally the best clamming areas occur in small feeder creeks (e.g., 1 to 2 m wide at the mouth and running hundreds of meters into the marsh) most of which are inaccessible to boats. Because clams occur sporadically, in small beds and inaccessible areas, Georgia shellfish leases, which are required to commercially harvest shellfish, cover thousands of acres and may include highlands, marshes, creeks, and rivers. Typically, clammers harvest one creek until it becomes uneconomical for them to continue (i.e., densities become too low) and then they move on to another. Since it takes 2 to 3 years for clams to grow to marketable size, these harvested creeks are generally not visited again for at least a year, allowing the pre-legal littlenecks to grow to harvestable size. As these creeks are harvested by hand, which is relatively inefficient, many clams are missed. Furthermore, chowders (the largest commercial size-class of clams) are often left in the beds because of their low economic value and the sporadic nature of their market. Thus, harvesting year round is unlikely to cause a great decrease in the spawning potential of Georgia clam populations.

We believe a closed clamming season is unwarranted in the coastal waters of Georgia for the following biological reasons . Firstly, although it is questionable whether larvae spawned during winter can survive and grow (Dalton and Menzel 1983), there is little doubt that those spawned in spring and fall are viable. Secondly, the minimum size limit established in the harvesting of clams ensures that clams will go through at least one, and probably several, reproductive cycle(s) before they reach legal minimum harvest size. Thirdly, since in general, chowders are seldom harvested because of poor marketability and since they have a greater volume of gonadal material, they presumably provide tremendous spawning potential. This could change dramatically if markets for chowders are developed. Finally, since clam populations are spread over vast areas, fishermen are not likely to harvest every population within a leased area during a single spawning period. This, coupled with the occurrence of several spawning peaks per year, makes it questionable whether a closed clam season for biological reasons is warranted.

In conclusion, based on biological data, a closed clam season is not warranted. In economic terms, the removal of the closed season will allow fishermen to harvest and earn a living year round. It will also allow fishermen to harvest clams in ample time to take advantage of the 4th of July trade. However, the current practice of transplanting shellfish from unapproved (i.e., areas with marginal water quality) harvesting waters to approved waters, by law, can only occur during the closed season. By removing the closed season, the practice of transplanting shellfish will no longer be an option for supplementing a commercial fisherman's stocks of shellfish. Non-biological problems will have to be discussed and catered for by the industry and those who regulate it.

Acknowledgements

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Freshwater Bivalve Mollusks (Bivalvia: Unionidae) of Graham Creek, a Small Southeastern Indiana Stream

Jeff L. Harmon*

Abstract

Eleven sites on Graham Creek and one site on the upper Muscatatuck River in southeastern Indiana were surveyed for freshwater mussels over a four year period ending in 1988. Twenty-three species were collected from Graham Creek. The single Muscatatuck River site produced 18 species, of which all but one were collected in Graham Creek. Fresh specimens of *Epioblasma triquetra*, which is listed as endangered in Indiana, and *Simpsonaias ambigua*, listed as a species of special concern in Indiana, were each collected at several sites. *Corbicula fluminea* was found to be progressing up Graham Creek during this survey period. Graham Creek appears to be a high quality stream and is presently supporting a healthy and diverse population of bivalves.

Introduction

Knowledge of Indiana's molluscan fauna dates to the early 1800's when Rafinesque studied the fauna of the Ohio and Wabash Rivers. The most extensive works on Indiana's molluscs occurred from approximately 1890 to 1940 when freshwater mussel shells were economically important as a raw material for the pearl button industry. Goodrich and van der Schalie (1944) compiled this early information into their "A Revision of the Mollusca of Indiana".

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In more recent works, Taylor (1982) and Weilbaker et al. (1984) have highlighted the unfortunate lack of knowledge concerning the current status of freshwater bivalves in small southern Indiana rivers and streams. Mussel surveys on larger rivers, such as the White and Wabash Rivers (Krumholz et al., 1970) and the Ohio River (Taylor, 1979), are more common, and are often the result of pre- and/or post-impoundment or channelization studies. Impoundment, channelization, pollution, siltation, and commercial exploitation of shells for the Japanese cultured pearl industry are serving to reduce or eliminate bivalves from many larger rivers. This exemplifies the need for knowledge of the molluscan fauna of small rivers and streams thus far unaffected by such factors. The fauna of one such stream, Graham Creek in southeastern Indiana, is the subject of this paper.

Graham Creek originates south of Versailles in southern Indiana's Ripley County (Fig. 1). It flows southwest through the Jefferson Proving Grounds, a U.S. military reservation. Near San Jacinto in Jennings County, it is joined by its largest tributary, Little Graham Creek. It then continues to wind southwesterly through Jennings County. Near Paris Crossing, Graham Creek enters Jefferson County and is joined by Big Creek to form the Muscatatuck River, a tributary of the East Fork of the White River, part of the Wabash and Ohio River drainage system.

Graham Creek's watershed drains 114 square miles in a three county area. No large population centers are in Graham Creek's agriculturally based watershed and much of the streams length is inaccessible by road. Graham Creek's pools and riffles flow primarily over a limestone bedrock substrate. Sand and gravel bars occur frequently along the course of the stream. Currently, Graham Creek exists in a fairly undisturbed state. Nutrient enrichment from fertilizers and siltation from agricultural activities appear to be the greatest threats to this high quality stream.

Materials and Methods

A preliminary survey of the mussel population of Graham Creek was conducted from 1985 through 1987. During 1988, an extensive survey was conducted at 11 sites on Graham Creek and one site on the Muscatatuck River 2.3 miles below the confluence of Graham Creek and Big Creek (Fig. 1).

Collection sites were chosen on the basis of accessibility and the presence of sand or gravel bars from which shells could be collected. Several sites were visited on numerous occasions while others were collected only once. Shells were collected from the stream banks, sand and gravel bars, and shallow water. Middens, presumably from muskrats, provided many fresh specimens. No extensive efforts were made to collect living specimens, but, when observed, living specimens were identified, recorded and returned to the stream. Empty shells were gathered and later cleaned, identified, and recorded.

Voucher specimens have been placed in the authors private collection, The Ohio State University Museum of Zoology, and the Marshall University Malacological Collection. Scientific names are those used by Dr. David H. Stansbery of The Ohio State University Museum of Zoology.

Collection Site Locations

Graham Creek
Site #

1. Ripley Co.: Co. Rd. 425S 0.1 mile W of Michigan Rd.; 0.25 mile N of New Marion; (N 39°00'50"; W 85°21'36")
2. Jennings Co.: Bridge 0.6 mile SSW of San Jacinto at Graham Baptist Church; (N 38°56'51"; W 85°30'05")
3. Jennings Co.: Highway 7 bridge 3.5 miles NW of Dupont, 4.7 miles SE of Vernon; (N 38°55'46"; W 85°33'46")
4. Jennings Co.: End of Co. Rd. 210E off Co. Rd. 500S; 1.5 miles E of highway 7; (N 38°55'10"; W 85°34'26")
5. Jennings Co.: Bridge 0.4 mile E of highway 3 on Co. Rd. 500S; 1.0 mile E of Lovett; (N 38°54'40"; W 85°36'47")
6. Jennings Co.: Co. Rd. 600S at Graham Presbyterian Church; (N 38°53'53"; W 85°36'40")
7. Jennings Co.: Co. Rd. 600S 0.7 mile S of site 6; 1.5 miles N of Co. Rd. 800S; (N 38°53'25"; W 85°36'40")
8. Jennings Co.: Highway 3 at Hopewell Cemetery 2.0 miles NNW of Commiskey; (N 38°52'58"; W 85°37'21")
9. Jennings Co.: Bridge 0.5 mile E of Graham Elementary School on Co. Rd. 800S; (N 38°52'07"; W 85°37'03")
10. Jennings Co.: Co. Rd. 75W ford 0.5 mile E of Commiskey; (N 38°51'50"; W 85°37'46")
11. Jennings Co.: Co. Rd. 75W 0.25 mile N of Paris; (N 38°49'47"; W 85°37'58")

