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*American*  
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# CONCHOLOGISTS OF AMERICA, INC.



In 1972, a group of shell collectors saw the need for a national organization devoted to the interests of shell collectors; to the beauty of shells, to their scientific aspects, and to the collecting and preservation of mollusks. This was the start of COA. Our membership includes novices, advanced collectors, scientists, and shell dealers from around the world. In 1995, COA adopted a conservation resolution: Whereas there are an estimated 100,000 species of living mollusks, many of great economic, ecological, and cultural importance to humans and whereas habitat destruction and commercial fisheries have had serious effects on mollusk populations worldwide, and whereas modern conchology continues the tradition of amateur naturalists exploring and documenting the natural world, be it resolved that the Conchologists of America endorses responsible scientific collecting as a means of monitoring the status of mollusk species and populations and promoting informed decision making in regulatory processes intended to safeguard mollusks and their habitats.

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***Cymbiola vespertilio* (Linnaeus, 1758) at night in 40 feet of water on a black sand slope, Sulawesi, Indonesia. Photographed by COA contributor and author, Charles E. Rawlings, MD, JD. Charles has recently published a book of his molluscan photos, see review on page 36.**

**Back cover: Chicago!! Clockwise from top: Downtown Chicago, the Chicago Theatre, the ‘L’, Navy Pier, Millennium Park, the Field Museum, and the Sears Tower. This is an exciting place and a lot of your shelling friends will be there – COA Convention Chicago, 27-31 July 2016, at the Crowne Plaza in Rosemont, IL. The hotel is minutes from Chicago O’Hare International Airport and there is a free shuttle. Don’t be left out. Fill out and mail in the forms that were in the last issue, or if they have mysteriously disappeared, go online to: [www.conchologistsofamerica.org](http://www.conchologistsofamerica.org). Everything you need to register can be found there. Image from Wikipedia.com.**

**In memoriam:**

**Lucille Green**



The illustration at the top shows several different types of shells, including a large, pointed shell and a smaller, rounded one. Below the illustration is a color photograph of a woman with dark hair, smiling, wearing a patterned top.

Clara Lucille Morrow Green, 71, passed away on Saturday, January 16, 2016 after a difficult battle with cancer. Lucille was born August 16, 1944, in Fort Worth, Texas. After graduating from Texas Christian University (TCU) in 1966, Lucille married David B. Green in 1967.

Lucille & David shared a common love for sea shells and were members of numerous shell clubs around the country, including The Central Florida Shell Club of Orlando where she served as President, 1989-1990. Lucille was the recipient of numerous major awards for scientific shell displays including The DuPont, given by the DuPont Museum of Natural Science of Wilmington, Delaware, and Best Exhibit Award, given by The Conchologist of America (COA). Lucille also received numerous awards for shell crafts and shell related needlework. She went on to serve on the Board of Directors for COA and was the COA Convention Chairman in Houston in 2000. She was also honored with the annual COA *Neptunea* Award for outstanding service in 2013.

A creative person, she enjoyed gardening, sewing, knitting, crochet, needlework, cooking, and entertaining friends and family. She was an avid collector of snail collectables and could usually be found wearing a snail pin on her blouse or jacket.

Lucille will be deeply missed by her family and friends.

# The Turrids: not just LBJs<sup>1</sup>

Bruce Neville

When I get shell-bored, I pull out Eisenberg. This is a dangerous thing. Unlike any other shell book, Eisenberg shows lots of shells laid out in relative size, on a double-page spread. Although the names on the bottom half are getting more and more highlighted (highlight?), there are still and probably always will be plenty of holes. Occasionally, I'll decide that my collection is seriously underrepresented in an entire family, and I'll set out to remedy the situation. Such was the situation a few years ago with the "Turridae." Widely acknowledged as the largest family of shells, I had pitiful few representatives —certainly less than 1% of the named species!

Many shellers have little experience with the turrids. Historically, shell books have ignored them, portrayed them as unappealing "little brown jobs," or given long, daunting, unillustrated lists of names. Identification was generally "only for specialists." Generic names were confusing and often-changing. Few species are common in beach drift or shallow water. Until recently, only a few species were available from dealers. It's no wonder, then, that shellers shied away from this large and confusing family.

Popular shell books of the late twentieth century contributed to this neglect. The "Greatest Shell Book Ever Written," Abbott's *Seashells of the World*, portrayed only seven species on a two-page spread. His later *Seashells of North America* portrayed 18 species, still on a two-page spread, from a more limited geographic area. From the time I got that book, I coveted *Cochlespira radiata* (Dall 1889). Eisenberg crammed an amazing 43 worldwide species, still on a two-page spread, which was probably a fair representation of the species available through dealers at that time, as was his goal. The following year, Abbott and Dance, in their *Compendium of Seashells*, illustrated 75 species.

Comprehensive works of the time did little to help the popularity of the family. Abbott's *American Seashells* (second edition) lists 572 species and subspecies of turrid, but only 165 are illustrated, most with line drawings. Keen's monograph on the Panamic province lists 301 species and subspecies of turrid and illustrates nearly all, though many are reproductions of the type figures of varying quality. Poppe and Goto later listed 168 species from Europe, but only illustrated 54. Nordsieck described and illustrated 305 species from Europe, again with line drawings. Wilson, in his comprehensive work on Australian prosobranchs, lists



**Books that through time covered more and more turrids, but still only a fraction of the estimated 3,000+ species.**

only 76 species and illustrates only 63, from a fauna estimated by Kohn (in Beesley et al.) at >400 species.

Fortunately, the situation has improved a bit in the twenty-first century. Williams's *Turridae of Florida and the Caribbean* lists and illustrates 301 taxa from that area, often with type specimens. Hasegawa et al. in Okutani illustrate 240 species from Japan, including many microspecies. Sysoev and Oliveira & Sysoev in Poppe illustrate 199 species from the Philippines. Although the illustrations in the latter are spectacular, they often do not substitute for the proverbial thousand words each.

So, how many species of turrid are there, really? The best answer was probably given by John K. Tucker in his *Catalog of Recent and Fossil Turrids*. No serious student of turrids can afford to be without this 1,295-page behemoth. Among the >11,350 species-group names listed, Tucker estimated that there were >3,000 potentially valid recent species in 2004, and more have been described almost every day since!<sup>2</sup> Thanks to the development of online auctions and the increased popularity of the group, I've finally made it to the magical 1% mark, and actually passed the 10% mark!

So, what makes a turrid a turrid? There is no single defining character shared by all turrids or that excludes all other mollusks. Basically, they are any conoidean mollusk that is not a cone or an auger. Even that gets a little vague around the conorbids.

One feature that has been called characteristic of the turrids is the "turrid notch," an indentation for the exhalant

1. Little brown jobs (to borrow a phrase from the birding world).

2. Note that I'm using the old, broad concept of the "Turridae" in this first part of the article. I'll get to recent developments in the taxonomy of the group later.

siphon near the shoulder. This notch may be quite prominent and marked by a difference in sculpture, or it may be completely obscured. I often see it referred to in a description and wonder what the author has been smoking. The “turrid notch” is also the source of the old name for the group, *Pleurotoma* Lamarck 1799, meaning lung-slit. This feature is, of course, not unique to the turrids. The cones also show an “anal notch” to varying degrees, though it is generally immediately adjacent to the suture in the cones and set off from the suture to some degree in the turrids.

The radula varies from 5 teeth per row to 4, 3, or 2, to 0. In the most primitive condition, there are five teeth per row and a well-developed radular membrane. The full complement of teeth is a small central (or rachidian) tooth, two laterals, and two marginals. This arrangement occurs in the drilliids. The lateral teeth are generally lost first, leaving a configuration of three teeth per row. Alternatively, the central tooth may rarely be lost, leaving four teeth per row, two vestigial laterals, and two marginals, as happens in some *Crassispira* species. Finally, the central or lateral teeth are lost, leaving only the two marginals. The radula has been completely lost in some species of raphitomids. As the radular teeth are lost, the radular membrane and odontophore also regress and finally disappear. Throughout the broad diversity of the group, each type of tooth can occur in several different forms. The marginal teeth show the greatest diversity of structure in the family. They are divided by Taylor et al. (1993) into three main classes, solid, “wishbone” or duplex, and hollow, each with several subclasses. It is the hollow marginals that are the venomous “harpoons” of the cones, augers, and many turrids.

Some genera have an operculum, while others do not. When present, the operculum is horny. It may fill the aperture completely or be vestigial. As may be expected in a group with >3,000 species, shell shape, size, and sculpture vary spectacularly. In length, the species vary from *Carinapex minutissima* (Garrett 1873) with an adult size of just a couple millimeters to *Turris crispata* (Lamarck 1816) with a maximum recorded size of 178.37 mm (Quiquandon 2015). The colors are generally variations of browns, tans, creams, and whites, but purples, reds, and other colors can occur. Sinistrality occurs naturally in a few genera (e.g., *Antiplanes* Dall 1902, *Scaevatula* Gofas 1989, *Asthenotoma* Harris & Burrows 1891), often alongside dextral species. Harry Lee reports reverse coiling in two recent species of turrids, *Asthenotoma lamothei* (Dautzenberg 1910) and *Clionella borni* (E.A. Smith 1877), at <http://www.jaxshells.org/reverse.htm>.

What do we know of their biology? Frankly, very little. They are found in all seas at all depths. Apparently all

are carnivorous. Where the diet is known, most species have been found to feed on worms, generally polychaetes. A few species have been observed feeding on mollusks. They do have a poison gland, like other conoideans. A few species are now being studied for their toxins. The poison apparatus has been secondarily lost in some groups, such as the strictispirids and some raphitomids. The sexes are separate and fertilization is internal. Eggs are laid in capsules that are adherent to the substrate.

Any recounting of modern classification must begin with Linnaeus. He described three species of turrid, though he did not recognize them as such: *Murex babylonius*, now *Turris babylonica* (Linnaeus 1758); *Murex javanus*, now *Turricula javana* (Linnaeus 1758); and *Strombus lividus*, now thought to be *Clavatula auriculifera* Lamarck 1816. The name *Turris* was validly erected by Röding in 1798.<sup>3</sup> He included 22 names under the genus, all of which are either synonyms of Linnaeus’s names or *nomina nuda*. Lamarck added two genera, *Pleurotoma* Lamarck 1799 and *Clavatula* Lamarck 1801. By 1822, there were 23 living and 30 fossil species of *Pleurotoma*. Röding’s *Museum Boltenianum* was, of course, rare and overlooked even in Europe during the eighteenth century, and Lamarck’s names were in general use. It was not until Dall resurrected the *Museum Boltenianum* in 1906 that Röding’s *Turris* was given precedence, though the furor over the loss of the familiar Lamarckian names lasted for over half a century. Only eight genus-group names had been erected for the turrids by 1850. There were 65 genus-group names in the family by 1900. The naming of genera has accelerated rapidly since 1900 and has not slowed since. Although he didn’t treat genus-group names, Tucker estimated that there were more than 350 valid genera.

Traditionally, the turrids were a catch-all family for any conoidean gastropod that wasn’t a cone or an auger. Species continued to be described, but there were no true specialists in the group. Species were transferred readily between genera, and genera were transferred just as readily between subfamilies. It was widely acknowledged that the turrids were not a natural group, i.e., the family did not contain all the descendants of a common ancestor and only those descendants, but nobody quite knew how to deal with them. Powell (1966) provided the first comprehensive treatment of the family, recognizing nine subfamilies, which eventually became 17, in an arrangement that was widely used for many years.

In 1993, Taylor, Kantor, and Sysoev sampled a large number of “turrids” and, based primarily on radular characters and feeding apparatus, proposed a six-family arrangement for the conoideans: Drilliidae, Terebridae, Pseudomel-

3. The name *Turris* has recently been attributed to Batsch 1789, but Batsch’s concept of the name did not include the species now included in the genus and the subsequent type designation is an erroneous reversal of precedence and therefore invalid.

atomidae, Strictispiridae, Turridae (with 5 subfamilies), and Conidae (including 6 “turrid” subfamilies). All of a sudden, the familiar “Conidae” became swamped with turrids! Cone-purists were outraged! This arrangement, however, recognized that the cones, for all their popularity, are just specialized turrids, nestled within the great assemblage of other turrids. The arrangement also went a long way toward reducing the paraphyly (non-naturalness) of the group. This was the system used by Turgeon et al. in the second edition of their *Common and Scientific Names of Mollusks*. With the addition of the Clavatulidae, this is also the arrangement adopted by Bouchet & Rocroi in their *Nomenclator of Gastropod Families* in 2005.

When Tucker and Tenorio published their masterful revision of the more restricted conoidean gastropods in 2009, they split the former Conidae (in the former, restricted sense, plus a few “turrids”) into five families. By doing so, the other subfamilies previously included by Taylor et al. in the Conidae were automatically also elevated to family status. The subfamilies in Taylor et al.’s concept of Turridae were similarly distinct and also needed to be elevated to the rank of family. Since that time, four of Tucker and Tenorio’s families have been re-lumped back into the Conidae, with Conorbidae remaining a distinct family. Kantor et al., in 2012, erected a new family for the single species *Bouchetispira vitrea* Kantor, Strong & Puillandre 2012. This brings the total number of currently recognized families in the former “Turridae” to 14. The current phylogenetic arrangement of the conoidean families is:

Drilliidae	Conorbidae
Pseudomelatomidae	Borsoniidae
Strictispiridae	Clathurellidae
Clavatulidae	Mitromorphidae
Horacilavidae	Bouchetispiridae
Cochlespiridae	Mangeliidae
Turridae (s.s.)	Raphitomidae
(Conidae)	(Terebridae)

But enough of my ramblings. I started out by saying that turrids are more than just “little brown jobs.” Let the pictures speak for themselves. Marcus Coltro of Femorale provided the many excellent photographs of the turrids (s.l.) that I used in an earlier presentation that was the basis of this article. It is with his renewed permission that I re-use the photos to demonstrate that turrids can be downright attractive and worthy of any sheller’s attention. Thank you, Marcus.

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#### Drilliidae (Copyright Femorale, used with permission)

1. *Clavus canicularis* (Röding 1798), 20.5 mm, Seragaki, Okinawa, Japan. 2a-b. *Clavus johnsoni* (Bartsch 1934), 31-41.5 mm, north of San Juan, Puerto Rico. 3. *Clavus lamberti* (Montrouzier 1860), 15.1 mm, Nacala Bay, Mozambique. 4. *Conopleura striata* Hinds 1844, 15 mm, Senkaku Islands, Okinawa. 5. *Drillia idalinae* P. Bernard & Nicolay, 1984, 22 mm, Lago Azul, São Tomé Island. 6. *Fenimorea halidorema* Schwengel 1940, 18.8 mm, Roatan Island, Honduras. 7. *Plagiostropha quintuplex* Melvill 1927, 8 mm, Zamboanga, Philippines. 8. *Fusiturricula jaquensis* (G.B. Sowerby I 1850), 38.7 mm, off Cartagena, Colombia.



Pseudomelatomidae (1-3) & Strictispiridae (4) (Copyright Femorale, used with permission)

1. *Antiplanes contraria* (Yokoyama 1926), 45.3 mm, Mobetsu, Hokkaido, Japan. 2. *Crassispira pulchrepunctata* Stahlschmidt & Bozzetti 2007, 13 mm, off Panglao, Philippines. 3. *Inquisitor solomonensis* (E.A. Smith 1876), 16.2 mm, Honiara, Guadalcanal.

4. *Strictispira coltrorum* Tippett 2006, 14.4 mm, Barra Beach, Salvador, Brasil.



Clavatulidae (Copyright Femorale, used with permission)

1. *Clavatulula muricata* (Lamarck 1822), 26.4 mm, off Freetown, Sierra Leone. 2. *Fusiturris similis* (Bivona 1838), 52 mm, Málaga, Spain. 3. *Pusionella nifat* (Bruguière 1792), 52 mm, Luanda, Angola. 4. *Toxiclionella elstoni* (Barnard 1963), 35.6 mm, off Transkei coast, South Africa. 5. *Turricula javana* (Linnaeus 1758), 52.2 mm, Java, Indonesia.