Muscatatuck River

12. Jefferson Co.: Bridge 2.5 miles SSW of Paris Crossing on Co. Rd. 1550W; (N 38°48'08"; W 85°40'13")

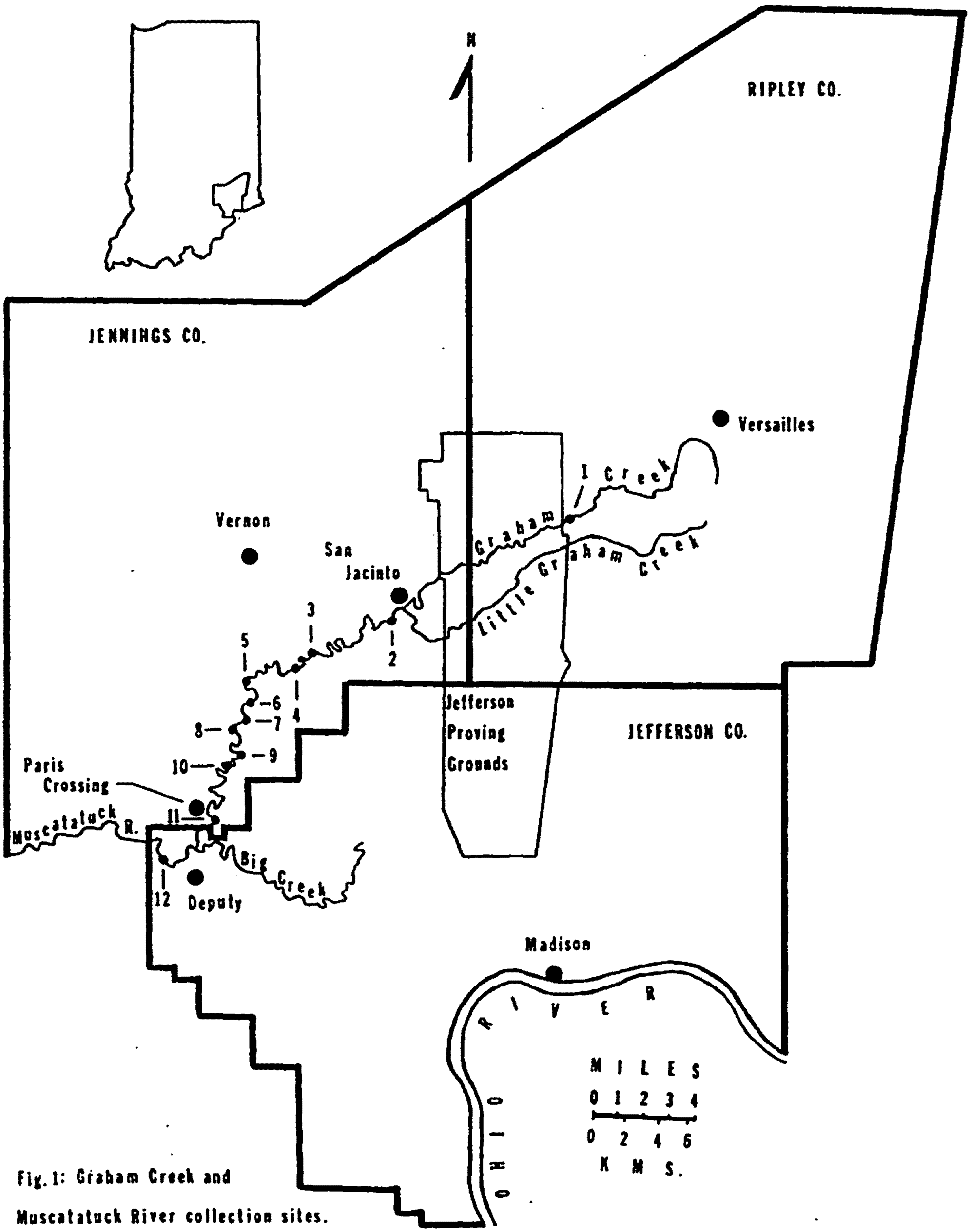

Fig. 1: Graham Creek and Muscatatuck River collection sites.

Results and Discussion

The eleven Graham Creek collection sites produced a total of 23 species of unionid mussels (Fig. 2). One additional species, Potamilus alatus, was found only at the Muscatatuck River site. Species diversity ranged from a low of 3 at site 1, the site farthest upstream, to 20 at site 10, the most visited site. All species were represented by either living specimens or at least one freshly dead specimen. Lampsilis radiata luteola was the only species found at all 12 sites and was the most common species throughout the stream. Five species, Anodonta g. grandis, Anodontoides ferussacianus, Fusconaia flava, Lampsilis ventricosa, and Villosa lienosa were each collected at 11 of the 12 sites. Lasmigona compressa was the rarest species with only 3 specimens collected from 3 sites.

Epioblasma triquetra, included on the Indiana Department of Natural Resources' Endangered Species List, was found in the lower reaches of this stream (sites 7 through 12). While no living specimens were located, several freshly dead individuals of this species were found, especially at site 7, indicating that a small population of this species existed at the time of this survey in this section of the stream. Simpsonaias ambigua, listed as a species of special concern in Indiana, was found at six sites, again in the lower reaches of the stream. No living specimens of S. ambigua were found but fresh dead shells were collected occasionally. E. triquetra and S. ambigua are considered to be sensitive species. Degradation of stream quality by pollution, siltation, etc., tend to eliminate these and other sensitive species first. Therefore, their presence indicates that Graham Creek is a stream of relatively high quality.

Several sites were noted for an abundance of juvenile specimens. This is an indication of a stream of not only sufficient quality for the mere existence of mussels, but for continuation of the molluscan population through successful recruitment as well.

Preliminary collections in 1985 did not reveal any specimens of the Asian Clam, Corbicula fluminea, at or above site 10. During the summer of 1988, Corbicula were found as far upstream as site 7. This suggests that this species was advancing into the Graham Creek watershed during this survey period. Corbicula were not found to be abundant at any site, as they often are in many streams, possibly due to competition from the flourishing native population of unionids. This could change, however, if some event, such as the drought that occurred during the summer of 1988, would weaken the endemic population. In fact, during July 1988 the author "rescued" several dozen mussels at sites 3 and 5 after they were left stranded on dry land when the stream flow reached zero and riffles became merely dry stretches between pools. There is no doubt, however, that large numbers of bivalves perished throughout the stream.

In addition to finding Corbicula and members of the Unionidae family, freshwater bivalves of the Sphaeriidae family were also noted at most sites but were not collected or identified.

A follow-up survey is planned by the author within a few years. The focus of this second survey will be an examination of the combined effects on the unionid population by: 1) the

SPECIES	SITE												
	1	2	3	4	5	6	7	8	9	10	11	12	Freq
Anodonta g. grandis Say, 1829		X	X	X	X	X	X	X	X	X	X	X	C
Anodontoides ferussacianus (Lea, 1834)	X	X	X	X	X	X	X	X	X	X		X	O
Strophitus u. undulatus (Say, 1817)			X	X	X	X	X	X	X	X	X		C
Simpsonaias ambigua (Say, 1825)					X		X		X	X	X	X	O
Lasmigona complanata (Barnes, 1823)			X					X		X		X	R
Lasmigona costata (Raf., 1820)			X	X	X	X	X	X	X	X	X	X	C
Lasmigona compressa (Lea, 1829)									X	X		X	R
Tritogonia verrucosa (Raf., 1820)							X			X	X	X	R
Quadrula p. pustulosa (Lea, 1831)											X	X	R
Amblema p. plicata (Say, 1817)			X	X	X	X	X	X	X	X	X	X	O
Fusconaia flava (Raf., 1820)		X	X	X	X	X	X	X	X	X	X	X	C
Pleurobema sintoxia (Raf., 1820)										X	X		R
Elliptio dilatata (Raf., 1820)			X	X	X	X	X	X	X	X	X	X	O
Ptychobranchus fasciolaris (Raf., 1820)			X		X	X	X		X	X	X		O
Obovaria subrotunda (Raf., 1820)											X	X	R
Potamilus alatus (Say, 1817)												X	O
Toxolasma parvus (Barnes, 1823)	X		X					X					R
Toxolasma l. lividus (Raf., 1831)			X	X	X		X		X	X	X		O
Villosa i. iris (Lea, 1829)			X	X	X	X	X	X	X	X	X		C
Villosa lienosa (Conrad, 1834)		X	X	X	X	X	X	X	X	X	X	X	C
Lampsilis teres (Raf., 1820)			X		X		X	X	X	X		X	O
Lampsilis radiata luteola (Lam., 1819)	X	X	X	X	X	X	X	X	X	X	X	X	A
Lampsilis ventricosa (Barnes, 1823)		X	X	X	X	X	X	X	X	X	X	X	A
Epioblasma triquetra (Raf., 1820)							X	X	X	X	X	X	O
Corbicula fluminea (Muller, 1774)							X	X	X	X	X	X	O
	3	6	16	12	15	12	17	15	17	20	18	18	24

Fig. 2: Distribution and frequency of freshwater mussels in Graham Creek (sites 1 - 11) and the Muscatatuck River (site 12); Ripley, Jennings and Jefferson Counties, Indiana. Legend: X = present; A = abundant; C = common; O = occasional; R = rare.

invasion of *Corbicula*; 2) the continued infiltration of fertilizers and silt; and 3) the drought of 1988.

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New Mollusks from Undersea Oil Seep Sites Off Louisiana

Arthur H. Clarke

ABSTRACT

The molluscan faunas associated with archibenthal oil and gas seep vents on the Louisiana Slope in the Gulf of Mexico are briefly discussed and three previously unknown species are described. These are *Bathynerita naticoidea* (n.gen., n.sp., Neritidae), *Gymnobela judithae* (n.sp., Turridae), and *Thyasira oleophila* (n.sp., Thyasiridae).

INTRODUCTION

Since 1985, oceanographers associated with Texas A&M University and the University of California at Santa Barbara have been investigating the unusual ecology and nutritional biochemistry of the mollusks and other invertebrates which thrive in the vicinity of undersea oil and gas seepage sites in the northern Gulf of Mexico (see Kennicutt *et al*., 1985 and Brooks *et al*., 1987a and 1987b). These vents are located at depths of about 500 to 700 m off Louisiana and eastern Texas. The molluscan faunas there are dominated by large vesicomyid clams (*Vesicomya cordata* Boss (1968) and *Calyptogena ponderosa* Boss, (1968)), an undescribed mytilid, an undescribed lucinid, and a large neogastropod (*Bartschia canetae* (Clench & Aguayo, 1948)). A number of other species also occur there as well, several of which appear to be undescribed. Isotope studies on some of the mollusks, specifically the vesicomyids, mytilid, and lucinid, have revealed an astonishing phenomenon, *i.e.* that those mollusks utilize methane and sulfur as energy sources (Brooks, *et al*., 1987b). The anomalous physiological processes involved in such unusual behaviors are under continuing study.

The absence of published descriptions and properly proposed taxonomic names for the new species found at these cold-seep sites and at others (for example at Cretaceous sites in arctic Canada (Beauchamp, *et al*., 1989)) has impeded scientific understanding and has hindered the precision with which the results of advanced biochemical, radioisotope, and paleoecological studies can be reported. By necessity, some ecologically important species continue to be cited only as "neogastropod species", "lamellibranch" species, etc. It is therefor appropriate that new species from these Gulf of Mexico sites, which are not being studied by workers who are specialists in the groups concerned or are not being included as parts of monographic studies, should be described and named without further delay.

Three such species, including a new genus, are described in this paper. Further publications may follow if more undescribed species come to light.

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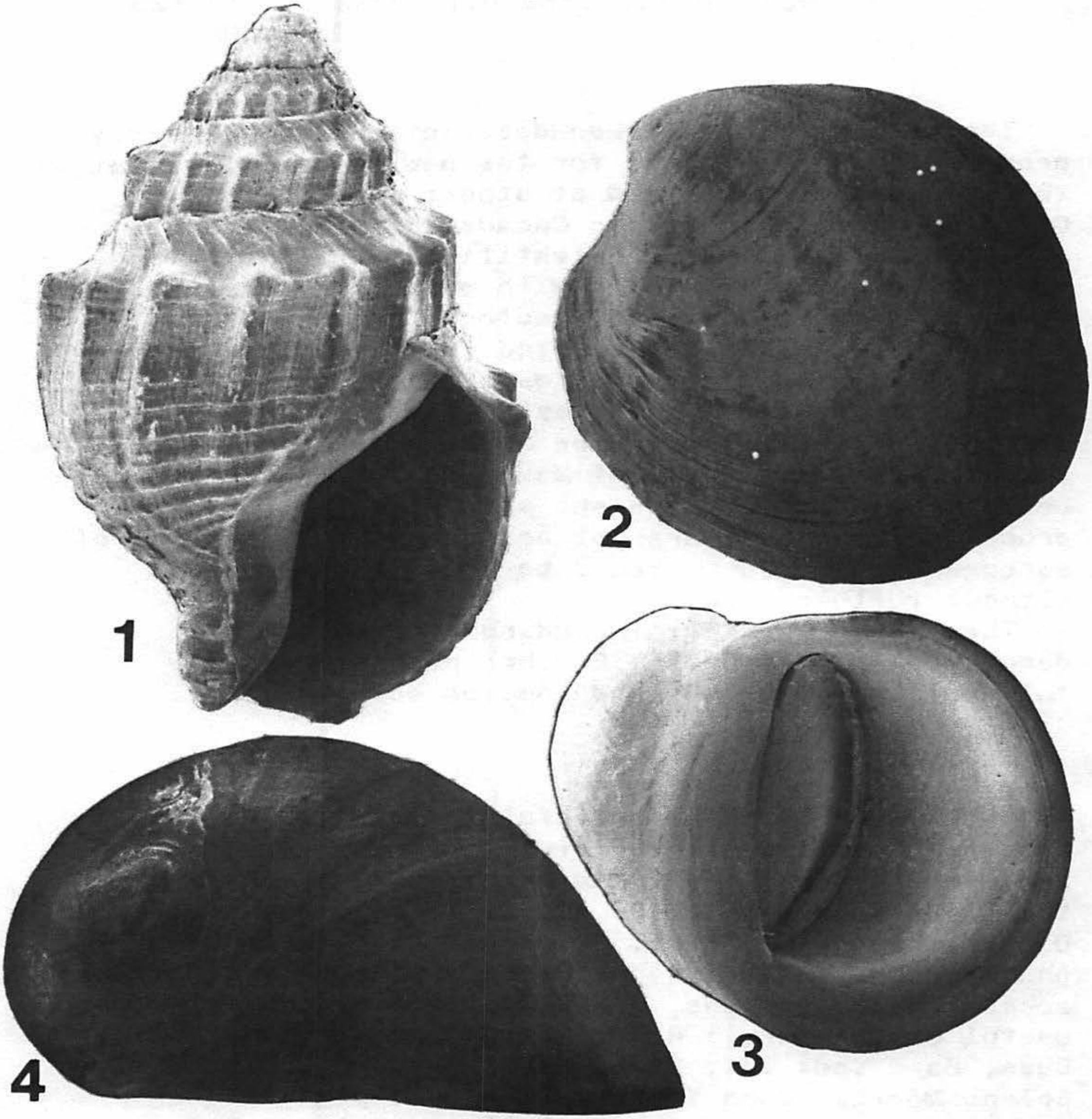


PLATE 2. Figure 1, Gymnobela judithae, holotype, X30. Figure 2, Thyasira oleophila, holotype, X15. Figures 3 & 4, Bathynerita naticoidea, holotype, Fig. 3 is X15, Fig. 4 is X20. Note that lip in Fig. 3 appears to be reflected; in reality it is not.

TAXONOMIC DESCRIPTIONS

Family NERITIDAE

Genus Bathynerita (New Genus)

Bathynerita so far contains only its type species, B. naticoidea, (n. sp.), described below. It differs from all other genera of Neritidae in that its sole member is an archibenthal species apparently confined to the vicinity of oil and gas seeps in the Gulf of Mexico. All other neritids occur in shallow subtidal or intertidal marine habitats or in brackish or freshwater habitats. Other distinct features are the depressed, broadly open shell, possession of an opercular flange which fits behind the columella, and a radula with a central tooth which is wider than high, with 4 heteromorphic lateral teeth on each side of the central, and very numerous, filiform marginals. Most of these teeth are quite different than those of typical species of Nerita L. and Neritina Lamarck (for comparisons see Tryon, 1882: Pl. 13, Figs. 44 & 45), particularly the outer laterals which are characteristically shaped and the marginals which are filamentous in Bathynerita. In addition, unlike species of Nerita, Bathynerita has an unpigmented, smooth shell without apertural nodules or denticles, an operculum without a peg or rib on its inner side, Further, unlike Neritina, Bathynerita has an unpigmented shell, lacks a pear-shaped aperture, and has a mainly calcareous operculum whose spiral nucleus is not located at or close to the margin.

The Subfamily placement of Bathynerita will remain uncertain until the anatomy of the type species has been thoroughly studied.

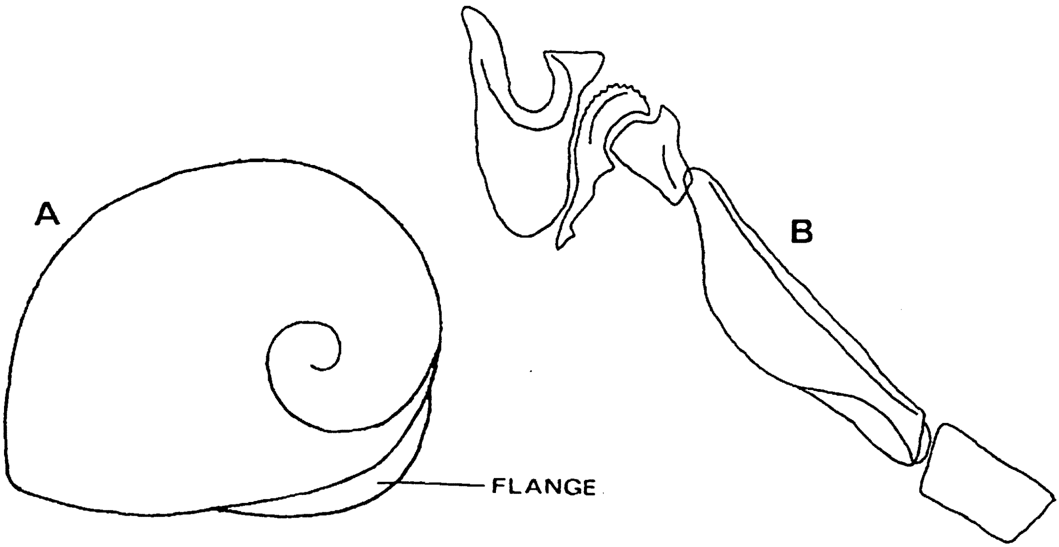
Bathynerita naticoidea (New Species)

Plate 2, Figures 1 & 2, Text Figures.

DESCRIPTION. Shell neritiform, almost naticiform, depressed, unpigmented, with about 1 1/2 whorls, and up to about 12.5 mm wide. In young specimens (2-3 mm wide), although partly corroded, the nuclear apex is seen to be rounded, slightly elevated above the succeeding whorl, finely punctata, and about 0.4 mm in diameter. In more mature specimens part of the nuclear whorl is corroded away and the apex appears larger (about 1 mm diameter) and does not project above the next whorl. Whorls rapidly enlarging, slowly decending, and coiling about 2 1/2 times during growth to maturity. The earliest whorl in all post-juveniles is partially obliterated, however, so that only about i to 1 1/2 whorls are present at any growth stage. Suture narrow and impressed. Body whorl rounded and dominant. Surface, where uncorroded, nearly smooth, white throughout, and with poorly defined collabral lines. Aperture prosocline, broadly expanded, with a subcircular margin which is continuous in some specimens and interrupted by an incomplete callus on the body whorl in others, and with a D-shaped opening. Outer lip thin and sharp at the edge and slightly thickened and chalky behind the edge. Aperture subnacreous within and with elongated adapical and basal muscle scars both clearly visible. Columella smooth, broad, flattened, shelf-like, and with callus extending onto the body whorl.

Operculum calcareous and brittle but with thin corneous layers covering outer and inner surfaces. Outer surface with prominent, sinuous, collabral threads and striae, faint spiral lines, and with a broad, spiral, brownish horn-colored admarginal band and a grayish abmarginal spiral band about half as broad as the outer band. Nucleus below and on labral side of center but not submarginal or marginal. Inner surface of operculum without rib or apophysis but with a conspicuous, curved flange on the labral side which arises from behind the margin, fits behind the labrum, and is embedded in the foot (Text Fig. A).