**Horaiclavidae**

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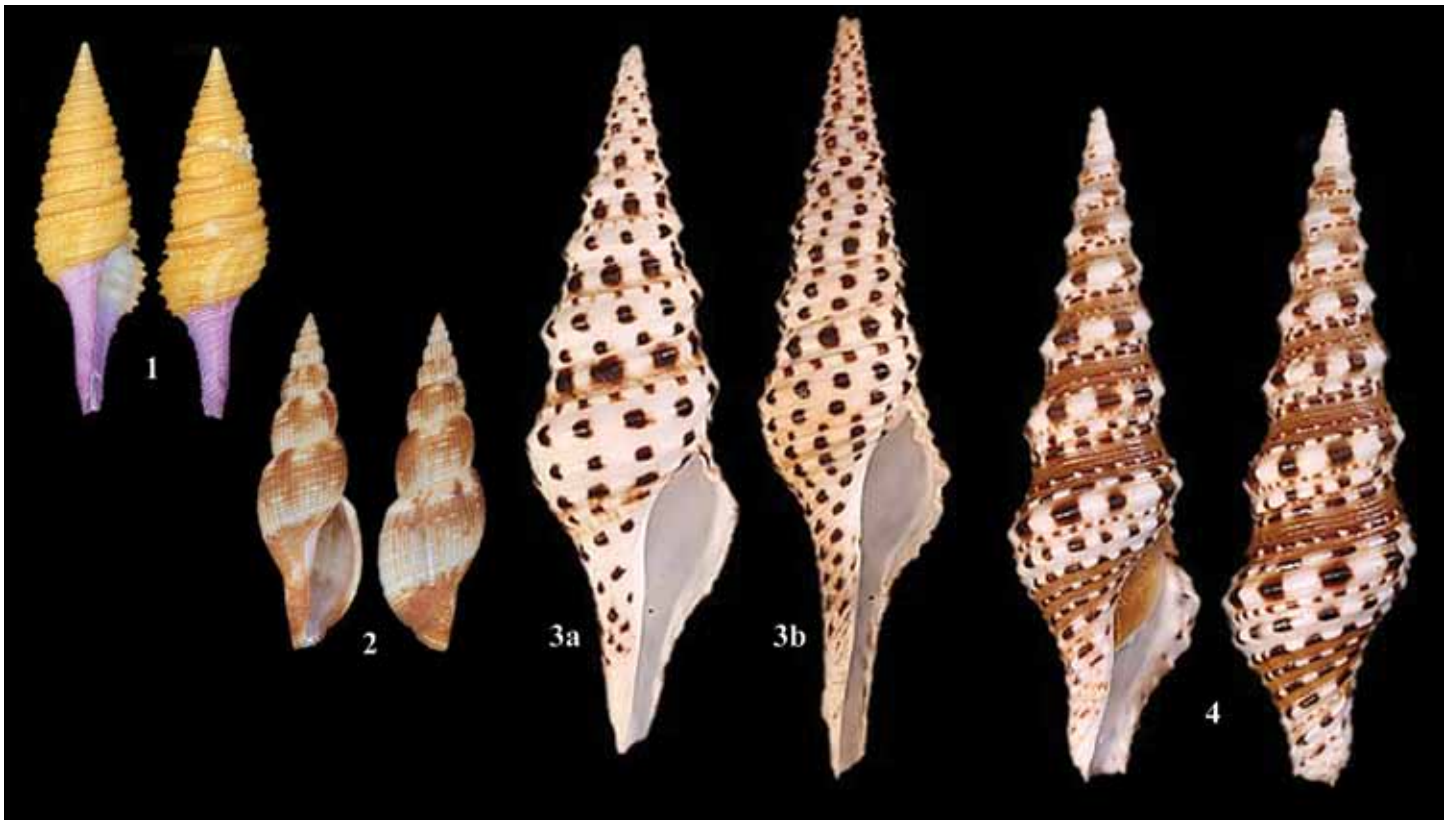
1. *Buchema buccoensis* (Nowell-Usticke 1971), 14.7 mm, Archipelago de San Blas, Caribbean side, Panama.
2. *Carinapex papillosa* (Garrett 1873), 4.7 mm, Puako, Big Island, Hawaii.



**Cochlespiridae**

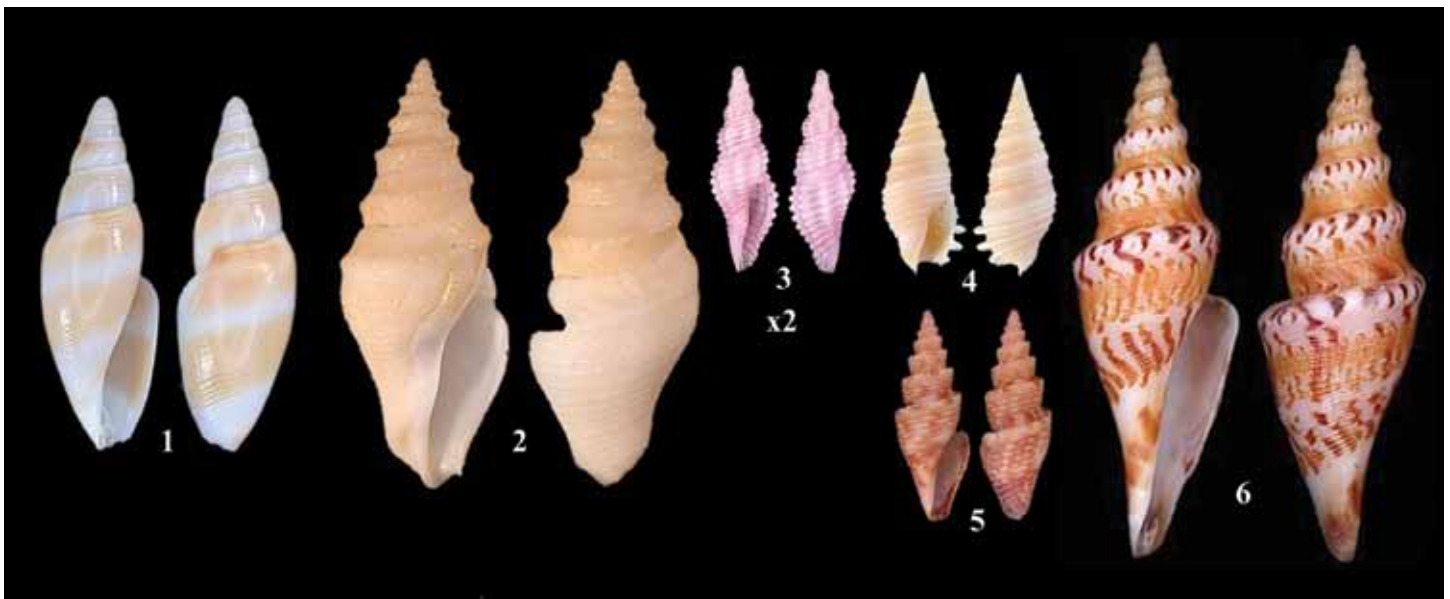
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1. *Cochlespira radiata* (Dall 1889), 23 mm, La Guaira, Colombia.
2. *Aforia multispiralis* Dell 1990, 73 mm, off Antarctic Peninsula.



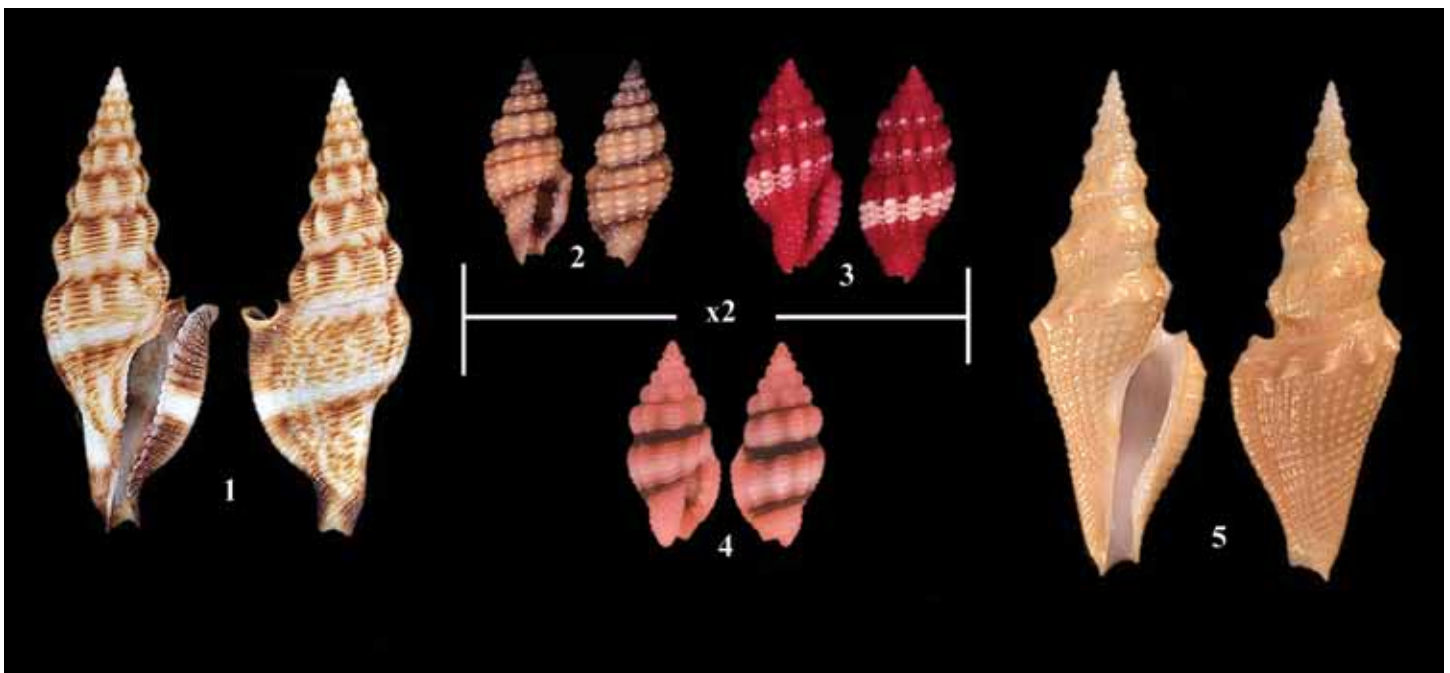
**Turridae** (Copyright Femorale, used with permission)

1. *Gemmula concinna* (Dunker 1856), 33.7 mm, Kota Kinabalu, Sabah, Malaysia.
2. *Maoridaphne* cf. *M. subula* (Reeve 1845), 28.7 mm, off Lu Tao, Taiwan.
- 3a. *Turris chaldeia* Kilburn, Fedosov & Olivera, 2012 (until recently thought to be a form of *T. babylonia*).
- 3b. *Turris babylonia* (Linnaeus 1758), 72 mm (elongate form), Panglao, Philippines.
4. *Turris spectabilis* (Reeve 1843), 63.7 mm, Lua'ofa Island, Vava'u, Tonga.



Conorbidae (1) & Borsoniidae (2-6) (Copyright Femorale, used with permission)

1. *Benthofascis pseudobiconica* Tucker, Tenorio & Stahlschmidt 2011, 36 mm, Sandy Cape, Queensland.
2. *Bathytoma prodicia* Kilburn 1978, 47 mm, off Maputo, Mozambique. 3. *Diptychophlia hubrechtii* Cunha 2005, 8 mm, Canopus Bank, 120 miles off Ceará, Brasil. 4. *Tomopleura makemonos* (Jousseume 1883), 19.5 mm, Muscat, Oman. 5. *Tropidoturris fossata notialis* Kilburn 1986, 19 mm, off Durban, Natal, South Africa. 6. *Zemacies excelsa* Sysoev & Bouchet 2001, 58.2 mm, North Surprises Islands, New Caledonia.



Clathurellidae (Copyright Femorale, used with permission)

1. *Glyphostoma otohimeae* Kosuge 1981, 32.2 mm, off Lu Tao, Taiwan. 2. *Lienardia mighelsi* Iredale & Tomlin 1917, 6 mm, Niuatoputapu, Tonga. 3. *Lienardia rubicunda* (Gould, 1860) 5mm, Taiwan. 4. *Lienardia rubida* (Hinds 1844), 6.9 mm, Zamboanga, Philippines. 5. *Strombinoturris crockeri* Hertlein & Strong 1951, 41 mm, Cebaco Island, Pacific Panama.



Mitromorphidae (1-2) & Mangeliidae (3-6) (Copyright Femorale, used with permission)

1. *Lovellona atramentosa* (Reeve 1849), 10.4 mm, Toau, Tuamotus, French Polynesia. 2. *Mitromorpha alphonsiana* (Hervier 1900), 4.9 mm, Hospital Point, Guam.

3. *Eucithara celebensis* (Hinds 1843), 8.2 mm, Port Vila, Efate, Vanuatu. 4. *Ithycythara cymella* (Dall 1889), 21.1 mm, off Marie Pampeon, Curaçao. 5. *Kurtziella antiochroa* (Pillsbry & Lowe 1932), 9.1 mm, Solongo Island, Manabí, Ecuador. 6. *Tenaturris decora* (E.A. Smith 1882), 6.2 mm, Bocas del Toro, Caribbean Panama.



Raphitomidae (Copyright Femorale, used with permission)

1. *Daphnella margaretae* Lyons 1972, 11.8 mm, off Alcobaça, Brasil. 2. *Daphnella olyra* Reeve 1845, 11 mm, Santa Rosa Island, Cebu, Philippines. 3. *Eubela nipponica* Kuroda 1938, 18.2 mm, Sagami Bay, Honshu, Japan. 4. *Eucyclotoma tricarinata* (Kiener 1840), 7.2 mm, Sand Island, Oahu, Hawaii. 5. *Hemilienardia ocellata* (Jousseume 1888), 3 mm, Taiwan. 6. *Kermia lutea* (Pease 1860), 7.7 mm, Seragaki, Okinawa. 7. *Microdaphne morrisoni* Rehder 1980, 4.1mm, Hawaii. 8. *Pleurotomella* sp., 13.3 mm, off Cabo Frio, Rio de Janeiro State, Brasil. 9. *Pseudodaphnella tincta* (Reeve 1846), 7 mm, Niuatoputapu, Tonga. 10. *Raphitoma bicolor* (Risso 1826), 6 mm, Mijas, Malagá, Spain. 11. *Thatcheria mirabilis* (Angas, 1877), 72.1 mm, off Keelung, Taiwan. 12. *Thatcheriasyrinx orientis* (Melvill 1904), 11.6 mm, off Kagoshima, Japan. 13. *Tritonoturris amabilis* (Hinds 1843), 30.5 mm, Kota Kinabalu, Sabah, Malaysia. 14. *Tritonoturris cumingii* (Powys 1835), 23 mm, Nacala area, Mozambique. 15. *Truncadaphne chrysoleuca* (Melvill 1923), 5.7 mm, off San Blas, Caribbean Panama. 16. *Veprecula arethusa* (Dall 1918), 12.5 mm, off Lu Tao, Taiwan.

# Cone Shells: Mumblings 36-plus years later

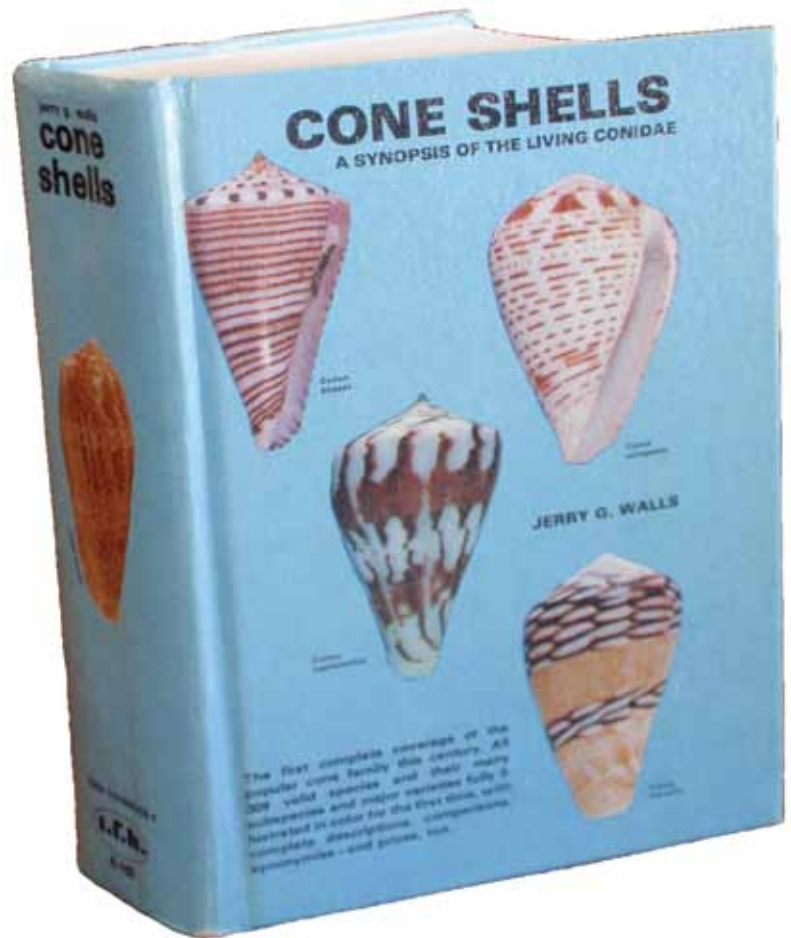
Jerry G. Walls

gyretes@prodigy.net

On March 6, 1979, I put into the mails the first copies of my new book, *Cone Shells, a Synopsis of the Living Conidae*. It's hard to believe that over 36 years have passed since I was able to put away my files and specimens used for that undertaking and move on to different areas. Only two shell books were still to be published by T.F.H. Publications in the next year or two (*Conchs, Tibias, and Harps* as well as the little *Shell Collecting*), and soon after I was mostly out of shell collecting. The cone book was written in about 18 months of nights and weekends between 1975 and 1977, with several trips to the Delaware Museum, followed by almost two years of waiting for actual publication. (See Crnkovic, 2008, for more information on *Cone Shells, The Pariah*, and other projects of this period.)

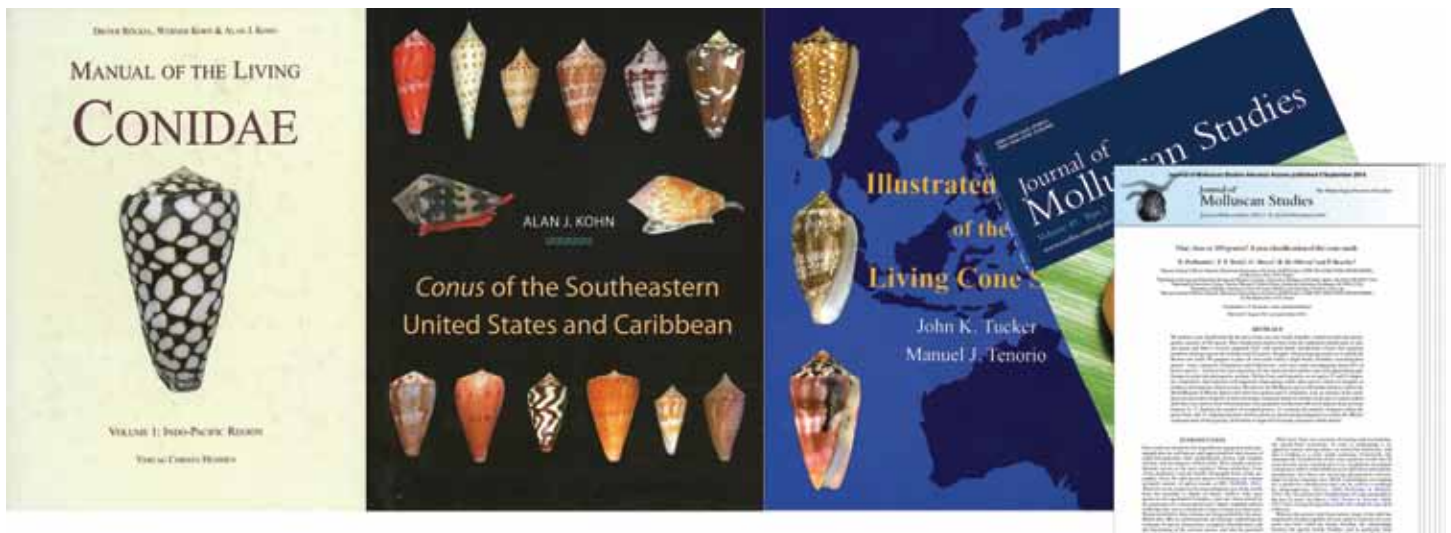
The past few years have seen a flurry of publications dealing with cone shell identification and relationships, with a few good regional books and even a new attempt to illustrate all the described species (see Tucker and Tenorio, 2013). There also has been considerable study of the molecular genetics of cones, mostly involving venoms and mitochondrial DNA (see Puillandre, et al., 2015, for a summary). Though I no longer actively collect cones (cowries, olives, and a few miscellaneous families are now my thing when I have time and money to spare), I try to keep some contact with the cone literature. Recently I had occasion to look up something in *Cone Shells*, and it started me thinking how the Conidae and my old book have fared over the years.

First, it is amazing to me that after all these years, *Cone Shells* remains the only book to attempt to both illustrate and describe in a systematic way all the cones, including variations. Recent books have tried to illustrate all the species, but without comparative descriptions that could be used to actually identify a cone. Additionally, the concept of a "valid" species has become pretty much the same concept as a "validly-named" species; they are not the same by a long shot, but this is not always obvious in the current literature. Unfortunately, the old "just look at the picture" concept of identification does not work well with cones (or most other shells, for that matter). Because cones are so variable in color, pattern, and shape, just looking at a picture of a single specimen, such as the holotype or name-bearer for the species, does not really give you an idea of what a cone species really represents. Collecting by picture matching really does



become just another version of stamp or coin collecting, putting a name rather than an animal in a box on a specimen tray.

Second, though the number of species of cones recognized continues to increase at a phenomenal rate – from the roughly 310 species and an additional 100 or so subspecies/named forms I recognized in 1979 to certainly over 800 "valid" (= validly-named) species today – the quality of the descriptions remains generally low. Few new names are compared in a meaningful way with basic species, there is almost no consideration of variation, and (surprisingly) a tendency has developed to recognize species by size. I've noticed more and more species described because all specimens are, say, over 70mm, while those of the closest species are under 60mm, or the new species is under 25mm, while similar forms are 50mm long. Has everyone forgotten that cones start small and grow, often changing their pattern and shape as they become mature and then senile? I certainly thought that after all these years there would be more de-



Left to right: 1. Röckel, Korn, & Kohn (1995), *Manual of the Living Conidae*. Vol. 1: Indo-Pacific Region [subsequent volumes never materialized, although], 2. Alan Kohn (2014) did publish *Conus of the Southeastern United States and Caribbean*. These first two books use a single genus, *Conus*, for 316 and 53 species respectively. 3. Tucker & Tenorio (2013), *Illustrated Catalog of the Living Cone Shells* recognizes 119 genera for almost 750 cone species. 4. Puillandre, Duda, Meyer, Olivera & Bouchet (2015) *One, four or 100 genera? A new classification of the cone shells*. *Journal of Molluscan Studies*, recognize 803 cone species in 4 genera and 71 subgenera.

scriptions of cone juveniles and growth stages in the literature, but they are strangely still almost absent.

Third, the use of mitochondrial DNA and radular tooth studies has led to absolute confusion in cone genera and even families. Utilizing the same basic information, which is constantly increasing, classifications recognize one family or five for the cones and anything from four genera to over 120 genera (with more described each year). Is any of this an improvement over recognizing just a single family Conidae with a single living genus, *Conus*, as was considered proper for so long? Certainly from the viewpoint of a collector, having literally dozens of generic names to pick through when looking for a species is discouraging and can lead to leaving the hobby. Puillandre, et al., 2015, give a listing of 803 “valid” species and their current classification into four genera and 71 subgenera (often almost guesswork) – now considered a conservative classification. Of course, the scientific work is being done not for collectors but for scientists, who are more interested in supposed relationships than taxonomy, which has to deal with making identifications that everyone can use. The scary part is that when DNA studies move to nuclear DNA (the DNA of a chromosome) from mitochondrial DNA (the DNA of energy-producers in a cell), classifications are likely to drastically change again if we can go by what has happened in other groups of animals. Instead of leading to stability (a goal of taxonomy and naming), recent studies have led to total instability. Hobbyists should beware of trying to apply the latest technological studies to their shells or they should be prepared to constantly change labels and not really learn anything in the process.

Fourth, researchers and collectors often forget there is a virtual forest of fossil cones out there as well as the living types. I listed about 1,200 fossil cone species names in *Cone Shells*, and certainly many more have been described since 1977 (when writing basically stopped on the book). Fossil cones can be studied only by morphology, occasionally with some color pattern visible, and thus cannot be integrated into any classification, familial or generic, based on DNA and radular teeth. Quite a bit of recent work shows that fossil cones, as might be imagined, are highly variable in shape and sculpture and also wildly over-named. I’ve often rather jokingly commented that if all the living cones were painted white, we probably could reduce the number of species to a few dozen, and that is the problem paleontologists face.

Lastly, and most importantly, why is my old book still the only affordable book on the family that a serious collector can buy and use to actually identify cones? You can still get used copies on the Internet for \$75 to \$100, just a few times the original selling price. Röckel, Korn and Kohn (1995) goes for \$500 to \$800 if you can find one (I’ve never been able to afford one); it covers only the Indo-Pacific and now is over 20 years old. The new Tucker and Tenorio (2013) is worldwide in scope, but it retails new for over \$180 and doesn’t discuss basic identifications; when out of print, it probably will sell for several hundred dollars as well. Of course, both the latter books cover many more “valid” species than mine, but most collectors – even specialists – probably will end up with just a couple of hundred cone species in their collections anyway, and not the super-rare species. Are newer, very expensive books really an aid to retaining collectors of this family? I challenge someone to come out



# Dream Stream stems teem with stenotremes redux – saturation 3D shelling along the PRR system sets stratospheric standards

by Harry G. Lee and Robert E. Winters

## CHAPTER I

It was Labor Day weekend 1996 when Dr. Fred Thompson, Dr. Henry McCullagh, and I (HGL) launched our canoe on the Paint Rock River (PRR) for a six mile reconnaissance from U.S. Route 72 (Fig. 1) just south of the town of Paint Rock to the tiny settlement of Butler Mill (twenty miles north of Guntersville, Alabama) on September first. Here the Paint Rock is shielded by a riparian corridor of hardwoods as it meanders through rich farmland. It averages about a hundred feet in breadth and has frequent gravel-bottomed riffles as it drops about twenty feet in altitude on its course to the once-mighty Tennessee River, 21 to 27 miles downstream. Limestone boulders and scarps along the banks and semi-limpid channels serve as a reminder of the calcareous bedrock of the plateau and upland valley it drains. Although the river was at a very favorable (low) stage, the naiads seen were scarce and essentially limited to slim pickings among muskrat-discards at the rodents' habitual feeding stations (middens) along the banks. It was still a productive trip malacologically, however! Fred found colonies of a new aquatic hydrobiid snail (*Marstonia angulobasis* Thompson, 2004), and Henry and I collected, or otherwise accounted for, about twenty naiad species in toto, but there's more to the story.

Somewhat daunted by the slim malacological pickings, I searched about for consolation. I took a few aquatic snails (*Elimia*, *Pleurocera*, *Leptoxis*, *Campeloma*, etc.), but I was soon distracted by the large logjams which festooned the riverbanks at frequent intervals. At closer inspection, these deposits of fluvial wrack at flood peaks up to fifteen feet above the present water level were seen to contain all manner of dismembered upstream flora. To my delight, scattered among the stems and twigs was a smattering of empty, but generally intact, landsnail shells. After sampling about a dozen and a half of the larger drift banks, I realized I had almost two hundred specimens of perhaps twenty species. Recalling my own advice to landsnailers (Lee, 1993), I grabbed several handfuls of stems, etc. from the last few strands and stuffed them into a one gallon Ziploc® plastic bag.

It took a week to dry (180 degrees for 6 hours), sieve, and finally microscopically examine the stems (etc.) the Ziploc® disgorged, but there was, as predicted, ample reward. A number of snail specimens, far too minute to be

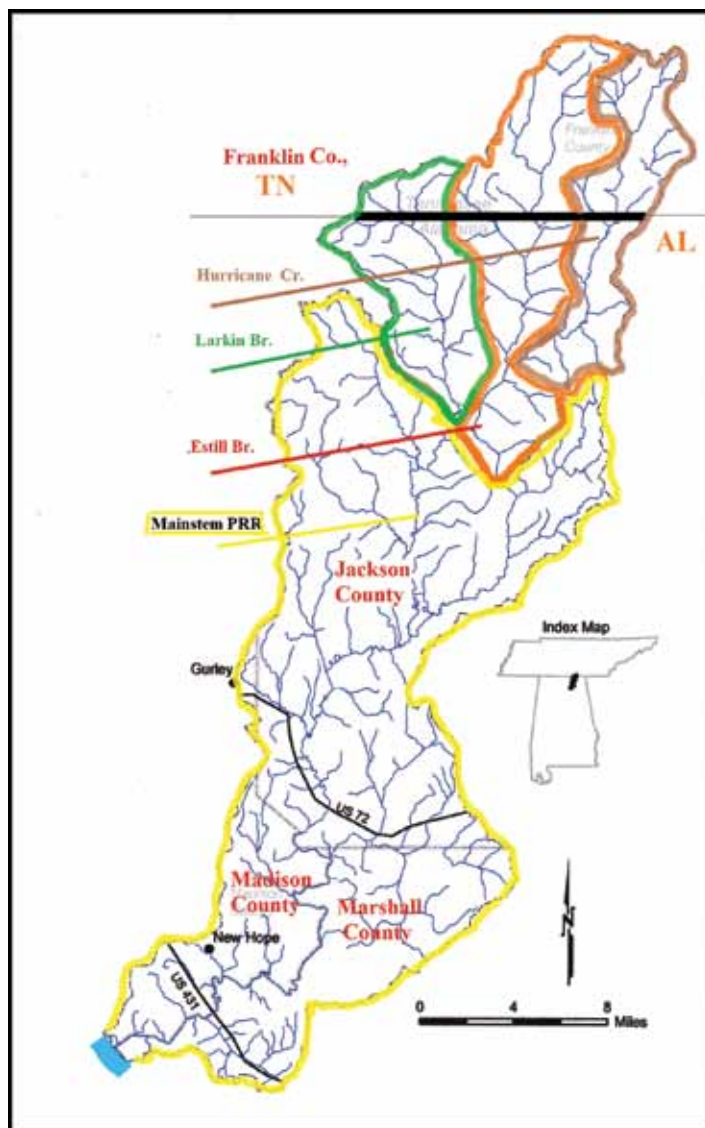


Fig. 1. The drainage area feeding into the Paint Rock River.

plucked in the field by visual reconnaissance, were added to the day's field cullings. The total count, 32 species, was considered a good snail catch for a single station in this part of the world. Of the total, the "stenotremes" (*Stenotrema* and *Euchemotrema*; treated as the former genus at the time), all shells of which were visually-plucked in the field, were dominant both in total numbers and a formidable seven species

(Lee, 1996). Admittedly a little overwhelmed by this diversity and novelty, I put in a few hours sorting and resorting these 120 or so stenotremes and came up with a conchological key for this group (Lee, loc. cit.). Unfortunately, no one can actually know where these 32 species lived in the 500 or so square miles (Fig. 1) that shed the waters which rafted and stranded their shells along our day's itinerary.