Body pale purplish brown in preserved specimens. The subtriangular demibranch, posteriorly-located egg-filled ovary, and some other neritid features (cf. Fretter & Graham, 1962, Fig. 311) are visible through the mantle but the internal anatomy was not studied. (Facilities for histological sectioning are not available). Radula rhipidoglossate, formula many+4+1+4+many, central tooth small and wider than high, first lateral tooth long and blade-like, other laterals multiform and complex, and marginals filiform, fine,and very numerous. See Text Figure B.



Text figures. B. naticoidea. (A) Outer view of operculum without sculptural details, x20, from an SEM photograph. (B) Radula showing central tooth and lateral teeth on one side, as seen at 500X with phase-contrast, light microscopy.

LOCATIONAL DATA. The holotype and 41 paratypes were collected alive at R/V Gyre Station 184 on the Louisiana Slope on a topographic feature named "Bush Hill", located about 124 mi due S of Franklin, St. Mary Parish, Louisiana, at 27° 47.87' N, 91° 30.51' W, at a depth of 541 m. Three other paratypes were collected alive during Johnson Sea-Link Dive 2065, located south of Bush Hill at 27° 41.43'N, 91° 32.42'W, at 722 m depth.

TYPES. The holotype of B.naticoidea is in the Museum of Comparative Zoology, Harvard University, and bears catalog number 297770. Paratypes are in the British Museum (Natural History), the Corpus Christi Museum, Corpus Christi, Texas, the MCZ, and the author's collection.

MEASUREMENTS.

	Height (mm)	Diag. Width (mm)	Visible Whorls
Holotype	9.55	11.63	1.5
Paratype (Type Local.)	11.35	12.15	1.1
Paratype (Type Local.)	10.05	11.50	1.1
Paratype (J S-L 2065)	10.63	12.50	1.2
Paratype (J S-L 2065)	11.30	12.25	1.2
Paratype (J S-L 2065)	10.00	11.00	1.7

Height (H) was measured, with calipers, along the axis of coiling from the top of the spire to the base of the aperture. Diagonal width (W_d) was measured from the outer edge of the aperture to the opposite side of the body whorl. 28 specimens from R/V Gyre Station 184, in addition to the 2 cited above, were also measured. The smallest specimen (2.4 mm (W_d) had the highest H/W_d ratio (1.00) but among the other specimens (W_d=2.70-12.15), H/W_d ratios (.753-.921) showed no correlations with size.

ECOLOGY. Videotape recordings made by scientists on board the Johnson Sea-Link submersible show abundant live B. naticoidea specimens crawling on shells of the live undescribed mytilid species which thrives at these cold-seep sites.

REMARKS. Comparative features are discussed under the generic description. The distinctive radular dentition, the operculum with its flange and non-marginal nucleus, the smooth, white, paucispiral shell, and the unusual ecology of *N. naticoidea* set it apart from all other Recent species. Its relationship to the numerous fossil species was not investigated because, since most of the important diagnostic features are not shell characters, such comparisons would not have been revealing The name *naticoidea* refers to the naticoid appearance of the shell.

Family TURRIDAE

Genus *Gymnobela* Verrill, 1884

Gymnobela judithae (New Species)

Plate 2, Figure 3

DESCRIPTION. Shell up to about 9.7 mm high, 7.1 mm wide, with short spire and about 7 whorls. Protoconch dome-shaped, with about 2 whorls, and smooth except that each whorl has a keeled periphery which abuts the following whorl. Later whorls strongly shouldered and bearing straight axial costae which increase from about 12 on the first post-protoconch whorl to about 14 on the body whorl. Costae prominent and nodulous at the shoulders on spire whorls, extending down to the suture below but not up to the suture above, and each incised below the shoulder by about 3 spiral grooves. Body whorl about 6.3 mm high, shouldered with nodular costae which extend only a little below the shoulder and rapidly weaken, and sculptured with about 12 spiral ridges. Aperture prosocline, about 5.0 mm high, 2.5 mm wide, with a shallow turrid notch, and a short but prominent siphonal canal. Outer lip thin, convex, and somewhat pendulous below; inner lip smooth, somewhat thickened, and sigmoid. Columella twisted.

Only empty shells of this species have been seen but some are obviously freshly dead.

LOCATIONAL DATA. The holotype and 32 paratypes were collected by box core at R/V Gyre Station 34, at 27° 47.05' N, 91° 30.5' W, at 512 m depth, on March 11, seum (Natural 1987. That is on Bush Hill, about 124 mi S of Franklin, St. Mary Parish, Louisiana. 7 other paratypes were also collected by box core at R/V Gyre Station 27, at 27° 40.6/ N, 91° 31.6' W, depth 678 m on March 5, 1967.

TYPES. The holotype is at the Museum of Comparative Zoology and bears catalog number 297771. Paratypes are also at the MCZ and in the British Museum (Natural History), the Corpus Christi Museum, and the author's collection.

MEASUREMENTS.

	Height (mm)	Width (mm)	Whorls
Holotype	6.83	4.33	5
Paratype, Gyre Sta. 34	8.15	4.60	6
Paratype, same	9.00	5.63	5
Paratype same	8.68	5.45	6
Paratype same	8.15	4.87	7
Paratype same	7.00	4.75	6
Paratype, Gyre Sta. 27	9.68	7.10	4 1/2
Paratype same	8.37	6.30	5
Paratype same	8.00	6.10	5
Paratype same	7.30	5.30	4 1/2

REMARKS. Gymnobela judithae appears to be more closely related to G. brevis (Verrill, 1885) (= G. blakeana (Dall, 1889)) than to any other species. In G. brevis the varices are consistently more numerous and extensive, however, numbering from 20 to 24 on the body whorl and covering that whorl. Further, in G. brevis the siphonal canal is not well developed. Another deepwater species, G. curta (Verrill, 1884) is also related to G. judithae, but the former is much smoother and is not conspicuously shouldered.

This species is named for my wife, Judith, for her constant understanding and help in my malacological efforts.

CLASS PELECYPODA

Family THYASIRIDAE

Genus *Thyasira* Lamarck, 1818

Thyasira oleophila (New Species)

Plate 2, Figure 4

DESCRIPTION. Shell to 22 mm long, 18 mm high, and 16 mm wide. Outline subcircular to subelliptical except excavated in front of the umbones and slightly indented posteriorly. Umbones protuberant, pointed, rather narrow, and inclined forward and inward. Lunule small, aurate, and defined by a groove. An additional shallower groove subparallel with the lunule boundary exists on each valve beyond the lunule boundary. Escutcheon long, narrow, lanceolate, and also bounded by a groove. A shallow but clearly defined broad radial furrow on each valve extends from the umbone to a shallow indentation at the mid-posterior margin. Another radial groove on each valve, which is narrower and not as clearly defined as the furrow, is between the furrow and the escutcheon. Shell surface whitish or grayish, with yellowish suffusions, and lightly sculptured with growth rests and fine collabral lines.

Hinge teeth absent. Ligament partially visible externally but mostly internal, beginning just below the umbones and extending posteriorly for about 40% of the shell length. Ligament groove bounded below by a narrow ridge (nymph) on the inside of each valve. Muscle scars and pallial line faint and pallial sinus absent. Mantle and foot pale brown and visible through the trans- lucent shell but detailed anatomy not studied.

LOCATIONAL DATA. The holotype and 31 paratypes are from R/V Gyre Station 34, located at 27° 47.05' N, 91° 30.05' W, depth 512 m, on Bush Hill on the Louisiana Slope about 124 mi S of Franklin, St. Mary Parish, Louisiana. They were collected by box core on March 11, 1987. Those specimens were empty shells and many were partly covered with crude oil. Another paratype, a living juvenile specimen, was collected on June 11, 1987, during Johnson Sea-Link Dive 2054, located at 27° 41.05' N, 91° 30.38' W, at 549-564 m depth, south of Bush Hill..

TYPES. The holotype is in the Museum of Comparative Zoology and bears catalog number 297772. Paratypes are also at the MCZ and in the British Museum (Natural History, in the Corpus Christi Museum, and in the author's collection.

MEASUREMENTS.

	Length (mm)	Height (mm)	Width (mm)	Remarks
Holotype	11.38	10.15	3.25	LV only.
Paratype (Type Loc.)	21.40	18.14	16.45	2 valves.
Paratype (same)	17.82	16.95	10.80	2 valves.
Paratype (same)	16.13	14.46	4.92	LV only.
Paratype (same)	13.63	12.13	3.89	LV only.
Paratype (same)	8.35	8.25	5.00	2 valves.
Paratype (J S-L 2054)	8.04	7.56	4.23	Live juv.

REMARKS. *Thyasira oleophila* is apparently more closely related to *T. flexuosa* (Montagu, 1803) than to any other Recent or fossil species. The maximum length of *T. flexuosa* (about 6 mm) is much less than that of *T. oleophila*, the radial furrow in *T. flexuosa* is much more conspicuous, and in that species the posterior margin is sharply concave in the area where the furrow terminates but in *T. oleophila* the margin is not concave or only slightly concave.

It has been suggested (Clarke, 1986) that some large species from eastern Pacific hydrothermal vents may be ecophenotypes of smaller, wide-ranging, non-vent, deep-sea species. At first sight *T. oleophila* might therefore be judged to be a possible ecophenotype of *T. flexuosa*. *T. flexuosa* is a more boreal species, however, and does not occur near or in the Gulf of Mexico. Further, the apparant association of *T. oleophila* with oil seep sites implies that fundamental biochemical differences probably exist between the 2 species.

The name oleophila relates to the fact that many specimens are covered with crude oil, a feature seen more frequently in this species than any other from the oil and gas seep sites.