The experience impelled me to commemorate the expedition with the title of which is repeated in the first half of the one heading this essay. I have never been back to the PRR, but a kindred spirit (with his newly adopted patron saint) has.

## CHAPTER II

About six years ago I (REW) "took a page" from HGL's book (Lee, 1996) and began retrieving mollusk specimens from flood drift, detritus, and debris (3D) along the PRR (Figs. 2, 3, 4). This is a great way to collect as it yields almost fresh specimens without killing the animals. Principally, I look for land shell specimens in the 3D, but occasionally a good specimen of a fresh water snail or bivalve is found. Monitoring river levels is the best way to determine if a flood has piled up the 3 D's. To date, about 30 3D samples have been taken from 16 stations along the PRR system (Table 1).



**Fig. 2.** The last pile of debris where the sinistral specimen of *Xolotrema obstrictum* was found.

On St. Patrick's Day 2015, I was collecting in one of my favorite places, the flood debris piles of the Estill Fork in Jackson Co., Alabama (Station 9; Table 1.). The rains and melting snow had pushed the water level of the normal 1.2 ft. Estill Fork to over nine feet. The Estill Fork and the Larkin Fork combine just above Princeton, Alabama, to form the PRR. Both Forks fall off the southeastern face of

**Table 1.** PRR system 3D stations collected by Robert E. Winters. Many visited more than once; average ~ twice, from 2009-2015 (see Fig. 1).

1. AL: Jackson Co: Larkin Fork of the Paint Rock River at Francisco, dry stream flood channel.
2. AL: Jackson Co: Larkin Fork, 3 miles SE of Francisco, east stream bank and low fields.
3. AL: Jackson Co: Larkin Fork, un-named hollow 4 miles SE of Francisco, mouth of freshet run and east bank.
4. AL: Jackson Co: Larkin Fork, Simpson Hollow, 1 mile N of Larkin, 2 miles of freshet run and east bank of Larkin Fork.
5. AL: Jackson Co: Estill Fork of the Paint Rock River, Burks Creek at CR175 bridge, both banks.
6. AL: Jackson Co: Estill Fork, Hurricane Creek at last private bridge S of CR9, steep north bank: limestone bluff with rubble, south bank high and muddy.
7. AL: Jackson Co: Estill Fork where CR175 runs into the water just S of the AL/TN border, low east bank adjacent to large weed-choked agricultural field.
8. AL: Jackson Co: Estill Fork at CR146 bridge, both banks.
9. AL: Jackson Co: Estill Fork 1 mile N of Estillfork, both banks.
10. AL: Jackson Co: Paint Rock River across from Horseshoe Cove, both banks and low field at the ford.
11. AL: Jackson Co: Paint Rock River, Swaim at jct. SR65 and CR27, both banks.
12. AL: Jackson Co: Paint Rock River 1 mile below Princeton, both banks.
13. AL: Jackson Co: Paint Rock River 2 miles below Hollytree, high limestone bluff and rubble on west bank and low field at the east bank ford.
14. AL: Madison Co: Paint Rock River at Butler Mill, high west bank.
15. AL: Marshall Co: Paint Rock River at Butler Mill, low east bank.
16. AL: Marshall Co: Paint Rock River 1 mile W of Humpton, high limestone bluff east bank.



the Cumberland Plateau and have high stream gradients. This means that they flood quickly but also drop back to normal quickly. Such was the case when I arrived, a scant three days after high water.

The pickings were amazing. The numerous small tributaries and intermittent freshets of the upper Estill Fork had washed thousands of land snails downstream to this choke point. I handpicked over 1,000 freshly dead snails >4mm. I also filled four 5 gallon buckets with fine detritus, e.g., **Fig. 4**, for further sifting and specimen extraction. At the end of four hours, my 68 year old back was telling me to call it a day; however a leprechaun or perhaps the great Saint himself whispered to me, “Cover the whole choke point completely.” Literally there on the last small pile of debris, e.g., **Fig. 2**, I found a sinistral specimen of *Xolotrema obstrictum* (Say, 1821). Anyone standing on the stream bank would have thought that I had a bit too much whiskey in celebration of the Saint’s Day. This was the first sinistral polygyrid that I have ever encountered. A fine bit of “left-handed luck” for a half Irishman.

### CHAPTER III

After I (HGL) read REW’s accounts on-line (Winters, 2014, 2015a, 2015b) this spring, we engaged in correspondence, and by mid-summer I’d received about five gallons of sieve-selected fines winnowed from the likes of the stuff in **Fig. 4** that Bob had set aside from the St. Patrick’s Day harvest at Station 9. It took a couple of weeks to cull and identify the microsnails, but the results were close to stupendous. Combining these microspecies from the St. Patrick’s Day take with the macrosnails identified by REW and/or Dr. Tim Pearce from it and the other PRR 3D collections, an astounding 102 landsnail species can be accounted for. An analysis, in phylo-alphabetical order is presented in **Table 2**.



**Fig. 3.** The old shoe might have a history, but our interest was in the snail shells found along with the shoe.



**Fig. 4.** Four 5 gallon buckets of snail-rich debris.

Table 2. Annotated inventory of the 102 landsnail taxa identified in the PRR 3D samples (2009-2015).

<i>Helicina orbiculata</i> (Say, 1818) Globular Drop NUC	<i>Glyphyalinia wheatleyi</i> (Bland, 1883) Bright Glyph NUC
<i>Pomatiopsis lapidaria</i> (Say, 1817) Slender Walker NUC	* <i>Hawaiiia alachuana</i> (Dall, 1885) Southeast Gem C
* <i>Carychium arboreum</i> Dourson, 2012 Tree Thorn NUC	* <i>Hawaiiia minuscula</i> (A. Binney, 1841) Minute Gem A
<i>Carychium clappi</i> Hubricht, 1959 Appalachian Thorn UC	<b><i>Mesomphix anurus</i></b> Hubricht, 1962 Frog Button R
* <i>Carychium exiguum</i> (Say, 1822) Obese Thorn UC	<i>Mesomphix capnodes</i> (W.G. Binney, 1857) Dusky Button NUC
<i>Carychium exile</i> I. Lea, 1842 Ice Thorn NUC	<i>Mesomphix globosus</i> (MacMillan, 1940) Globose Button R
<i>Carychium nannodes</i> G. Clapp, 1905 R	* <i>Paravitrea</i> sp. cf. <i>P. capsella</i> (Gould, 1851) Dimple Supercoil NUC
<i>Cochlicopa lubrica</i> (Müller, 1774) Glossy Pillar UC	* <i>Paravitrea multidentata</i> (A. Binney, 1841) Dentate Supercoil UC
<i>Cochlicopa morseana</i> (Doherty, 1878) Appalachian Pillar UC	<i>Paravitrea petrophila</i> (Bland, 1883) Cherokee Supercoil d. Pearce UC
<i>Columella simplex</i> (Gould, 1841) Toothless Column R	* <i>Paravitrea</i> sp. cf. <i>P. pilsbryana</i> (G. Clapp, 1919) Translucent Supercoil R
* <i>Gastrocopta armifera</i> (Say, 1821) Armed Snaggletooth A	* <i>Striatura meridionalis</i> (Pilsbry & Ferriss, 1906) Southern Striate A
* <i>Gastrocopta contracta</i> (Say, 1822) Bottleneck Snaggletooth A	<i>Striatura milium</i> (Morse, 1859) Fine-ribbed Striate d. Pearce UC
* <i>Gastrocopta corticaria</i> (Say, 1817) Bark Snaggletooth A	<i>Ventridens acerra</i> (J. Lewis, 1870) Glossy Dome A
* <i>Gastrocopta pentodon</i> (Say, 1822) Comb Snaggletooth A	<i>Ventridens</i> sp. cf. <i>V. coelaxis</i> (Pilsbry, 1899) Bidentate Dome R
* <i>Gastrocopta procera</i> (Gould, 1840) Wing Snaggletooth A	<i>Ventridens collisella</i> (Pilsbry, 1896) Sculptured Dome C
* <i>Gastrocopta tappaniana</i> (C.B. Adams, 1841) White Snaggletooth A	<i>Ventridens demissus</i> (A. Binney, 1843) Perforate Dome C
<i>Pupoides albilabris</i> (C.B. Adams, 1841) White-lip Dagger A	<i>Ventridens gularis</i> (Say, 1821) Throaty Dome C
* <i>Vertigo gouldii</i> (A. Binney, 1843) Variable Vertigo C	<i>Ventridens ligera</i> (Say, 1821) Globose Dome UC
* <i>Vertigo milium</i> (Gould, 1840) Blade Vertigo A	<b><i>Zonitoides arboreus</i></b> (Say, 1817) Quick Gloss C
* <i>Vertigo oralis</i> Sterki, 1898 Palmetto Vertigo UC	<b><i>Zonitoides lateumbilicatus</i></b> (Pilsbry, 1895) Striate Gloss d. Pearce NUC
* <i>Vertigo oscariana</i> Sterki, 1890 Capital Vertigo UC	<i>Euchemotrema leai aliciae</i> (Pilsbry, 1893) Alicia's Pillsnail UC
* <i>Vertigo ovata</i> Say, 1822 Ovate Vertigo UC	<b><i>Infectarius infectus</i></b> (Say, 1821) Shagreen A
* <i>Vertigo pygmaea</i> (Draparnaud, 1801) Crested Vertigo R	<b><i>Infectarius rugeli</i></b> (Shuttleworth, 1852) Deep-tooth Shagreen NUC
* <i>Vertigo rugosula</i> Sterki, 1890, Striate Vertigo R	<b><i>Infectarius smithi</i></b> (G. Clapp, 1905) Alabama Shagreen A
* <i>Vertigo tridentata</i> Wolf, 1870 Honey Vertigo A	<b><i>Lobosculum pustuloides</i></b> (Bland, 1858) Tiny Liptooth A
* <i>Strobilops aeneus</i> Pilsbry, 1926 Bronze Pinecone C	<b><i>Mesodon clausus</i></b> (Say, 1821) Yellow Globelet C
* <i>Strobilops labyrinthicus</i> (Say, 1817) Maze Pinecone UC	<i>Mesodon elevatus</i> (Say, 1821) Proud Globe R
* <i>Strobilops texasianus</i> Pilsbry & Ferriss, 1906 Southern Pinecone R	<b><i>Mesodon sanus</i></b> (Clench & Archer, 1933) Squat Globe A
<i>Punctum blandianum</i> Pilsbry, 1900 Brown Spot R	<b><i>Mesodon thyroidus</i></b> (Say, 1817) White-lip Globe A
* <i>Punctum minutissimum</i> (I. Lea, 1841) Small Spot A	<b><i>Mesodon zaletus</i></b> (A. Binney, 1837) Toothed Globe A
<i>Haplotrema concavum</i> (Say, 1821) Gray Lancetooth A	<b><i>Millerelix plicata</i></b> (Say, 1821) Cumberland Liptooth C
<i>Novisuccinea ovalis</i> (Say, 1817) Oval Ambersnail R	<b><i>Neohelix albolabris</i></b> (Say, 1817) Whitelip C
<i>Anguispira columba</i> (G. Clapp, 1920) Dove Tigersnail NUC	<b><i>Neohelix fuscolabris</i></b> (Pilsbry, 1903) Brownlip UC
<i>Anguispira cumberlandiana</i> (I. Lea, 1840) Cumberland Tigersnail R	<i>Patera appressa</i> (Say, 1821) Flat Bladetooth UC
<i>Anguispira jessica</i> Kutchka, 1938 Mountain Disc C	<b><i>Patera perigrapta</i></b> (Pilsbry, 1894) Engraved Bladetooth NUC
<b><i>Discus clappi</i></b> (Pilsbry, 1924) Channeled Disc R	<b><i>Patera sargentiana</i></b> (C.W. Johnson, 1821) Grand Bladetooth NUC
<i>Discus nigrimontanus</i> (Pilsbry, 1924) Black Mountain Disc d. Pearce UC	<i>Stenotrema calvescens</i> Hubricht 1961 Chattanooga Slitmouth R
<b><i>Discus patulus</i></b> (Deshayes, 1830) Domed Disc C	<b><i>Stenotrema deceptum</i></b> (G. Clapp, 1905) Monte Sano Slitmouth A
* <b><i>Helicodiscus aldrichianus</i></b> (G. Clapp, 1907) Burrowing Disc UC	<b><i>Stenotrema exodon</i></b> (Pilsbry, 1900) Alabama Slitmouth C
* <b><i>Helicodiscus</i></b> sp. cf. <i>H. notius notius</i> Hubricht, 1962 Tight Coil A	<i>Stenotrema hirsutum</i> (Say, 1817) Hairy Slitmouth NUC
<i>Lucilla</i> sp. cf. <i>L. barri</i> (Hubricht, 1962) Raccoon Coil d. Pearce R	<i>Stenotrema macgregori</i> Dourson, 2011 MacGregor's Slitmouth R
<i>Lucilla</i> sp. cf. <i>L. hadenoecus</i> (Hubricht, 1962) Cricket Coil d. Pearce R	<b><i>Stenotrema spinosum</i></b> (I. Lea, 1830) Carinate Slitmouth NUC
* <b><i>Lucilla punctatella</i></b> (Morrison, 1942) Punctuate Coil R	<b><i>Stenotrema stenotrema</i></b> (L. Pfeiffer, 1842) Inland Slitmouth A
* <b><i>Lucilla</i></b> sp. cf. <i>L. scintilla</i> (Lowe, 1852) Oldfield Coil C	<b><i>Stenotrema turbinella</i></b> (Clench & Archer, 1933) Little Turban Slitmouth UC
* <b><i>Lucilla singleyana</i></b> (Pilsbry, 1890) Smooth Coil UC	<b><i>Triodopsis hopetonensis</i></b> (Shuttleworth, 1852) Magnolia Threetooth A
* <b><i>Euconulus chersinus</i></b> (Say, 1821) Wild Hive A	<b><i>Triodopsis tennesseensis</i></b> (Walker & Pilsbry, 1902) Budded Threetooth NUC
* <b><i>Euconulus dentatus</i></b> (Sterki, 1893) Toothed Hive C	<b><i>Triodopsis tridentata</i></b> (Say, 1817) Northern Threetooth C
* <b><i>Gastrodonta interna</i></b> (Say, 1822) Brown Bellytooth A	<b><i>Triodopsis vulgata</i></b> Pilsbry, 1940 Dished Threetooth C
* <b><i>Guppya sterkii</i></b> (Dall, 1888) Sterki's Granule C	<b><i>Xolotrema carolinense</i></b> (I. Lea, 1834) Blunt Wedge NUC
<b><i>Glyphyalinia cryptomphala</i></b> (G. Clapp, 1915) Thin Glyph NUC	<b><i>Xolotrema obstrictum</i></b> (Say, 1821) Sharp Wedge C
<b><i>Glyphyalinia lewisiana</i></b> (G. Clapp, 1908) Pale Glyph NUC	
<b><i>Glyphyalinia praecox</i></b> (H.B. Baker, 1930) Brilliant Glyph C	

- 5 specimens = Rare (R)
- 6-20 specimens = Uncommon (UC)
- 21-50 specimens = Not uncommon (NUC)
- 51-100 specimens = Common (C)
- >100 specimens = Abundant (A)

**Boldface** connotes taken in the most provident sample: Station 9: Bob Winters! 17 March, 2015. These **84 taxa** (*Mesomphix* ID'ed only to genus) comprise 41 microspecies (< 5.50 mm when adult) plus 7 more species identified from juvenile specimens of non-

microspecies culled from fine particle sievings (HGL) and 36 non-microspecies (REW); included in the latter moiety was the sinistral specimen of *Xolotrema obstrictum* mentioned above. As noted in the table, some of the 17 remaining species were identified by Dr. Tim Pearce. These specimens are vouchered at the Carnegie Museum, Pittsburgh in his care.

\*Indicates represented by a scanning electron micrograph (SEM) image in **Plate 1**. These hypotypes are vouchered at the Florida Museum of Natural History, Gainesville.

This is certainly a prodigious list, both in numbers of specimens and in species richness. Furthermore, there are some rare, one possibly unnamed, and some significant range extensions as indicated by the comments in the explanation under **Plate 1**). On the order of 20% of the known shelled landsnail species in the USA, east of the Rockies, are included. Since the PRR drains an area known to be landsnail friendly by geography (Hubricht, 1985) and habitat: the limestone-rich steep (in its tributaries) landscape through which it runs allows snails to prosper (and their shell remains to persist longer than in other terrains), the authors expected a rich harvest. A hundred-odd species was quite an optimistic target, but 84 from a single collecting event was hyperbolic. Provident collections such as these, especially a focused one such as the St. Patrick's Day 2015 exercise, yield a generous representation of a regional fauna without the destruction of living specimens and critical habitat, extensive deployment of resources (e.g., time, manpower and transportation), and with greater return of specimens and diversity compared to conventional methodologies. Ecologists and zoogeographers may lament the lack of precision inherent in our protocols; nonetheless we believe we've demonstrated the value of 3D collecting in an integrated approach to the understanding of landsnail communities, species diversity, and, in the future, their population trends.

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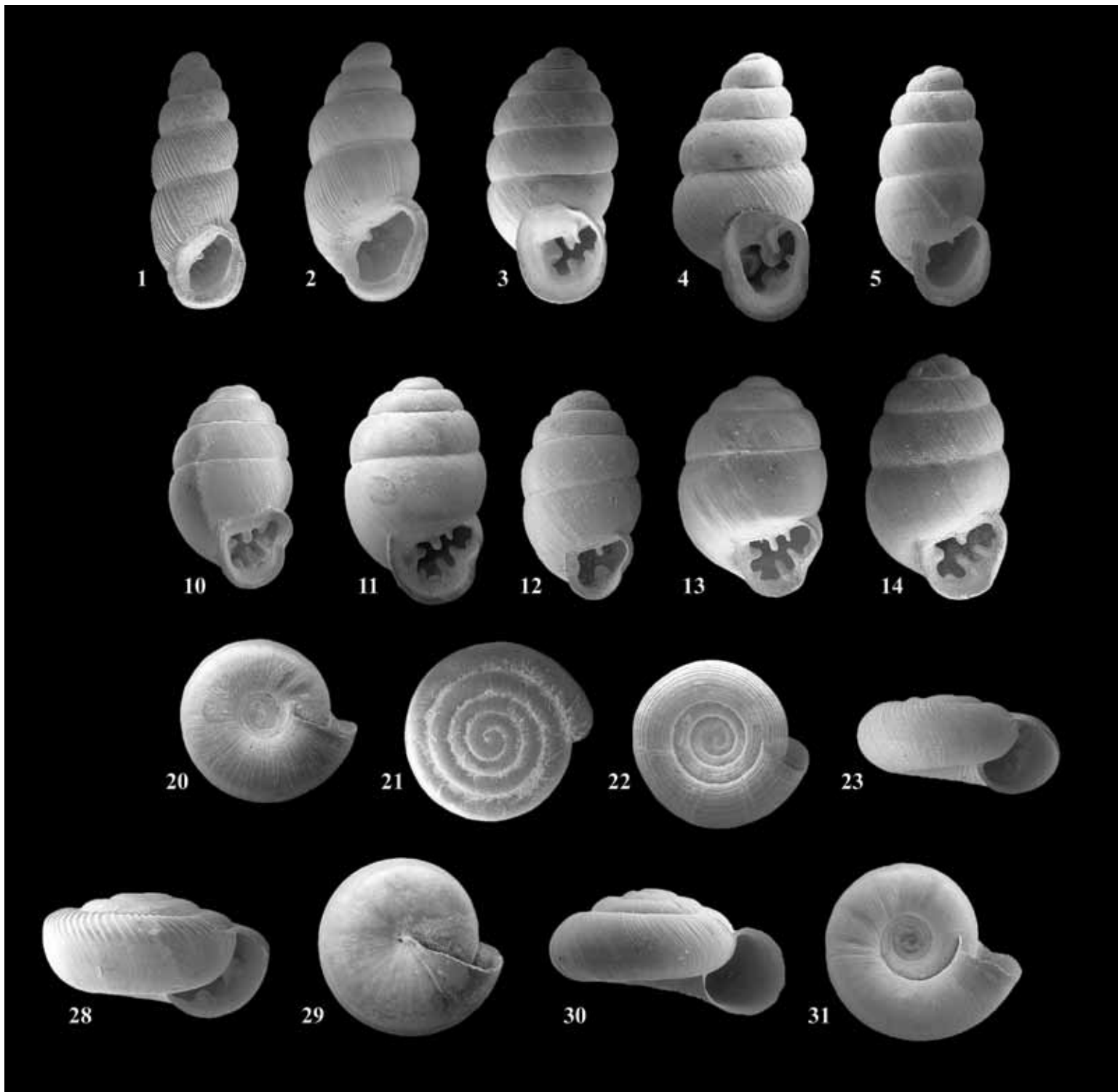


Plate 1. Selected shells from the March 17, 2015, Station 9 PRR 3D sample: 34 microspecies (plus one atypical sp.)

Row 1: 1. *Carychium arboreum* 1.77mm [range extension from Smoky Mts.], 2. *C. exiguum* 1.45mm, 3. *Gastrocopta*

8a&b. *G. tappaniana* [two shells; L, 1.41mm, has umbilicus and infraparietal denticle; unique; R, 1.58mm], 9. *Vertigo*

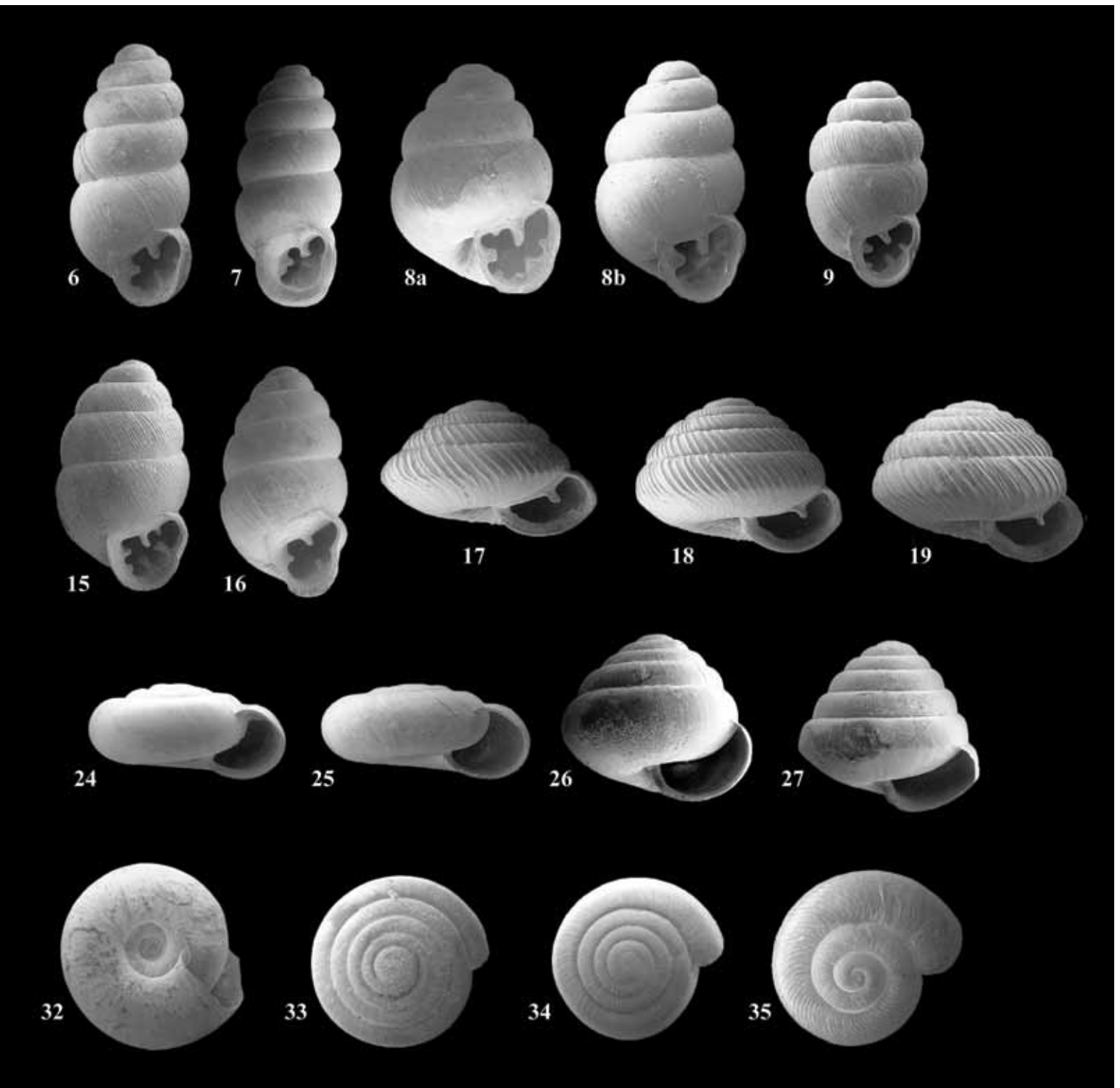
Row 2: 10. *Vertigo milium* 1.39mm, 11. *V. oralis* 1.68mm, 12. *V. oscariana* 1.27mm. 13. *Vertigo ovata* 1.57mm, 14. *V. lops aeneus* 2.15mm, 18. *S. labyrinthicus* 1.97mm, 19. *S. texasianus* 2.11mm.

Row 3: 20. *Punctum minutissimum* 1.14mm, 21. *Helicodiscus aldrichianus* 1.76mm [very rare; TN specimen], 22. *H.*

range extension], 24. *L. scintilla* 1.87mm, 25. *L. singleyana* 1.71mm, 26. *Euconulus chersinus* 1.91mm, 27. *E. denta*

Row 4: 28. *Gastrodonta interna* 1.85mm [juvenile; reaches ~ 9mm], 29. *Guppya sterkii* 1.01mm, 30. *Hawaiia minu*

need of taxonomic revision], 33. *P. multidentata* 2.22mm, 34. *Paravitrea* sp. cf. *P. pilsbryana* 2.45mm [another speci



specimen) and one juvenile of a larger species. Not to scale; for details see plate explanation below.

3. *G. armifera* 3.63mm, 4. *G. contracta* 2.04mm, 5. *G. corticaria* 1.97mm, 6. *G. pentodon* 1.87mm, 7. *G. procera* 2.05mm, 8. *V. gouldii* 1.47mm.

9. *V. pygmaea* 1.76mm [major southward range extension], 15. *V. rugosula* 1.80mm, 16. *V. tridentata* 1.77mm, 17. *Strobilium*

18. *H. sp. cf. H. notius* 3.11mm [umbilicus consistently wider; n. sp?], 23. *Lucilla punctatella* 1.41mm [very rare species; n. sp?], 24. *H. notius* 1.88mm.

25. *H. notius* 2.14mm, 31. *H. alachuana* 2.08mm, 32. *Paravitrea sp. cf. P. capsella* 2.03mm [n. sp ? – a species complex in the species complex?], 35. *Striatura meridionalis* 1.39mm.




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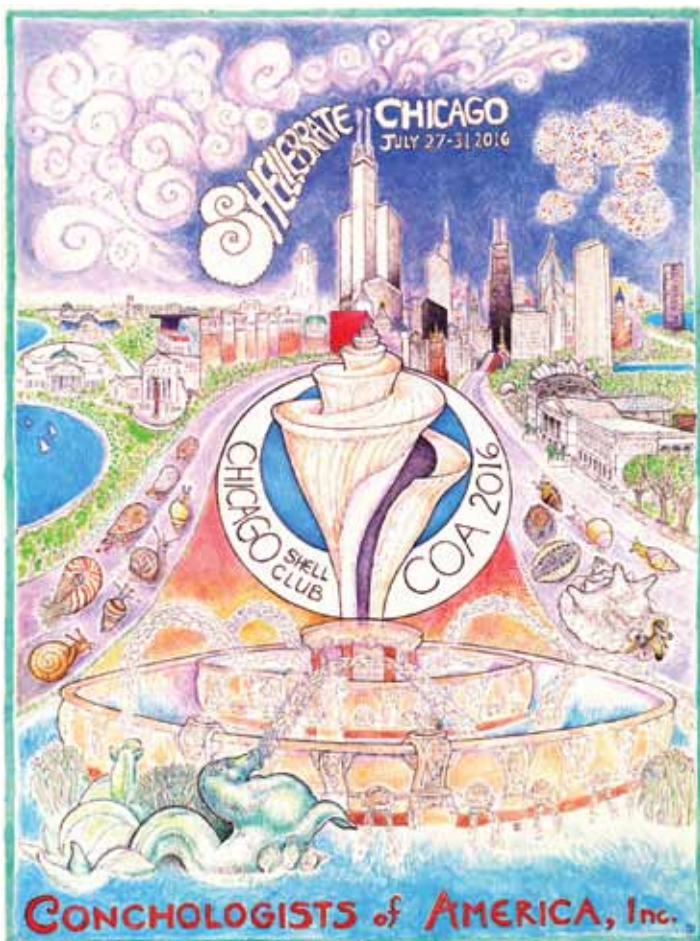
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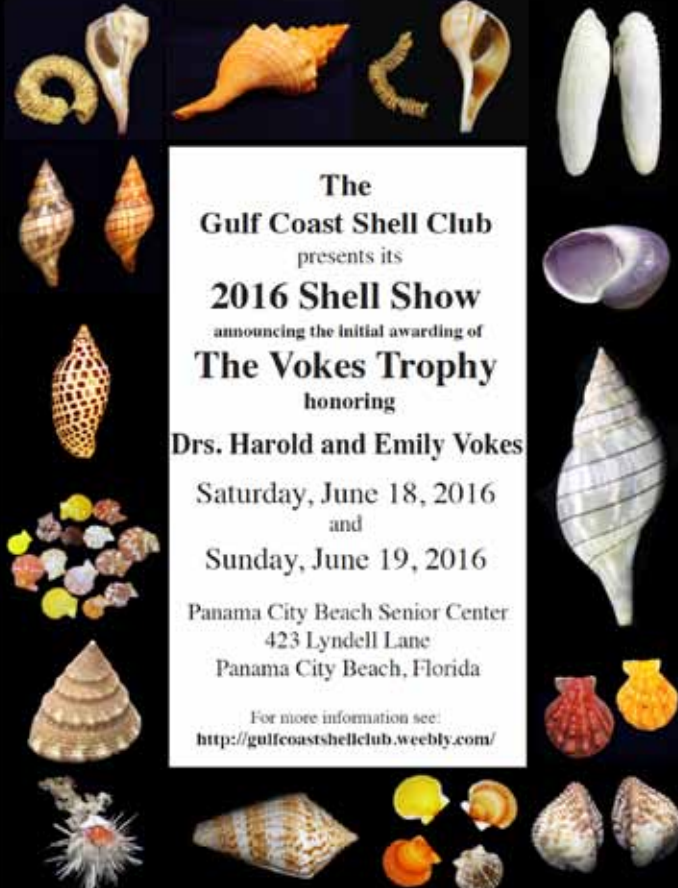
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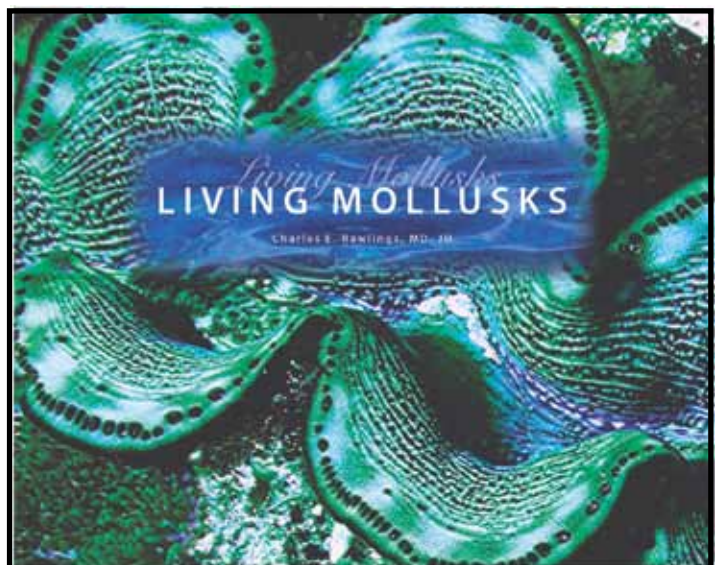




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# The Ohio State University freshwater mussel collection

**F. Matthew Blaine**

**Curatorial Associate**

Delaware Museum of Natural History

**Research Associate**

The Florida State Collection of Arthropods

**Research Associate**

The McGuire Center for Lepidoptera and  
Biodiversity at the Florida Museum of  
Natural History, University of Florida



**Fig. 1.** Our host, Tom Watters amidst the Ohio State University mollusk collection.

Back in October 2013 my wife and I decided to drive to Ohio State University to attend OVUM 7. In case you were wondering, OVUM stands for Ohio Valley Unified Malacologists, which is one of the regional group meetings devoted to malacology. In these meetings scientists, citizen scientists, students, and interested parties present papers and PowerPoint presentations to attentive audiences. Other regional groups include SCUM (Southern California United Malacologists), MAM (Mid Atlantic Malacologists), and FUM (Florida Unified Malacologists).