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Additional Terrestrial Gastropods of Travis County, Texas

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INTRODUCTION

The terrestrial gastropod fauna of Travis County, Texas (which includes the city of Austin), has been largely unstudied until the last fifteen years. A summary of known records as of April 1975 included 31 species (Neck 1976b) from published records by other workers and eleven species first reported by Neck (1977). These 42 species have been supplemented by an additional nine species (Neck 1976a, 1981, 1984; Hubricht 1985). Subsequent field studies and inspection of museum collections have revealed five additional species which have been added to the known terrestrial gastropod fauna of Travis County. These species and pertinent information pertaining to their known occurrence in Travis County are discussed below. Habitat information from recent personal collections of the five species reported by Hubricht (1985) is also included because no such data have been published for Travis County. Table 1 summarizes the history of knowledge of known species in the terrestrial gastropod fauna of Travis County.

NEW SPECIES REPORTS

Family Pupillidae

Pupilla muscorum (Linnaeus, 1758)

Pupilla muscorum is a Holarctic species whose known range in North America includes Canada, scattered localities in the northeastern United States and the Rocky Mountains southward to New Mexico (Pilsbry, 1948). The only Texas record listed by Cheatum and Fullington (1973) is a Comal County record in Singley (1893) from river drift (likely a fossil shell) but not accepted by Hubricht (1985). Cheatum and Fullington (1973) questioned the existence of living populations of this species in Texas although Pleistocene records are known (Cheatum and Fullington, 1973; Hubricht, 1985).

TABLE 1

History of number of terrestrial gastropods known from Travis County, Texas. Previous checklist (1976b) included only "pre-1976" and "Neck 1977" records.

	Terrestrial Gastropods		
Literature references	Native	Introduced	Total
pre-1976	30	1	31
Neck 1976a	0	1	1
Neck 1977	3	8	11
Neck 1981	2	0	2
Neck 1984	0	1	1
Hubricht 1985	5	0	5
current publication	3	2	5
Current totals	43	13	56

A collection of three fresh, glossy shells of *P. muscorum* is present in the Dallas Museum of Natural History (DMNH 1551-5F), and is labeled as follows: "coll. along Colorado River woodland-Austin, Tex. coll. Cheatum July 15, 1940." All three specimens are dextral with a white callus present behind the lip on the body whorls, although the callus is not as heavily developed as those shells illustrated by Pilsbry (1948:937, fig. 503:13-14). Desiccated animal remains exist in the smallest specimen. Shell measurements and notes on variation in expression of the parietal lamella are presented in Table 2. The exact location of the collection site by Elmer P. Cheatum is unknown, but the site is likely to have been inundated by Town Lake in 1960. Vanatta (1926) reported P. muscorum from flood debris collected by Julia Gardner in 1925 along the Colorado River in adjacent Bastrop County, about 2.3 kilometers downstream of the Bastrop/Travis County line; no indication of whether the shell(s) was (were) modern or fossil was provided. The native status of this population could be questioned easily, but the occurrence of fresh shells of P. muscorum in DMNH (#1796, coll. 10 June 1938) from New Braunfels, Comal Co., Texas, indicates that isolated populations of this species apparently exist in protected mesic sites in the Balcones Escarpment Zone.

TABLE 2

Description of three shells of Pupilla muscorum from Austin, Travis Co., Texas (DMNH 1551-5F). All measurements in millimeters.

Height	Width	Whorls	Parietal lamella
3.50	1.70	6.0	present (white shell material)
3.20	1.67	5.8	absent, slight raised area present (no white shell material)
2.90	1.65	5.5	apparently absent, slightly raised area present (no white shell material)

Gastrocopta tappaniana (C.B. Adams, 1842)

G. tappaniana is known from scattered localities in North America east of the Great Plains (Hubricht, 1985). Three shells of G. tappaniana were recovered from a soil sample taken from a mixed hardwood/evergreen woodland (Ulmus crassifolia/Quercus fusiformis/Juniperus ashei) in Gus Fruh Park (19 Feb 1984). The locality is in a protected portion of the canyon of Barton Creek within the city limits of Austin.

Family Subulinidae

Lamellaxis mauritianus (Pfeiffer, 1852)

L. mauritianus is now found throughout tropical regions of the world due to transport via human commerce; native range of this species is unknown. Two shells of this species were found on 23 March 1985 in recent flood debris at the edge of Waller Creek below the 24th Street bridge on the campus of The University of Texas at Austin. This species could be restricted to greenhouses in Austin or may be able to withstand the milder examples of Austin's variable winters.

Family Helicodiscidae

Helicodiscus inermis H.B. Baker, 1929

Helicodiscus inermis is known from highly scattered locations in the eastern United States from Maryland to Florida westward to Kansas and Texas according to Hubricht (1985), who includes a record from Travis County. I have recovered H. inermis from soil samples from Gus Fruh Park (19 Feb 1984, same sample which also yielded G. tappaniana) and Kenyon Rock Shelter (8 Sept 1985). This latter locality is in the uppermost portion of the Bull Creek drainage near the junction of RR 2222 and RR 620. Dominant woody plants in this canyon are Arizona walnut (Juglans major), pecan (Carya illinoinensis), Texas sugarberry (Celtis laevigata), yaupon (Ilex vomitoria), Texas persimmon (Diospyros texana), and spring herald (Forestierra pubescens).

Helicodiscus nummus (Vanatta, 1899)

Helicodiscus nummus has been recovered from scattered localities in central and north central Texas (Hubricht, 1985). One live immature H. nummus was extracted from a soil sample from a deciduous woodland on the floodplain of Walnut Creek (collected 18 Feb 1983). Two shells of this species were recovered from the same soil sample collected 19 Feb 1984 from the Gus Fruh Park that also contained Punctum vitreum and Striatura meridionalis.

Family Punctidae

Punctum vitreum Baker, 1930

Punctum vitreum is known from scattered localities from New Jersey to Iowa southward to northern Alabama and western Texas. Texas records are limited to woodlands associated with the Balcones Escarpment and montane areas of Trans-Pecos Texas (Hubricht, 1985). Although Hubricht (1985) includes a record for Travis County, no habitat data has been published for this area. I have recovered shells of P. vitreum from western Travis County at Gus Fruh Park (19 Feb 1984) and near Kenyon Rockshelter (8 Sept 1985). Both sites support a mixed woodland community (mostly Texas oak, Quercus buckleyi/Ashe juniper woodlands).

Family Zonitidae

Hawaiia minuscula (Binney, 1840)

Hawaiia minuscula ranges throughout most of the United States east of the Great Plains according to Hubricht (1985) who includes a record from Travis County. Personal collections of this species have been made at the Kenyon Rock Shelter canyon (8 Sept 1985, mentioned above) and West Cave (27 Jan 1982). Both localities are locally mesic, but well-drained insular microhabitats in a xeric region. West Cave is a mesic, wooded box canyon off the Pedernales River in the southwestern corner of Travis County. This locality is a nature preserve and is the type locality of Mesodon leatherwoodi Pratt, 1971; H. minuscula was not recorded by Pratt (1971) from West Cave.

Striatura meridionalis (Pilsbry and Ferriss, 1906)

Striatura meridionalis ranges throughout the southeastern United States (generally south of the Ohio River) as far west as central Texas including Travis County (Hubricht, 1985). *S. meridionalis* has been recovered from soil samples collected in West Cave (27 Jan 1982), Gus Fruh Park (19 Feb 1984), and Kenyon Rock Shelter Canyon (8 Sept 1985) in Travis County. All three samples were from humid soil underneath downed wood or deep leaf litter. *S. meridionalis* was not listed by Pratt (1971) from West Cave.

Family Polygyridae

Polygyra gracilis Hubricht, 1961

Polygyra gracilis is known from several counties of the Texas Hill Country (Cheatum and Fullington, 1973). Hubricht (1961) reported it from "river bluffs and ravines" in this area and later reported it from Travis County (Hubricht, 1985). The only collection of this species that I have made in Travis County is from West Cave. *P. gracilis* was extracted from a soil sample taken from the most mesic of three samples removed on 27 January 1982. Large amounts of leaf litter are present as this site. *P. gracilis* was not listed by Pratt (1972) from West Cave.

Triodopsis cragini Call, 1886

Triodopsis cragini ranges from Louisiana to Missouri westward to eastern Texas and Kansas (Hubricht, 1985). In eastern Texas, *T. cragini* inhabits pine, pine/hardwood, and oak/hickory woodlands (Cheatum and Fullington, 1971). On 16 November 1985 a single adult shell of *T. cragini* was found in a humus-rich accumulation under boards and bricks in a residential yard within 20 feet of a small creek (Johnson Branch). Comparison to shells from Texas localities reveals that the apertural teeth are not as heavily expressed as those from Jasper County, but are more similar to teeth of shells from Nacogdoches County (although the Austin shell is smaller). The Austin shell measures 10.6 mm in diameter with a height of 5.35 mm (5.1 whorls). This residential yard is the same locality from which the introduced predatory snail, *Euglandina rosea* (Ferussac, 1821), has been recorded (Neck, 1984).

SUMMARY

With the addition of these five species (*Pupilla muscorum*, *Gastrocopta tappaniana*, *Lamellaxis mauritianus*, *Helicodiscus nummus*, and *Triodopsis cragini*) the terrestrial gastropod fauna of Travis County, Texas, is known to consist of 56 species. These five species (and the five reported by Hubricht, 1985) belong to three classes of species: 1) relictual species whose occurrence in Travis County is limited to restricted areas of favorable microhabitat which is stable in the short time scale -- *P. muscorum*, *G. tappaniana*, *H. nummus*, *H. inermis*, *P. vitreum*, and *S. meridionalis*; 2) peripheral species whose geographical range, i.e., suitable microhabitat, only includes a portion of Travis County and is unstable in time -- *H. minuscula* and *P. gracilis*; and 3) newly established, or only lately discovered, populations of species not native to Travis County -- *L. mauritianus* and *T. cragini*.