I was going to present a PowerPoint presentation on my research titled, “The freshwater mussels of Sussex County, Delaware”. I was very excited about the trip because in addition to giving my presentation I was going to get to see the vast collection overseen by my friend G. Thomas Waters, who in addition to hosting OVUM 7 is Curator of Mollusks, Department of Evolution Ecology and Organismal



**Fig. 2.** *Epioblasma flexuosa* Rafinesque, 1831, collected in the mid-to-late 1800s and now with GPS coordinates on the label. This species (like too many US freshwater mussels) is extinct.



**Fig. 3.** A look at the extensive molluscan collection at the Ohio State University.

Biology. We were going to get a guided tour of Ohio State University's extensive collection!

Tom was a gracious host and after providing us with a parking pass that would prevent our car from being ticketed or towed, he explained to us a little bit about the collection as an introduction (Fig. 1). The collection is a research collection and there are offices with people working on their respective projects around the building. In addition there was an ongoing project to add GPS locations to labels that were written before the invention of GPS and had accurate collection locations on their labels. They used the machine that projected detailed maps of collection areas and when the cursor is placed at the appropriate spot the GPS coordinates appeared. These coordinates were then added to the appropriate labels (Fig. 2). Notice that the specimens were collected between 1846 and 1889, way before GPS and yet GPS coordinates are provided. Brilliant!

The collection inhabits a vast space much like a huge warehouse and is made up of cabinets in addition to rows and rows of shelving, all filled with mollusks, bivalves and gastropods (Fig. 3). A major focus of the collection is fresh water mussels (Figs. 4-7). There are many exceedingly rare specimens (Figs. 6-7).

If you are a marine bivalve collector you will immediately notice that all of the fresh water mussels are disarticulated. Tom once told me that the first thing that he does when new material comes into the museum is to break the valves of each shell apart. "This drives marine bivalve people crazy" he explained. One very important thing about identifying fresh water mussels is the complex structure of the teeth and other features inside of the shell around the hinge area. Thus having the shells separated is important. In addition it makes storing them much easier.

The collection also has many land snails. Here is a drawer full of Achatinellidae (Fig. 8). I was particularly interested in how they are housed and displayed. As you can see, each glass vial has one or more specimens with the appropriate data displayed so it can be read while the vials are in cabinet drawers. To my delight, there were also vials of pea or fingernail clams (Sphaeriidae). I have been searching many years for them and have never found them in the wild. The illusive, for me, *Sphaerium* (Fig. 9) is finally within my view.

Tom gave us time to wander through the collection. There are shelves full of boxes of fresh water mussels (Figs. 10-11). Finally we did a tour of the wet collection where specimens are preserved in ethyl alcohol (Figs. 12) and then it was time to attend OVUM.

Visiting The Ohio State University Mollusks Department of Evolution Ecology and Organismal Biology was a memorable experience for us. I thank Dr. Watters for providing us with this remarkable experience.



Fig. 4. Tom explains the collection storage and display system.



Fig. 5. *Lasmigona compressa* (Lea, 1829). Listed as a "species of concern" by the Ohio Division of Wildlife.



Fig. 6. *Elliptio spinosa* (Lea, 1836), an Alabama endemic, is listed as endangered by the International Union for Conservation of Nature.



Fig. 7. *Cristaria spatioca* (Clessin, 1875) from Japan and also a species of concern. Note the rare freshwater mussel that imitates a fish.



Fig. 8. Vials of Achatinellidae, small colorful tree snails found throughout the Pacific islands. The greatest variety occurred in Hawaii (called the Oahu tree snail), but habitat destruction and introduced species left maybe 10 extant *Achatinella* species out of the original 265+.



Fig. 9. A drawer of the small brown *Sphaerium* (finger-nail clams) I have yet to collect in the wild.



Fig. 10. I investigate some of the countless boxes of freshwater mussels. Photo by Dona Blaine.



Fig. 11. Even more boxes of freshwater mussels.



Fig. 11. A small portion of the wet collection - mollusks in alcohol.

# 2016 SHELL SHOWS & RELATED EVENTS

## (January – July 2016)

Information is subject to change. Please verify with the individual organization.

### Jan. 9-10, 2016

**SPACE COAST SEASHELL FESTIVAL**, Melbourne, FL  
The Melbourne Auditorium, 625 E. Hibiscus Blvd.  
Alan Gettleman, 2225 Tanglewood Lane, Merritt Is., FL 32953-4287  
E-mail: lychee@cfl.rr.com Tel. (321) 536-2896

### Jan. 16-17, 2016

**51st BROWARD SHELL SHOW**, Pompano Beach, FL  
Emma Lou Olson Civic Center, 1801 Northeast 6th Street  
Alice Pace, 7405 SW 128 Ct., Miami, FL 33183  
E-mail: alicepace90@att.net Tel. (305) 301-1296 (Cell)

### Feb. 11-13, 2016 (New: Thursday – Saturday)

**52nd ANNUAL SARASOTA SHELL SHOW**, Palmetto, FL  
Bradenton Area Convention Center, 1 Haben Blvd.  
Donna Cassin, 3432 Highlands Bridge Rd., Sarasota, FL 34235  
E-mail: dcassin941@gmail.com Tel. (941) 362-3302

### Feb. 20, 2016

**FUM (FLORIDA UNITED MALACOLOGISTS)**, Sanibel, FL  
Bailey-Matthews National Shell Museum, Sanibel, FL  
José Leal, Bailey-Matthews National shell Museum  
3075 Sanibel Captiva Road, Sanibel, FL 33957  
E-mail: jleal@shellmuseum.org Tel. (239) 395-2233

### Feb. 27-28, 2016

**ST. PETERSBURG SHELL SHOW**, Seminole, FL  
Seminole Recreation Center, 9100 113<sup>th</sup> St. N., Seminole, FL  
John Jacobs, 202 Soldier Court, Seffner, FL 33584  
E-mail: johncheryl@earthlink.net Tel. (813) 309-2608 (Evening)  
*Exhibit form available at web site: <http://www.stpeteshellclub.org>*

### Mar. 3 - 5, 2016

**79<sup>th</sup> SANIBEL SHELL SHOW**, Sanibel, FL  
Sanibel Community Center, 2173 Periwinkle Way  
Mary Burton, 558 Foxcreek Drive, Lehigh Acres, FL 33974  
E-mail: marybsanibel@hotmail.com Tel. (239) 395-3626  
Website: [www.thesanibelcaptivashellclub.com](http://www.thesanibelcaptivashellclub.com)

### Mar. 10-12, 2016

**MARCO ISLAND SHELL CLUB SHOW XXXV**, Marco Is., FL  
United Church of Marco Island, 320 North Barfield  
Jae Kellogg, 1402 N. Collier Blvd., Slip D-6, Marco Island, FL 34145  
E-mail: pjsailkw@gmail.com Tel. (239) 253-8483

### Mar. 12-13, 2016

**XXVII PARIS INTERNATIONAL SHELL SHOW**, Paris, France  
Espace Charenton, 327 rue de Charenton, 75012 Paris  
Perrine Dardart, 8, Rue des Tilleuls, 02190 Pignicourt, France  
E-mail: perrine.dardart@gmail.com Tel. 33 (3) 23-22-46-41

### Apr. 15-17, 2016

**AUSTRALIAN NATIONAL SHELL SHOW**, Brisbane  
Gaythorne Bowls Club, 18 Prospect Road, Gaythorne 4051  
Brisbane Shell Club, P.O. Box 78, Arana Hills, Qld 4054  
Email: [brisbaneshellclub@powerup.com.au](mailto:brisbaneshellclub@powerup.com.au)  
<https://www.facebook.com/groups/1434389403526873/>

### Apr. 23, 2016

**BRITISH SHELL COLLECTOR'S CLUB CONVENTION**, Essex, England  
Theydon Bois Community Centre, Essex  
Deborah Rolfe, 15 Dene Holm Road, Northfleet, Kent DA11 8LF, UK  
Email: [deborah@deborahrolfe.orangehome.co.uk](mailto:deborah@deborahrolfe.orangehome.co.uk), Tel. 44 1474 567 827

### May 21-22, 2016

**XXVI BELGIUM INTERNATIONAL SHELL SHOW**, Antwerp, Belgium  
"Extra Time" Sports Hall, Louisalei 24, Hoboken  
Charles Krijnen, Burgemeester Jansenstraat 10, NL-5037 NC Tilburg, Nederland  
E-mail: [bvc.shellshow@planet.nl](mailto:bvc.shellshow@planet.nl) Tel. 31 (13) 463 0607  
Website: [www.bvc-gloriamaris.be/beurs\\_e.htm](http://www.bvc-gloriamaris.be/beurs_e.htm)

### Jun. 18-19, 2016

**GULF COAST SHELL SHOW**, Panama City Beach, FL  
Panama City Beach Senior Center, 423 Lyndell Lane  
Jim Brunner, 2511 Parkwood Drive, Panama City, FL 32405  
Email: [jili@knology.net](mailto:jili@knology.net) Tel. (850) 215-2086

### Jul. 1-3, 2016

**TOWNSVILLE SHELL SHOW**, Townsville, Queensland, Australia  
Orchid Society Hall in Kirwan  
Jack Worsfold  
Email: [jnw\\_48@yahoo.com.au](mailto:jnw_48@yahoo.com.au)

### Jul. 9-10, 2016

**KEPPEL BAY SHELL SHOW**, Yeppoon, Queensland, Australia  
Gus Moore Pavilion at the Yeppoon Show Ground  
Jean M. Offord, 277 McDougall St., N. Rockhampton, Qld. 4701, Australia  
Tel. 61 (7) 4928-3509

### Jul. 27-31, 2016

**CONCHOLOGISTS OF AMERICA ANNUAL CONVENTION**, Chicago, IL  
Crowne Plaza Chicago O'Hare Hotel, 5440 River Road, Rosemont, IL 60018  
Katarina Frost  
E-mail: [2016COA@gmail.com](mailto:2016COA@gmail.com) Tel. 847-458-7000.  
Website: [www.conchologistsofamerica.org](http://www.conchologistsofamerica.org)

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2016-10-12

# Shelling the Pearl Islands of Panama

Vicky Wall

Since 1988 I have been fortunate to go on several shelling trips, but only during the summer due to my job as a high school biology teacher. After retiring last year I could finally go on a minus-tide shelling trip during the winter, specifically to the Pearl Islands of Panama. From 18-24 January 2015, 8 North Carolina Shell Club members headed to Pacific Panama: NC residents Everett Long, Ed Shuller, Jeannette Tysor, Susan O'Connor, Bill Bennight, and myself, and our two club members from Florida, Charlotte Thorpe and Alan Gettleman. Everett, Charlotte, and Alan started working on this trip back in September, checking out maps and arrangements for boat trips to various islands in the area. Everyone but myself had been to Panama before so the hunt was on for new places to explore. Everett arranged for the use of a boat for the week, the *Relampago*, maintained by a very friendly Captain and his first mate.

Our flight to Panama was uneventful, however, not so for our arrival at the hotel on Isla Contadora. First we took a harrowing van-taxi ride through Panama City traffic to get to the marina. There didn't appear to be any designated traffic lanes. It was a massive game of chicken or as my son would say, "mom, you have to own the intersection." The problem is that everyone in Panama City tries to own the intersection! At the marina, we met our boat for our 2.5 hour trip to Isla Contadora. The owner of the boat was from Panama, but had attended Lenoir Rhyne University in Hickory, NC...what a small world! Our boat was good sized but it sure didn't look like it could hold 8 people plus 16 pieces of luggage and 8 backpacks. Our captain and mate made it all fit and it was a comfortable ride. Upon arrival at our island, the first thing we noticed was the absence of a dock. To get to the beach, we were transferred, along with our luggage, to smaller water taxis that got as close to shore as possible, but we still had to wade in the water to get to shore. Depending on one's height, this could be knee-deep or waist-deep. Susan is the shortest one in our group and she was a good sport about it all. I wish I had gotten a picture of our departure from the small boats but the cameras were inside my backpack and I was trying hard to keep that over my head and out of the water, along with my shoes. Once on the beach, we had a steep walk up concrete and wooden



*Macrocypraea cervinetta* and *Conus purpurascens* were just two of many species I hoped to find on my first Panama trip. Photo by the author.

stairs to get to our rooms. Our porters were amazing, carrying our heavy bags from the water up those stairs for us. Once we got situated in our rooms, it was close to dinner time. We had a few minutes so Charlotte and I went down to the beach to see what we might find. In just minutes exploring the rocks we found *Littorina modesta*, *Nerita funiculata*, and *Siphonaria gigas*. As this was my first trip to Panama, every shell was new for me so finding several species right away was exciting.

The next day we headed out early for Isla Mogo Mogo (of TV's Survivor Fame). This was an amazing place, with sand flats, tons of rocks to turn, and good snorkeling. I didn't know where to start! Aside from Guaymas, Mexico, my other shelling trips didn't include very much rock turning, but here in Panama, literally every single rock had something hiding underneath. Some of the many species found included *Conus gladiator*, *Conus princeps*, *Conus purpurascens*, *Bursa corrugata*, *Cerithium adustum*, *Chiton stokesii*, *Macrocypraea cervinetta*, *Tegula picta*, *Turbo saxosus*, and *Opeatostoma pseudodon* (with unusually long aperture spines). One of my favorite finds was on a second take. I had put a rock back but then thought I'd take another look at what appeared to be just a scaly part of the rock. It turned out to be *Crucibulum umbrella* with a beautiful lavender interior. The cowries were the toughest for me to see. Everett asked me if I had found any yet and when I said no, he said he'd help me out. Everett is the "Rock Whisperer".

He surveyed a couple of rocks and then told me to turn “that one”. Well, “that one” had a cowrie underneath. The other one didn’t. As the tide came in we started to find murex coming out of the sand in between the rocks. Finding my first *Hexaplex radix* was a thrill as that was one of the shells on my “Panama Wish List”. Charlotte had told me that I would find lots of them. I believed her but was still amazed at the number. All of us were able to find enough to choose the best specimens to keep and then return the rest. The children and adults we met along the way use the various murex species as a food source, so they were very adept at finding them quickly. Other species we found were *Hexaplex princeps* and *Hexaplex regius*. While snorkeling, Ed and Jeanette found three amazing *Homalocantha oxyacantha* and two *Neorapana muricata* with beautiful deep orange apertures. Ed and Bill found several *Jenneria pustulata* living at the base of corals. Charlotte was the first to find large *Vasum caestus* in about 5 feet of water. They blended in well with the sand but after seeing hers, it became easier to spot them on the bottom.

The Pearl Islands received their name from the pearl industry dating back to the 1400s. One of the most famous pearls in the world was found by a slave in 1513, the 55 carat, tear-drop shaped La Peregrina (Spanish for pilgrim). Owned by several royal families over the centuries, this pearl was purchased by Richard Burton for Elizabeth Taylor in 1969 for \$37,000. In 2011 it sold for 10.5 million dollars! I was fortunate to be able to see this pearl at the Smithsonian Institution in Washington D.C. when Ms. Taylor offered it on loan for their Pearl Exhibit. It was absolutely breathtaking. Needless to say, after finding several pearl oysters, *Pinctada mazatlanica*, I checked each one carefully for a pearl. I really wanted to be able to tell my husband that I was able to pay for my trip plus some with my pearl! None of us had such luck, but we did have those beautiful shells to take home.

On Wednesday, we headed to another island, Isla Casayeta. Here is where we experienced what a true minus tide is and how fast the water can recede! Our captain and his mate anchored our trusty *Relampago*, and I’m not positive, but I think the water depth was 4 or 5 feet. We were ferried to shore in small boats that met us at our boat. Alan and Charlotte headed into the village to see if there were any fishermen who had shells they would want to sell. The plan was to stay just a little while and then head to another island to catch low tide. While we waited for Alan and Charlotte to return, we checked out the rocks and shoreline for shells. It couldn’t have been more than 20 or 30 minutes when I turned around to look at our boat. At that moment, it leaned over and I saw Everett slide off the back of the boat into the water, landing on his feet. Right behind Everett our poor captain and his mate jumped into the water. Our 5 foot anchoring depth was now less than a foot and the *Relampago* was stuck in the mud (relampago is Spanish for lightning,



Exposed rocks at low tide in Panama, a shellers dream. L-R: the author, Jeanette, Charlotte, and Ed. Photo by Alan Gettleman.



*Opeatostoma pseudodon* is by no means rare, but I was still thrilled to collect this beautiful shell. With the periostracum intact it is brown with black spiral lines. Photo by author.



Our shell cleaning station with electricity, sink, running water, and loads of counter space. L-R: Everett, Bill, Charlotte, Jeannette & Ed. Photo by author.



An ignoble afternoon for our boat, the *Relampago*. No harm was done (except maybe the captain's pride) and the collecting was great. Photo by author.



*Lobatus peruvianus* with the vivid coloring only found in freshly caught individuals. Photo by author.



Although it might look like a miracle, that is actually Susan collecting during an extremely low tide. Photo by Alan Gettleman.



The beach at our hotel on Isla Contadora. Photo by Jeannette Tysor.



*Lobatus galeatus* collected by Ed and Jeanette. Photo by Jeanette Tysor.



Ed and Jeanette found these *Hexaplex radix*, *Vasum caestus*, *Neorapana muricata*, and *Homalocantha oxycantha*. Photo by Jeanette Tysor.



which at this point was very sad!). If I had known this was going to happen and had shot a video, I know it would have been a hit on YouTube. I felt badly for our captain and mate, as they were really embarrassed that they hadn't kept an eye on the tide. Alan was able to speak with them in Spanish, reassuring them that everything was fine and that we were not angry with them. Thank goodness there was no damage to the boat. Everett, with his agile slide off the boat, was the subject of some good ribbing the rest of the week. Our poor *Relampago* looked like the SS *Minnow*, but not a problem. We just continued to shell as we waited for the tide to come back in and right our boat. Everett and Susan had a good time checking out the shell piles and bartering for shells with a very enterprising 10 year old. It was fun to watch as he and Everett sparred back and forth over the price of some spiny oysters. We enjoyed sitting with the local folks, even if communicating was a challenge. One older man was disappointed that we didn't have any cigarettes. Everett had some candy that he brought for the children so he shared some with that man, which he enjoyed very much.

Back at our hotel our daily routine consisted of shelling until the late afternoon, then time to clean shells, eat dinner (the local restaurants were great and within walking distance), and get some rest for the next day. Leave it to Everett to find a primo place for cleaning shells...an unused outdoor bar area with electricity, sink, running water, and loads of counter space on which to work. He checked with the hotel desk and the young American tour director there said it would be fine for us to use that space. In fact, she was very interested in what we were doing and what shells we were finding. This particular hotel was getting back on its feet after being vacant for several years. I imagine our cleaning station will once again be used as an outdoor bar and seating area someday, but for our week, what a find!

Our last day of shelling was the most exciting. And as "Murphy's Law of Shelling" would have it, one of the most productive. It was a long afternoon and night cleaning and packing shells for the trip home the next day. We arrived at Isle Bayoneta for another great low tide. Two species on my wish list were still elusive, the beautiful tented olive *Oliva porphyria* and the large conch *Lobatus galeatus*. Earlier in the week I found a fresh dead juvenile *Lobatus galeatus* but none of us found any of the olives or mature conchs. Time was running short so we fanned out among the rocks and got to work. Here is where I finally found one of my favorites, the thorn latus, *Opeatostoma pseudodon*. They were grouped underneath rock ledges and in crevices. If we had to leave at that moment, I would have left with a smile, as it had been such a wonderful week, but we weren't finished yet. As the tide was slowly coming back in, things really got hopping. As I was picking my way among the rocks I found a mature *Lobatus galeatus* and then in two more steps, I found another. I couldn't believe it! As my students would say, OMG! I never would have thought such a large shell could fit and maneuver among the rocks. Then Jeannette said she found one and then a second one a few



**Our group getting ready to board the *Relampago*: (back) Vicky Wall, Bill Bennight, Alan Gettleman, Ed Shuller, (front) Charlotte Thorpe, Susan O'Connor, (boat owner), Jeannette Tysor, Everett Long. Photo by boat captain.**

minutes later. The best moment was with Alan. He was wading in knee-deep water several yards ahead of us when he waved his hand above his head holding a *Lobatus galeatus*, the prettiest one of all. Not to be outdone, as Everett was walking along the water's edge, probably thinking we had lost our minds, he casually reached down and then asked, "what do you think about this?" He had found a beautiful *Lobatus peruvianus*! They were popping out of the sand too. I found two juveniles, that I left, and then two mature specimens. I believe Ed and Jeannette found several, as did Everett and Charlotte. What a great way to end the trip. For the week, we found 110 different species of mollusks.

Saturday was "going home" day. Once again our porters were amazing, carrying 50 pound bags on their shoulders for the trip down the steps to the beach, and out to the waiting water taxis. This time we were old pros and were ready for the short wade out to the boats - shoes off, pant legs rolled up! What we weren't ready for was moving from the water taxis to the *Relampago* in pretty rough water. Thank goodness the water was much calmer in the next cove for the transfer. The 2.5 hour trip back to the mainland had calmer seas than the previous week. I struggle with motion sickness, but not this time. It was such a relief to be able to talk with everyone and take photographs and not feel sick. As we neared Panama City, we saw lines of huge transport ships waiting their turn for passage into the Panama Canal. Also waiting was a military frigate. The soldiers waved to us as our captain drove our boat around theirs. I hated to see our time in Panama end. It was great to spend time with old friends and make new ones. I hope there will be many more opportunities in the future to go shelling with such great people.

Vicky Wall  
vwall3@embarqmail.com

## Panama species list

- Acanthais brevidentata* (Wood, 1828)  
*Anachis fluctuata* (G.B. Sowerby I, 1832)  
*Anachis pardalis* (Hinds, 1843)  
*Anachis rugosa* (G.B. Sowerby I, 1832)  
*Anadara tuberculosa* (G.B. Sowerby I, 1833)  
*Arca mutabilis* (G.B. Sowerby I, 1833)  
*Arene fricki* (Crosse, 1865)  
*Axinactis inaequalis* (G.B. Sowerby I, 1833)  
*Bailya anomala* (Hinds, 1844)  
*Barbatia illota* (G.B. Sowerby I, 1833)  
*Barbatia lurida* (G.B. Sowerby I, 1833)  
*Barbatia reeveana* (d'Orbigny, 1846)  
*Bursa corrugata* (Perry, 1811)  
*Cantharus sanguinolentus* (Duclos, 1833)  
*Carditamera affinis* (G.B. Sowerby I, 1833)  
*Cerithium adustum* Kiener, 1841  
*Cerithium gallapaginis* G.B. Sowerby II, 1855  
*Cerithium nicaraguense* Pilsbry & Lowe, 1932  
*Cerithium stercusmuscarum* Valenciennes, 1833  
*Chaetopleura lurida* (G.B. Sowerby I in Broderip & G.B. Sowerby I, 1832)  
*Chama buddiana* C. B. Adams, 1852  
*Chione subimbricata* (G.B. Sowerby I, 1835)  
*Chiton stokesii* Broderip, 1832  
*Columbella major* G.B. Sowerby I, 1832  
*Conus brunneus* Wood, 1828  
*Conus gladiator* Broderip, 1833  
*Conus nux* (Broderip, 1833)  
*Conus princeps* Linnaeus, 1758  
*Conus princeps* form *lineolatus* Valenciennes, 1832  
*Conus purpurascens* G.B. Sowerby II, 1833  
*Crassispira xanti* Hertlein & Strong, 1951  
*Crepidula aculeata* (Gmelin, 1791)  
*Crepidula lessonii* (Broderip, 1834)  
*Crepidula onyx* G.B. Sowerby II, 1824  
*Crepidula rostrata* C. B. Adams, 1852  
*Crepidula striolata* Menke, 1851  
*Crucibulum scutellatum* (Wood, 1828)  
*Crucibulum spinosum* (G.B. Sowerby II, 1824)  
*Crucibulum umbrella* (Deshayes, 1830)  
*Ctena mexicana* (Dall, 1901)  
*Cyclinella saccata* (Gould, 1851)  
*Diodora saturnalis* (Carpenter, 1864)  
*Echinolittorina modesta* Philippi, 1846  
*Engina pulchra* (Reeve, 1846)  
*Engina maura* (G.B. Sowerby I, 1832)  
*Eualetes tulipa* (Rousseau in Chenu, 1843)  
*Fissurella virescens* G.B. Sowerby I, 1835  
*Gari helenae* Olsson, 1961  
*Glyptanachis hilli* (Pilsbry & Lowe, 1932)  
*Granolaria salmo* (Wood, 1828)  
*Hespererato scabriuscula* (Gray in G.B. Sowerby I, 1832)  
*Hexaplex princeps* (Broderip, 1833)  
*Hexaplex radix* (Gmelin, 1791)  
*Hexaplex regius* (Swainson, 1821)  
*Homalocantha oxyacantha* (Broderip, 1833)  
*Jenneria pustulata* (Lightfoot, 1786)  
*Leucozonia cerata* (Wood, 1828)  
*Leucozonia rudis* (Reeve, 1847)  
*Lobatus galeatus* (Swainson, 1823)  
*Lobatus peruvianus* (Swainson, 1823)  
*Macrocypraea cervinetta* (Kiener, 1843)  
*Malea ringens* (Swainson, 1822)  
*Mangelia* species  
*Megapitaria aurantiaca* (G.B. Sowerby I, 1831)  
*Mitra tristis* Broderip, 1836  
*Mitrella delicata* (Reeve, 1859)  
*Modiolus capax* Conrad, 1837  
*Monoplex macrodon* (Valenciennes, 1832)  
*Murexsul zeteki* (Hertlein & Strong, 1951)  
*Nassarius collarius* (C. B. Adams, 1852)  
*Nassarius luteostoma* (Broderip & G.B. Sowerby I, 1829)  
*Nassarius versicolor* (C.B. Adams, 1852)  
*Natica chemnitzii* Pfeiffer, 1840  
*Neorapana muricata* (Broderip, 1832)  
*Nerita funiculata* Menke, 1851  
*Nerita scabricosta* Lamarck, 1822  
*Notoacmea subrotundata* (Carpenter, 1865)  
*Notocytharella striosa* (C.B. Adams, 1852)  
*Olivella volutella* (Lamarck, 1811)  
*Opeatostoma pseudodon* (Burrow, 1815)  
*Orthalicus princeps fischeri* Martens, 1893  
*Parvanachis nigricans* (G.B. Sowerby I, 1844)  
*Parvanachis pygmaea* (G.B. Sowerby I, 1832)  
*Periglypta multicostata* (G.B. Sowerby I, 1835)  
*Persististrombus granulatus* (Swainson, 1822)  
*Pilsbryspira aterrima* (G.B. Sowerby I, 1834)  
*Pinctada mazatlanica* (Hanley, 1856)  
*Planaxis planicostatus* G.B. Sowerby I, 1825  
*Polinices panamaensis* (Récluz, 1844)  
*Polinices uber* (Valenciennes, 1832)  
*Pseudozonaria arabicula* (Lamarck, 1811)  
*Pseudozonaria robertsi* (Hidalgo, 1906)  
*Pustulaturus mediamericus* (Hertlein & Strong, 1951)  
*Rissoina gisna* Bartsch, 1915  
*Rissoina stricta* (Menke, 1850)  
*Siphonaria gigas* G.B. Sowerby I, 1825  
*Siphonaria maura* G.B. Sowerby I, 1835  
*Stramonita biserialis* (Blainville, 1832)  
*Tagelus affinis* (C.B. Adams, 1852)  
*Tagelus politus* (Carpenter, 1857)  
*Tegula picta* McLean, 1970  
*Thaisella kiosquiformis* (Duclos, 1832)  
*Transennella puella* (Carpenter, 1864)  
*Turbo fluctuosus* Wood, 1828  
*Turbo saxosus* Wood, 1828  
*Vasula melones* (Duclos, 1832)  
*Vasula speciosa* (Valenciennes, 1832)  
*Vasum caestus* (Broderip, 1833)  
*Vermicularia pellucida eburnea* (Reeve, 1842)  
*Vitta luteofasciatus* Miller, 1879

# “Molluscan Communities of the Florida Keys and Adjacent Areas: Their Ecology and Biodiversity”

by Edward J. Petuch and Robert F. Myers

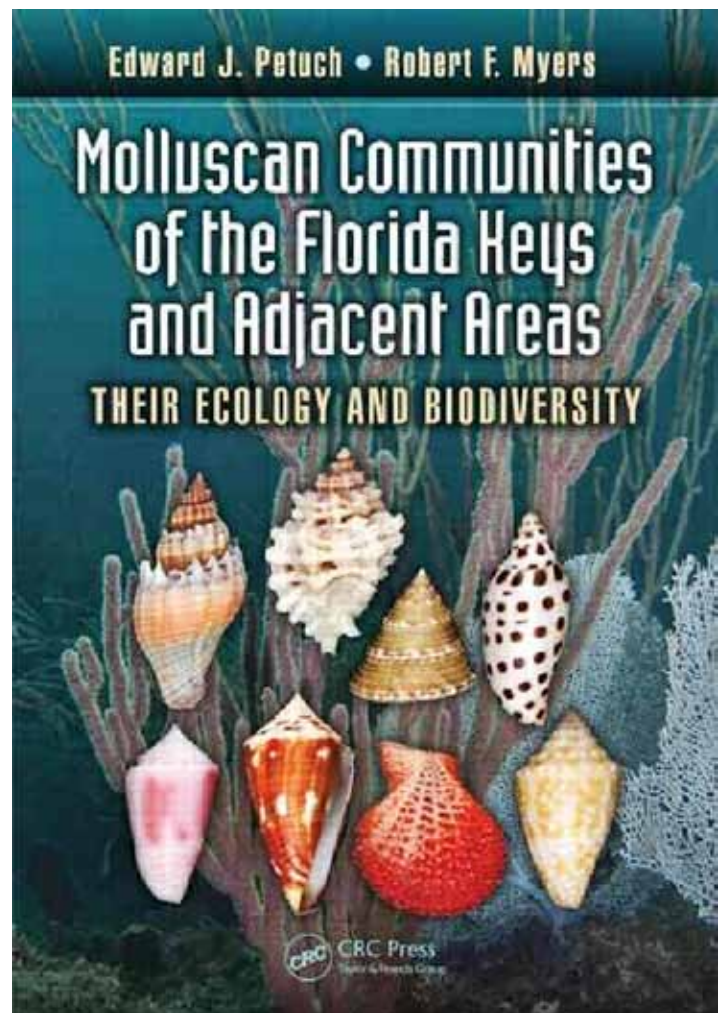
Published 2014, CRC Press - Taylor & Francis Group, Boca Raton, Florida, ISBN 13: 978-1-4822-4918-7 in hardcover with laminated board case binding, 299 pp., illustrated in high color resolution photographs by Robert F. Myers, about \$120

Review by David P. Berschauer  
shellcollection@hotmail.com

This book is organized and arranged by habitats, the way a field collector or ecologist would approach a collecting trip or expedition rather than the traditional taxonomic hierarchy. The authors lead the reader through an exploration of twenty different marine ecosystems from the Palm Beach region south through the Florida Keys, across the Dry Tortugas, and through the vast Ten Thousand Islands region - an area encompassing the southern extreme of the Suwannean Molluscan Subprovince of the Carolinian Molluscan Province and representing an ecological transition zone. This book is unique by being the first book on mollusks of the greater Florida Keys region organized by marine ecosystems and their associated molluscan assemblages arranged by the CMECS (Coastal Marine Ecological Classification Standard) system.