Undoubtedly, several other terrestrial gastropods are present in Travis County but have yet to be recorded by malacologists. Species which have been reported from counties adjacent to but not known from Travis County include *Gastrocopta pentodon*, *Vertigo milium*, *Vertigo ovata*, *Helicodiscus notius*, and *Polygyra dorfuelliana*. These species may be added to the known fauna by sampling of additional rare microhabitats and by examination of additional museum collections. Any additional species are likely to fall within the three basic classifications cited above, because all widespread species in this area should be known. A few additional species could result from the taxonomic splitting of complexes now believed to consist of a single species.

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Erginus rubellus (FABRICIUS, 1780) (GASTROPODA: LOTTIIDAE) IN NEWFOUNDLAND AND LABRADOR, CANADA

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ABSTRACT

A collection of *Erginus rubellus* (Fabricius, 1780) is reported from the Island of Newfoundland, Canada. It is the second known record of the species for the Island; and the first reported in over a century. Shell morphology and distribution are discussed, with particular reference to Newfoundland and Labrador.

INTRODUCTION

Erginus rubellus (Fabricius, 1780): Family Lottiidae, is a small patellacean limpet of semi-circumpolar North Atlantic distribution. Hitherto, the species has been referred most often to the genus *Acmaea* or *Tectura*: Family Acmaeidae. The genus name *Problacmaea* Golikov, 1972 is a modern synonym of the older name *Erginus* Jeffreys, 1866. *E. rubellus* is the type species of the genus *Erginus*. We have chosen, in this paper, to adopt the nomenclatural revisions proposed for the family Acmaeidae by Lindberg (1986, and personal communication).

In northern regions, *E. rubellus* has been reported from Norway, the Russian coast near Murmansk, Novaya Zemlya, Svalbard, Jan Mayen, Iceland, and Greenland (Thorson, 1941, 1944); from the Canadian Eastern and High Arctic (Thorson, 1941, 1944; Macpherson, 1971); and (possibly) from Alaska

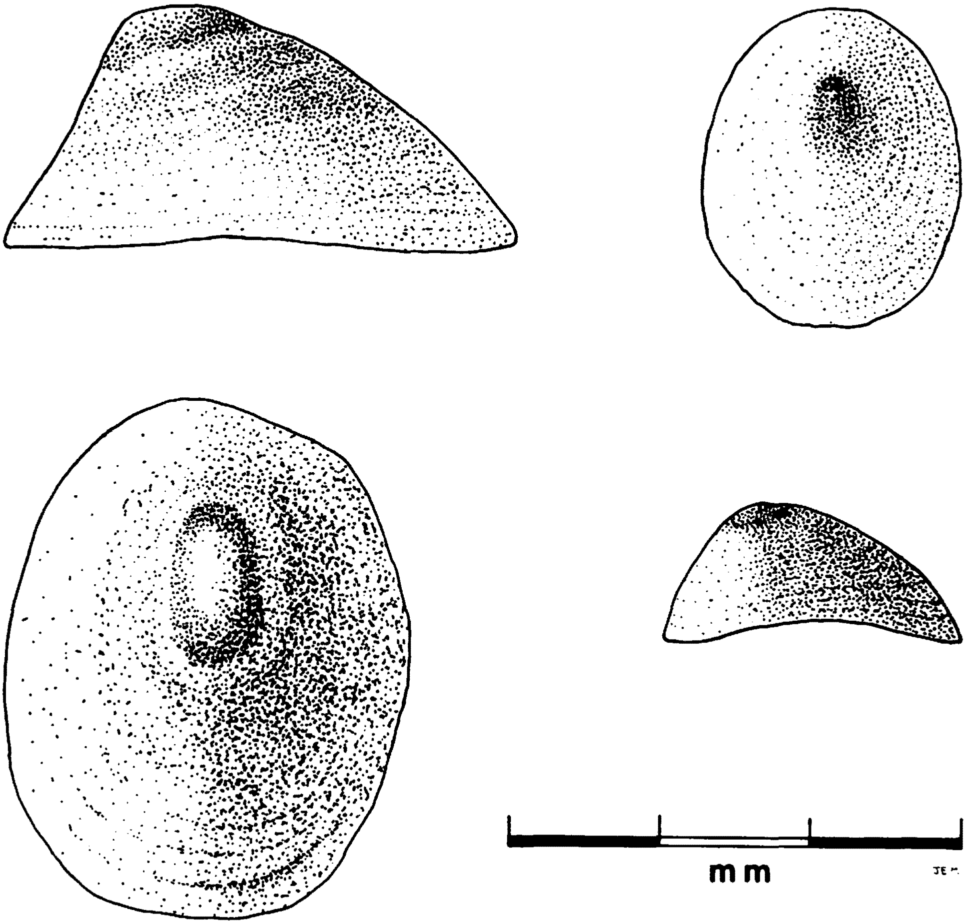

Figure 2: Two representative examples of Erginus rubella (Fabricius, 1780) from Point May, Newfoundland [NFM MO-1204].

(Posselt and Jensen, 1898). In Eastern North America, the species has been reported from as far south as Nova Scotia (Whiteaves, 1901) and Maine (Morris, 1973). It appears to be uncommon in collections.

E. rubellus is a small species. Maximum recorded measurements of the typical form are: length - 9.5 mm (Thorson, 1941), width - 6.9 mm (Odhner, 1912), height - 4.9 mm (Odhner, 1912). Shell color is uniformly whitish (Morris, 1973), reddish, brownish, or yellowish (Odhner, 1912). Faint growth lines are reputed to be the only sculptural feature (Macpherson, 1971). The interior of the shell is whitish, and the shell rim is comparatively thin (Macpherson, 1971). The apex is quite high and, while sometimes situated near the center of the shell, is normally somewhat ahead of center. Variety *elevata* (Ohdner, 1910) exhibits a relatively narrow, sharply-elevated shell, with a base that is concave in lateral view.

The known bathymetric range of *E. rubellus* extends from low tide (Odhner, 1912) to 565 metres (Thorson, 1941, 1944). The species has been found on a wide variety of substrates, including rocks, stones, gravel, clay, sand, mud, seaweed, and coralline algae (Odhner, 1912).

DISCUSSION

E. rubellus has been reported from several Labrador localities (Fig. 1). Packard (1867) listed it from Strawberry Harbour (55°09'N, 59°04'W) at a depth of 36.6 m with no mention of substrate, and from Square Island (52°45'N, 55°52'W) at a depth of 54.9 m on "hard bottom". Bush (1883) reported a specimen from Temple Bay (51°59'N, 55°55'W) at an unspecified depth on "rocky bottom". The above records were repeated in Packard (1891), Whiteaves (1901), and Johnson (1909). Johnson (1926) reported a collection by Owen Bryant, from Gready Harbour (53°48'N, 56°26'W) at a depth of 22 m. Johnson (1934), Thorson (1951), and Macpherson (1971) also re-cited many of the above Labrador records. The National

Museum of Natural Sciences, in Ottawa, Canada, houses a single specimen taken at the eastern approaches to the Straits of Belle Isle off Camp Bay (52°08'N, 55°38'W) at a depth of 55–64 m.

E. rubellus has been reported from the Island of Newfoundland only once. In 1876, the German malacologist T.A. Verkrüzen conducted surveys for molluscs in the area of St. John's (47°34'N, 52°43'W), and privately published a little-known paper entitled Mollusca Dredged and Collected by T.A. Verkruzen, in 1876, in the Neighbourhood of St. John's, Newfoundland, Including a few Species obtained from the Bay of Fundy (1877a). Verkrüzen reported finding the species in the "Narrows [harbour entrance] and outer bays", noting that it was "rather scarce". The record was repeated in Verkrüzen (1877b, 1886) and Odhner (1912). Verkrüzen deposited a "duplicate set" of his specimens in the Newfoundland Museum at St. John's (Howley, 1913), but they (and a quantity of other natural history specimens) were apparently destroyed in a fire in 1937. An entry in a century-old catalogue of specimens in the Newfoundland Museum reads - "Case 8. [No.] 25. Pilidium rubellum Fabr. e portu Narrows, St. John's T.A.V. 1876". Gilkinson (1986) does not mention E. rubellus in his review of the literature on Newfoundland and Labrador molluscs.

Preliminary to the compiling of a field guide for Newfoundland marine molluscs, the authors of the present paper have been engaged in extensive field surveys. On June 8, 1986, during one of these surveys, Angela and Lori Ann Noseworthy collected sixteen shells of E. rubellus at Point May (46°54'N, 55°56'W) on the southwestern tip of the Burin Peninsula, southern Newfoundland. The shells were found at low tide in accumulated shell drift, on patches of sand between large beach boulders. The specimens represent the second record of the species from the Island of Newfoundland.

David R. Lindberg of the University of California at Berkeley compared our specimens with typical specimens from Greenland, and found them to be identical in shell morphology and structure. Dimensions of the Newfoundland specimens are: length - 2.0 to 4.5 mm, width - 1.7 to 4.0 mm, height - 1.0 to 2.7 mm. Shell color is a brownish yellow. Basal shape is broadly oval. Most shells are somewhat worn, but fresher specimens exhibit faint growth lines. A similar species, E. sybariticus (Dall, 1871) from Alaska, has rosy-pink rays. The shells (Fig. 2) agree well with those figured in Sars (1878).

Point May is an exposed location at the southwestern tip of Newfoundland's Burin Peninsula. The coastline is mostly rocky, with shallow water extending out over mostly hard bottom to a distance of 2.5 km. The locality experiences strong westerly winds and is frequently pounded by heavy ocean swells. To date, twenty-five species of marine mollusc have been recorded there, mostly subarctic or boreal forms. While a few specimens of species representing the Point May fauna have been obtained from tide pools, the great majority have been discovered in the shell drift.

E. rubellus is an arctic and subarctic species (Sneli and Steinnes, 1975). In the northeast Atlantic, the warm waters of the North Atlantic Drift limit its southward distribution to 69°30'N, on the coast of Norway (Høisaeter, 1986). Its distribution in Newfoundland is undoubtedly related to the Labrador Current, a wide stream of arctic water which flows south from Davis Strait and along the Labrador coast to Newfoundland and the Grand Banks. The more southerly record from Nova Scotia (Whiteaves, 1901) is from deeper water ("fishing banks").

Our specimens of E. rubellus are deposited in the collections of the senior author (RGN G902L12f); the Museum of Paleontology, University of California at Berkeley (UCMP 10254); and the Newfoundland Museum (NFM MO-1204).

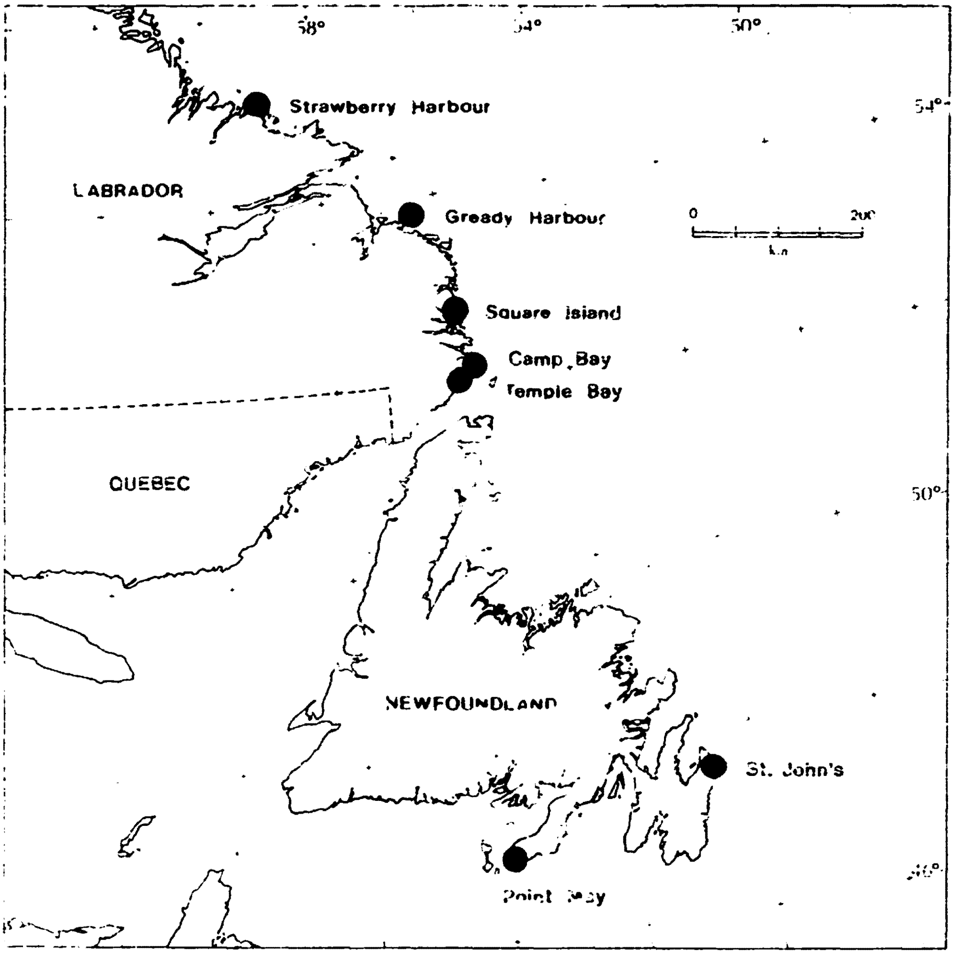

Figure 1: Known Collection Localities for Erginus rubella (Fabricius, 1780) in Newfoundland and Labrador, Canada.

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance of David R. Lindberg, who verified our identifications; and also the assistance of R. Tucker Abbott, who reviewed the manuscript and offered several helpful suggestions. We also wish to thank Joy, Angela, and Lori Ann Noseworthy, the senior author's family, for their valuable assistance during many field surveys. The Mollusc Section of the National Museum of Natural Sciences in Ottawa has kindly permitted us to examine its collections and to cite its records of Newfoundland and Labrador material.

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Mytilopsis leucophaeta (Conrad, 1831) from the Upper Mississippi River (Bivalvia:Dreissenidae)

by

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Members of the genus *Mytilopsis* (Conrad, 1857) inhabit brackish waters of tropical, sub-tropical or temperate lattitudes (Marelli & Gray, 1983). *Mytilopsis leucophaeta* (Conrad, 1831) has been reported from brackish waters and both coastal lakes and streams along the Atlantic and Gulf Coasts of the United States and has been introduced into portions of Europe (Marelli & Gray, 1983).

On 26 August 1988 two living *M. leucophaeta* were collected from the Mississippi River in Madison County, Illinois, approximately 3.5 kilometers upstream from where the Missouri River enters the Mississippi River. This area is an outer bend of the river with a water depth of approximately seven to nine meters. Substrate consisted primarily of sand, gravel and cobble. Other mollusks associated with *M. leucophaeta* include sixteen species of unionids and two species of snails. One *M. leucophaeta* was found attached to the surface of a *Megalonaias nervosa* (Rafinesque, 1820) and the other was included in a collection of snails. Length and height measurements are 14 mm and 5 mm and 16.1 mm and 7.3 mm respectively.

The location where *M. leucophaeta* was collected is used extensively as a barge fleeting area, primarily by various oil companies since oil refineries are located nearby in Illinois.

Individuals of M. leucophaeta are capable of attaching to a surface, then releasing themselves and reattaching to another surface (Dan Marelli, per. communication). It is likely M. leucophaeta attached to barges from the Gulf Coast and were transported upstream and subsequently dropped off at this location.

Although individuals of M. leucophaeta are evidently capable of surviving in the Upper Mississippi River, at least for an undetermined period of time, it is not likely this species will reproduce since Siddall (1980) reported that salinity pulses are necessary to initiate spawning. Since two individuals were collected at this site the author plans further sampling at this location to determine if additional M. leucophaeta are present and to search for indications of possible reproduction. One specimen has been deposited at the Ohio State University Museum, catalog number OSUM - 29843.

The author acknowledges Dr. David H. Stansbery, Ohio State University, Dr. Arthur E. Bogan and Dr. Gary Rosenberg, The Academy of Natural Sciences and Dr. Dan Marelli, Florida Department of Natural Resources for identification of specimens and diver John Ahrling for his assistance.

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FORUM

IDENTITY OF *ANODONTA* (*LASTENA*) *OHIENSIS* RAFINESQUE (BIVALVIA: UNIONOIDEA)

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The identity of *Anodonta* (*Lastena*) *ohiensis* Rafinesque, 1820 has been a long standing source of controversy. Say (1834), Conrad (1834, 1853), and Ferussac (1835) considered it to be synomynous with *Symphynota laevissima* Lea, 1829. Despite these identifications, Lea's name generally has been applied to the species. Utterback (1915-1916), Ortmann (1919), and Frierson (1927) employed *ohiensis* as the senior name for *Anodonta imbecillis* Say, 1829; however, Ortmann and Walker (1922) demonstrated that this usage was incorrect and decided that *ohiensis* was unidentifiable. Recently, *ohiensis* again has been considered to have priority over *laevissima* (e.g., Morrison, 1969; Buchanan, 1980; Oesch, 1984). Stansbery (personal communication in Oesch, 1984) stated that a neotype for *A.* (*L.*) *ohiensis* had been established by R.I. Johnson, but no such designation has been found in the literature (e.g., Johnson and Baker, 1973; Johnson, 1980). The present usage of *ohiensis* versus *laevissima* has not been justified properly.

Rafinesque's (1820) original description is as follows:

> 3. Sous-Genre. LASTENA. Lastene.
> Charniere a deux rides transversales, obtuses, presque lamelliformes, divergeant de chaque cote du bec. Ligament droit, membraneux, double, ou anterieur ou posterieur.
> 58. Espece. *Anodonta* *ohiensis* (Lastena ohiensis).

> Anodonta de l'Ohio.
> Test tres-mince, fragile, transparent, bombe, elliptique, un peu aile et ensuite tronque obliquement en arriere; sommets entiers, rides; epiderme lisse, olivatre ou brun; nacre-bleuatre. Longueur 5-9, diametre et axe 1-3 de la largeur.
> Var. 1. Radiata. Olivatre-cuivre, a bandes radiees, verdatres.
> Var. 2. Viridis. D'un beau vert-olivatre.
> Var. 3. Violacina. Nacre violacee.
> Var. 4. Nigrescens. Noiratre-olivatre.
> Tres-commune dans l'Ohio et toutes les rivieres adjacentes. Largeur de 2 a 4 pouces; les rides lamellaires sont parfaitement separees des bords de la coquille. L'aile posterieure est comprimee, angulaire, en talus et brunatre. Il aurait peut-etre ete convenable de nommer cette espece A. mutabilis.

This species possessed a very thin, somewhat inflated shell with a posterior wing and oblique truncation. The wing was described as forming a compressed, angular talus and, in conjunction with the posterior truncation, was distinct enough for Rafinesque to consider naming it mutablis (=cutoff). Periostracum varied from greenish to copperish to black and sometimes possessed green rays. Nacre ranged from bluish to purple and lamelliform lateral and pseudocardinal hinge dentation is described. The subgenus Lastena under Anodonta apparently was created to accommodate species with thin shells and reduced dentition.