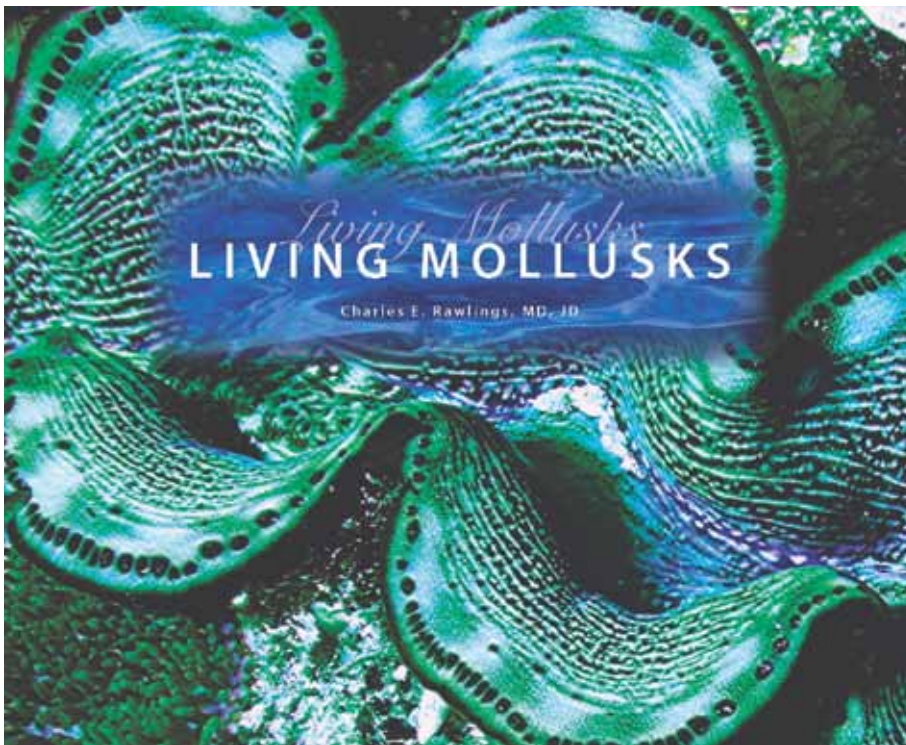
More than 1,200 species in 140 families are noted from the study areas, with large glossy color plates illustrating over 550 of the region's most ecologically important species. Along with species lists for each of the twenty marine ecosystems and associated molluscan assemblages surveyed, the authors describe two new species of bivalves in the families Pectinidae and Arcidae, and ten new gastropod species in the families Muricidae, Buccinidae, Nassariidae, Naticidae, Turritellidae, and Olividae. Finally, for the land snail enthusiasts there is a chapter on the endemic tree snails of the Florida Keys tropical hardwood hammocks, with rich illustrations of many of the rarest subspecies and forms.

I found this book to be both an enjoyable read and a useful and valuable reference guide. If you collect shells or ever plan to collect shells in Southern Florida this book is a fantastic addition to your shell library.



A different way to use UV images

A Florida Pliocene fossil from the Caloosahatchee Formation, *Pleioptygma carolinensis* (Conrad, 1840) 55mm. On the left is the shell in normal light – some pattern can be seen. In the middle is the same shell under ultraviolet (UV) light – the pattern is much more evident. On the right is the same shell in a negative exposure of the UV image. We will never really know what these fossils looked like in life, but this is an interesting presentation of a possibility. Editor.



## *Living Mollusks*

by Charles E. Rawlings, MD,  
JD

Published 2015 by Peppertree Press,  
LLC.,  
Sarasota, Florida.

ISBN 978-1-61493-365-6

hardcover, 11 x 14 inches, 179 pp.

In excess of 150 high resolution, full  
page photographs

\$49.95, or if combined with "Living  
Shells", \$69.95

<http://www.livingmollusks.com>



Charles Rawlings is well known to COA. His photographs have graced dozens of *American Conchologist* covers and he is the recipient of the 2014 *Neptunea* Award. What makes his photographs so special are three things. First, he donates them to the magazine. Most photographers of this quality and breadth of coverage want to be compensated – and rightfully so as they have to pay for their photographic gear, SCUBA gear, and the flights to various places around the globe. Second, he actively seeks out specific locations that offer rare and unusual molluscan subjects. A number of his photographs have been the first ever of a species *in situ* and I'll never forget the images he took while swimming with feeding Humboldt squid at night. And we get these free for the magazine. Last, when he is under water, the doctor and lawyer take backseat to the artist. His images are well-framed and composed (not an easy task as anyone who has taken underwater photos will tell you) and sometimes downright astounding.

Charles published "Living Shells" in 2010 (reviewed in this magazine in Dec 2011). The format is similar to this volume, though it is only 129 pages. It is a large colorful book where the living shells are sometimes enlarged many, many times. His image of *Conus gloriamaris* crawling at night in the sand is slightly more than 20 inches in length. That is the animal and shell, not the double page size. There is something to be said about an image of a *Pleurotomaria* or *Harpa costata* that is the size of a football (and probably the first ever *in situ*). So enough! What about this new book.

*Living Mollusks* is similar to *Living Shells* in the large high quality images with many species you will have

never seen before as living animals. It is however, larger and a bit cleaner in format and ease of use than the first volume. He now has easily visible page numbers on every page (past the table of contents) and a comprehensive photograph index at the back. Another nice thing (carried over from the first volume) is the chapter: "First Photographs". These are critters photographed only as dead, dried shells prior to this. Another chapter is: "One of a Kind". These are not necessarily rare species, but rather images of species that are unusual and not likely repeated elsewhere. And he has, "Abstracts and Eyes" - a chapter of images that struck him as odd-looking, well-patterned, or just strangely interesting. His other chapters are based on molluscan families (i.e. slit shells, volutes, cowries, cones, murex, bivalves, etc. - a total of 14 chapters) and a couple groups not addressed in many shell books - cephalopods and nudibranchs.

There you have it. This is a fun book with many amazing images. I have both volumes and consider them a valuable addition to my shell library. Too often we get hung up in the rigors of taxonomy and shell identification. Charles lets us enjoy the living beauty of our collections and then some.



# COA Award winners 2016 Broward Shell Show

Broward Co., FL – 16 Jan 2016



**Jim & Linda Brunner with “Muricinae: Beautiful Carnivores,” winners of the COA Award.**

**Part of the Brunner’s COA Award winning display “Muricinae: Beautiful Carnivores.”**

The annual Broward Shell Club Shell Show was held in the spacious Pompano Civic Center. We had a good crowd and added double digit numbers of new club members! This year’s winners of the COA Award were Jim & Linda Brunner with a display titled “Muricinae: Beautiful Carnivores.” This intriguing display showing the life styles and habitats of this muricid subfamily was 25 feet long in 12 cases. Not much was left out. Truly a remarkable effort by the Brunners.



Shell Show Chairperson was Alice Pace and the Scientific Judges were Bill Lyons and Richard Goldberg. Other notable winners were:

**DuPont Trophy & Leonard Hill Memorial Trophy to Martin Tremor Jr. & Conrad Farler for “Trachycardiinae - the Elongated Cockles.”**

DuPont Trophy & Leonard Hill Memorial Trophy to Martin Tremor Jr. & Conrad Farler for their display, “Trachycardiinae - the Elongated Cockles.”

American Museum of Natural History Award to Gene Everson for his display of “The Genus *Semele*.”

Shell of the Show (self-collected) to Linda Zyman for *Timbellus phyllopterus*.

Shell of the Show (any manner) to Greg Curry Jr. for *Voluta (Tenebricola) cukri*.



In all there were 238 feet of display cabinets and over 2,000 attendees. Well done to the Broward Club.

**Shell Show Judges (L-R): Richard Goldberg, Emily Savage, Anne Joffe, & Bill Lyons.**

# COA Award winners 2016 Astronaut Trail Shell Show

Brevard Co., FL – 9-10 Jan 2016

Alan Gettleman



The COA Award is presented to Gregory Curry, Sr., (L) of Key West, Florida, for a display of the genus *Amoria*. Judges: Harry Lee (R) and Homer J. Rhode III (M).

Formed during the height of the Apollo program and race to the moon, the Astronaut Trail Shell Club celebrated their 50<sup>th</sup> year as a club with their 36<sup>th</sup> shell show January 9-10<sup>th</sup>. Well known shell dealers Don and Jean Pisor of San Diego, charter members of our club, were in attendance.

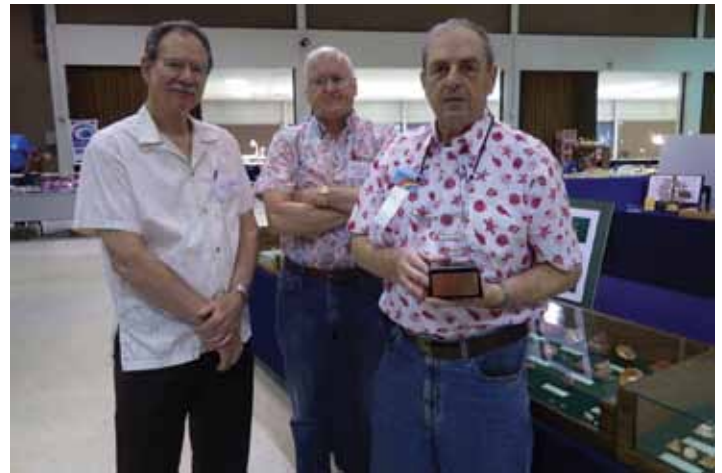
Scientific judges were Harry G. Lee, M.D., and Homer J. Rhode III. Artistic judges were Linda Koestel and Amelia Ann Dick. Major scientific awards were the Conchologists of America (COA) Award to Gregory Curry, Sr. of Key West, Florida, for a display of the genus *Amoria*. The DuPont Trophy was won by Anne Joffe of Sanibel for an extensive 48 foot display titled "Mollusk General Hospital", with aberrant, damage-repaired and freak shells. The Master's Trophy was won by Gene Everson of Louisville, Kentucky for the Family Turbinidae. The R. Tucker Abbott Award of the club was won by Vicky Wall of Mayodan, North Carolina, for a self-collected display of "Your Going Where?"

The Shell of Show was *Stellaria lamberti* (Souverbie, 1871) by Vicky Wall. Both World Wide Self-Collected Shell of Show, *Cassis tuberosa* (Linnaeus, 1758), and Florida Self-Collected Shell of Show, *Scaphella junonia* (Lamarck, 1804), were by Pat and Bob Linn of Dunedin, Florida. Junior Scientific Trophy went to "First Shelling Trip. . ." by Collin and Karsyn Redding of Palm Bay, Florida.

The Arts & Craft Premium Trophy: Victoriana by Charles Barr, Rockford, Illinois; the Arts & Crafts Trophy: Water Lily Single Sailor's Valentine by Hatsue Iimero,



The DuPont Trophy was won by Anne Joffe of Sanibel, Florida, for an extensive 48 foot display titled "Mollusk General Hospital", with aberrant, damage-repaired, and freak shells.



The Master's Trophy was won by Gene Everson of Louisville, Kentucky, for the Family Turbinidae.

Hokotu, Yamanashi, Japan; the Arts & Crafts Collectible Trophy: Leper Doll by Charles Barr; and the Junior Arts & Crafts Trophy, "Seashells Skating to the Beach" by Melissa Linn, Indianapolis, Indiana.

The club is changing their venue and date for the 2017 show, which will be January 21-22 at the Eau Gallie Civic Center in Melbourne, Florida. Our show will again be one week separated from the Broward Shell Show so those wanting a mid-winter break can vacation in Florida and visit two shell shows on adjoining weekends.

# 2016 COA Convention Chicago, IL

27-31 July 2016

**(25-26 July: pre convention field trips, 1-2 August: post convention field trip)**

**It's time to start seriously planning on attending the 2016 COA Convention in Chicago.**

The Crowne Plaza in Rosemont, Illinois, will be home to the Conchologists of America annual convention just minutes from Chicago O'Hare International Airport. On Monday and Tuesday (25-26 July) there are pre-conference field trips. The conference convenes Wednesday morning and concludes with the Bourse on Saturday and Sunday.

There is a free shuttle to the hotel, so no need to rent a car. There are many restaurants in the area and the Fashion Outlets of Chicago just out the back door. Room rates are \$148 (plus tax) for single occupancy, which includes free parking, WiFi, fitness center, and breakfast. Double occupancy is \$158 (plus tax) {\$10 for the 2<sup>nd</sup> breakfast} and \$248 (plus tax) for suites. These rates are available for 3 days before and 3 days after the Convention.

For hotel reservations, call Toll Free: 888-233-9527, international callers call 847-671-6350 or go to: <https://goo.gl/nhuhJC>. Reservation code is Conchologists of America. Deadline for convention rate is July 6, 2016. If you cannot find your registration forms, go online to: [www.conchologistsofamerica.org](http://www.conchologistsofamerica.org). Everything you need to register can be found there.

The 2016 COA Convention will be a family event. We encourage you to bring your spouse, children, and grandchildren – there is so much to do in Chicago. There is a shuttle that will take you to the “Blue Line,” which takes you right to downtown Chicago. The list of museums and things to do is more than anyone can do in a week. Some highlights include:

- \*Chicago Art Institute
- \*Blues Concerts and Dinner
- \*Grant Park Symphony Orchestra
- \*Millennium Park (see the famous “Bean”)
- \*Adler Planetarium
- \*John G. Shedd Aquarium (pre-convention field trip planned)
- \*Field Museum of Natural History (pre-convention field trip planned)
- \*Museum of Science and Industry (pre-convention field trip planned)
- \*The Lincoln Park Zoo
- \*The Magnificent Mile (shop until you drop!)
- \*Fabulous restaurants to please all
- \*and much, much more!

The welcome party will be held at the Field Museum of Natural History, right under Sue, the best preserved and most complete *Tyrannosaurus* ever found. If you get here a bit early (25-26 July) you can get a behind-the-scene tour of



Chicago's Crowne Plaza



**How many opportunities will you have to eat dinner under *Tyrannosaurus rex*.**

the Field Museum, take a river cruise to learn all about the city's architecture, sail on Lake Michigan on the *Mystic Blue* and watch the city skyline (plus great food and drinks), or hang around after the convention (1-2 Aug) to go on a collecting trip to the Mississippi River. If you do not partake of any of the pre- or post-convention trips, you will still enjoy a stay in a classy hotel, great food, lots of folks you know (some you may even like!), get inundated with shell-related talks, bid on that perfect find in silent and oral auctions, and finally wander the world famous COA bourse on Saturday and Sunday.

## Come to Chicago!