Rafinesque's species obviously is not Anodonta imbecillis as Ortmann and Walker (1922) concluded. However, it is far from unidentifiable. The reduced dentition, thin shell, color of periostracum and nacre, and the posterior wing are diagnostic and readily referable to the species which generally has been known as laevissima. Ohiensis has nine years priority over Lea's epithet and, therefore, takes precedence. It would appear that the early synonymies of Say (1834), Conrad (1834, 1853), and Ferussac (1835) were correct.

Ortmann (1912) considered the North American unionoid genera Proptera Rafinesque, 1819 (non Potamilus Rafinesque, 1818 sensu Morrison, 1969: Gordon, in press) and Leptodea Rafinesque, 1820 to be essentially indistinguishable with respect to gross morphology. The primary diagnostic character for Proptera is its unique "celt" or "axe-head" shaped glochidia. This form of glochidium was described and illustrated by Lea (1838, 1863) and Coker and Surber (1911) for ohiensis (as laevissima) and three other species, thus warranting their inclusion in Proptera: Unio alatus Say, 1817 (type; see Metaptera, below); Unio capax Green, 1832; and Unio purpuratus Lamarck, 1819. Two other mussels, Symphynota inflata Lea, 1831 and Unio (Lampsilis) amphicaenus Frierson, 1898 have been referred to Proptera; however, published descriptions of their glochidia presently are not available. Other species of Proptera purportedly range into eastern Central America (Simpson, 1900; Clarke, 1973).

Two other genera generally have been considered junior synonyms of Proptera (e.g., Frierson, 1927): Metaptera Rafinesque, 1820 (type: megaptera Rafinesque, 1820 = Unio alatus Say, subsequent designation by Herrmannsen, 1847) and Symphynota Lea, 1829 (type: U. alatus Say, original designation). Naidea Swainson, 1840, Lymnadia Swainson, 1840, and various misspellings were added to the synonymy by Thiele (1935) and Haas (1969), respectively. The recent recognition of Anodonta (Lastena) ohiensis Rafinesque (type of Lastena Rafinesque, 1820: subsequent designation by Herrmannsen, 1847) and Symphynota laevissima Lea as conspecifics necessitates the inclusion of Lastena in the synonymy of Proptera. The use of Potamilus in place of Proptera has been discusseed elsewhere (Gordon, in press).

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Addendum: Rafinesque (1831) described *Anodonta digonata* (type locality: Lake Erie) as a "thin, oval swelled" shell with anterior and posterior wings. The margin (dorsal) of these wings was characterized as "flexuose" in opposition to straight, the general case for this feature in *Leptodea fragilis* (Rafinesque, 1820). Although Rafinesque did not describe hinge dentition, he referred this species to *Lastena*, thus implying reduced, lamelliform dentition (see above). This form appears to be conspecific with *Proptera ohiensis* and, therefore, a junior synonym of that species. Haas (1969) previously had considered *A.*

digonata to be equivalent to A. cataracta Say, 1817. Rafinesque (1831) also speculated that A. digonata should be classified in its own subgenus, Flexiplis Rafinesque, 1831. Based on the apparent synonymy of digonata under ohiensis, Flexiplis would be subordinate to Proptera.

At the end of the description for Anodonta digonata, A. rufa Rafinesque, 1831 is listed as a probable variety of "A." ohiensis. Anodonta rufa is a nomen nudum.

ENDANGERED SPECIES NEWS

Since July 1, 1988, several molluscan species have been either formally added to the federal List of Endangered and Threatened Species, formally proposed for listing, or have reached an active pre-proposal stage which is just prior to formal proposal. These are listed below. All except Mesodon magasinensis (a polygyrid land snail) are unionids. The Official List now contains 10 species of gastropods (4 classed as endangered and 6 as threatened) and 35 species of bivalves (all Unionidae and all endangered). Recovery plans for some species have also been recently completed or are underway. Full information about official listings or proposals have been published in the Federal Register and summaries have been given in the Endangered Species Technical Bulletin published by the U.S. Department of the Interior.

Officially Listed

Mesodon magazinensis (Pilsbry & Ferris)
Canthyria (as "Pleurobema") collina (Conrad)
Pegias fabula (Lea)
Lampsilis streckeri Frierson

Officially Proposed

Alasmidonta heterodon (Lea)
Hemistena lata (Rafinesque)
Obovaria retusa (Lamarck)

In A Pre-Proposal Stage

Arcidens (*Arkansia*) *wheeleri* (Ortmann & Walker)
Cyprogenia stegaria (Rafinesque) (= *irrorata* (Lea))
Epioblasma (=*Dysnomia*) *sulcata sulcata* (Lea)
Lampsilis powelli (Lea)

Recovery Plans Recently Completed or Underway

Canthyria steinstansana (Johnson & Clarke)
Potamilus (=*Proptera*) *capax* (Green)
Margaritifera hembeli (Conrad)
Pleurobema curtum (Lea)
Pleurobema marshalli Frierson
Pleurobema taitianum (Lea)
Epioblasma penita (Conrad)
Quadrula stapes (Lea)

The designated periods for receipt of comments have expired in some cases but are still current in others. Biologists who desire information about the survival status of *A. heterodon*, or have special knowledge about that species, are asked to contact the Field Supervisor, U.S. Fish & Wildlife Service, 1825 Virginia St., Annapolis, MD 21401. For *A wheeleri* contact that agency at 222 S. Houston, Suite A, Tulsa, OK 74127. For *C. stegaria* or *E. sulcata* contact the F&WL Service at 100 Otis St., Room 224, Asheville, NC 28801. For *M. hembeli* and the 5 species listed below it contact the F&WL Service at Jackson Mall Office Center, 300 Woodrow Wilson Ave., Suite 316, Jackson, MS 39213.

REVIEW

A Classification of the Living Mollusca compiled by Kay Cunningham Vaught, xii + 189 pp., 1989, edited by R. Tucker Abbott and Kenneth Jay Boss, plastic comb binding $17.00, hardback library binding $21.00 (+ $2.00 mailing), published by American Malacologists, P.O. Box 1192, Burlington, MA 01803.

This scholarly compilation seeks to provide an up-to-date systematic arrangement of all available supraspecific molluscan names (with authors and dates) published prior to 1988 together with synonymies, bibliographies, and an index. More than 15,000 names are included. Regrettably, no type species are cited, no illustrations useful for identification are included, and most author and date text citations are not elaborated in the bibliographies.

The author deserves great credit for producing such an impressive and comprehensive work. Any such undertaking, especially if carried out without constant access to the facilities of a major natural history museum, must inevitably contain errors and omissions. Unfortunately it is incumbent on a reviewer to point out significant errors and to assess the degree of completeness which has been achieved.

The basic arrangement of the text, which is presumably designed to reflect phylogeny, is unusual. The first group considered is the Aplacophora rather than the Monoplacophora and the last is the Scaphopoda rather than the Cephalopoda. An excessive number of Families (4) in Recent Monoplacophora is also accepted. Partly because of my own research interests, certain systematic inaccuracies at the genus-group level are also immediately apparent. These involve misplacement of some genera (for example Herringtonium should be transferred to Sphaeriidae, Canthyria to Pleurobemini, and Clencharia probably to Lametilidae); inappropriate status applied to others (for example, all 5 genera clearly described by Petuch in 1987 (New Caribbean Marine Faunas, Charlottesville, VA: CERF) are treated as nomena dubia; they are Lindapterys, Harasewychia, Nodicostatella, Turricostatella, and Scissuladrana), and omission of others (for example, Abyssogyra and Benthobrookula (both) Clarke, 1961 (Bull. Mus. Comp. Zool., Vol 125) (Cyclostremidae) and Alasmidens Clarke, 1981 (Smithsonian Contrib. to Zool., No. 326) (Unionidae)). Text citations and bibliographic references for many of the synonymies are also not given and one can only speculate about the bases for those opinions.

The most serious difficulties, however, involve other aspects of the bibliographies. A number of author names are misspelled and many citations are incomplete. Some errors and much duplication might have been avoided if the several bibliographies had been combined into one. In addition, many significant and pertinent contributions by a number of the best workers in malacology are not included. For example, most of the monographs and other major papers by W.J. Clench, R.D. Turner, A. Myra Keen, R.I. Johnson, S.L.H. Fuller, D.H. Stansbery, and Henry van der Schalie are not cited and most of the Johnsonia monographs are omitted. The bibliographies, therefore, should not be regarded as a roster of the most important recent contributions to systematic malacology but only as a selected subsample of malacological literature as a whole.

This work cannot serve as a substitute for the well-illustrated and thoroughly documented monographs of Thiele or Wenz, or the molluscan volumes of the Treatise on Invertebrate Paleontology. It is a voluminous, thoughtful, modern compilation, however, and it can be an extremely useful guide to molluscan classification and to some of the recent molluscan literature. It is excellent value for the price and it is therefore sincerely recommended.

Arthur H. Clarke

Contents of Volume 2

INFORMATION FOR CONTRIBUTORS

Malacology Data Net (Ecosearch Series) seeks to enhance progress in malacology by facilitating rapid publication of significant new information about all aspects of marine, freshwater, and terrestrial mollusks. All scholarly contributions are welcome, but manuscripts dealing with timely issues such as current threats to the survival of molluscan species or communities, descriptions of new taxa, opportunities for participation in ongoing research programs, etc. are particularly appropriate.

Editorial style used in this journal follows the Style Manual for Biological Journals available from the American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, VA. 22209. Manuscripts should be submitted (in duplicate) as camera ready copy, using "letter quality" type, with text in blocks 5 inches wide and 6½ inches high. Use of a word processor is recommended. Each manuscript will be reviewed by at least two professional malacologists and, if necessary, will be returned to the author for revision. After final acceptance publication will proceed rapidly, normally within about 8 weeks.

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