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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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In This Issue

Editor's comments -----	3
The labral tooth -- variations on a theme by Emily H. Vokes -----	4
Still more on blood-sucking mollusks: a bivalve? by Tom Eichhorst -----	6
Report on a dredging expedition off the Louisiana coast, including geographical extensions and new record sizes by Emilio F. García -----	7
Neptunea Award by Harry Lee -----	11
COA grantees at the AMS/COA meeting by Paul Callomon -----	12
Dealer Directory -----	14
The 2012 Philadelphia Shell Show by Paul Callomon -----	16
Creature feature by Dan Dourson -----	19
In Memoriam -----	20
Are snails slowing down? by Tom Eichhorst -----	20
A re-description of the du Pont Trophy (Shell Show Award: Outstanding Exhibit) with notes on distribution and morphology by Elizabeth K. Shea & Leslie L. Skibinski -----	21
The Texas Conchologist by Lucy Clampit -----	25
An analysis of the microsnailed from six habitats in the "Kochi Hill" area, Bernheim Arboretum and Research Forest, Bullitt County, Kentucky by Harry G. Lee and Lori Schroeder -----	26
AMS/COA Group photo -----	36 & back cover

Front Cover: *Voluta musica* Linnaeus, 1758, photographed in the Caribbean off Union Island, the Grenadines, by Charles Rawlings in 2009. This image clearly demonstrates the shell markings responsible for the name "music volute" as well as the intricate markings of the living animal. A quick check of the WoRMS database ([www: marinespecies.org](http://www.marinespecies.org)) found 23 synonyms for this pretty little shell.

Back Cover: Here we have most of the attendees at the AMS/COA joint meeting and convention in Philadelphia. Paul Callomon has provided a key on page 35 to most everyone in the photograph.

Editor's comments: As we say goodbye to 2012 I would like to thank the many people who make this magazine possible. First are the contributors. Without our many talented and willing authors, this would be an extremely limited publication. As it is we have authors who write articles on systematics, natural history, conchological history, collecting expeditions, new shell discoveries, shelling trips, shell shows, and some topics less directly related to conchology but still of interest to our readers. I quite often begin the layout of the magazine convinced I will not have enough material for a complete issue, but it seems that someone always comes through with that critically-needed article and I can patch together another run. Thanks to all of you, and please, please keep our magazine in mind for your next shell piece. The last minute stuff is oh-so-welcome, but it could eventually lead to ulcers! I also thank the many people who have provided me with shell images over the years, such as the wonderful photographs by Charles Rawlings (e.g. the front cover of this issue).

After I have the magazine as ready to print as I can make it, I send off a copy to Bruce Neville at Texas A&M University in College Station, Texas. For about a decade now he has been reviewing each issue and not only correcting my lapses of English, but more importantly tracking down scientific names to ensure we print the correct name, the correct spelling of that name, the correct author, and the correct date. He also works diligently to keep our taxonomy updated and at least internally standardized. Thankfully Bruce is not only eminently qualified to provide this guidance, but he is a good enough friend to stick with what is truly an onerous task.

After Bruce sends me his corrections and suggested changes, I do another clean up of the magazine and send it electronically to our printer, JPA in Illinois. These good folks have not only cut the cost of the magazine in half, but they are always willing to help with technical questions and their turnaround time is always the minimum possible. This is also when I make a last minute email request to Steven Coker for money. He cuts the checks for postage and printing and gets them in the mail as if it was an emergency - which it almost always is as I tend to run late.

JPA mails a few copies to me and 1,200 (over 350 lbs) to Lynn Scheu in Kentucky. Lynn was editor for 16 years and did both my job and the one she does now. When she stepped down she agreed to continue to dedicate one complete weekend each quarter to unpack magazines, stuff envelopes, sort piles by zip code, and haul the resultant tonnage to the US Post Office. She and husband Richard respond each time as if *American Conchologist* is so important it has to go out immediately. Think about what you did last weekend and if you could or would have dropped it all to shuffle magazines.

Some others in this process, **every time**, are Doris Underwood who keeps the COA membership list up-to-date and mails Lynn the required labels, and Betty Lipe who stepped up to work with our advertisers and keep me apprised with what ads to print with each issue. We also have Tom Grace who collects and stores all extra copies. I do not know what to do with the few extras I get each time, I cannot imagine trying to store the thousands of copies in Tom's garage, basement, attic, and probably storage shed.

Finally, each reader gets his or her *American Conchologist* and if I am lucky they might see me at an annual COA convention and congratulate me on the magazine. Of course, I nod, smile, and say, "Thanks!" as if I had done it all - but now we all know the truth.

The labral tooth -- variations on a theme

Emily H. Vokes

Predatory snails generally have two ways of getting into a shell. Some drill a nice round hole and insert the proboscis into the victim and ingest the soft tissues, but this is very time consuming, taking hours or even days to complete. The second method is to enter the victim's shell through an existing opening, such as the aperture of a snail or the space between the two valves of a clam, but the victim may react violently by closing the aperture with the operculum or clamping the valves together. If the predator has already gained entrance the proboscis can even be severed, but if part of the shell can be wedged into the opening this will stop the closing. It turns out that a small tooth on the edge of the outer lip of the predator's shell is an effective tool to keep the opening from being closed. Obviously it is a trick worth developing.

I first became aware of the taxonomic value of the labral tooth while at the Australian Museum, working with Winston Ponder on the Indo-Pacific species of *Murex*. The first task he gave me was to describe each of the species in a detailed manner. To my surprise, as I worked through the approximately 40 species then referred to *Murex* s.s., a pattern appeared, separating them into two groups. One, true *Murex* s.s., was characterized by having nine angulate "proto-varices" on the earliest post-nuclear whorl, a markedly spinose shell, a monochromatic tan color, a smooth inner lip, and, most noticeably, a labral tooth. In contrast, the second group, which we referred to *Haustellum*, differed in having 12 rounded axial ribs on the earliest post-nuclear whorl, less impressive spines, color stripes, denticles on the inner lip, and no labral tooth.

Our work was published in the *Records of the Australian Museum* (Ponder and Vokes, 1988) and I further discussed this separation in "What ever happened to dear old *Murex*?" in *American Conchologist* (Vokes, 1990) wherein I pointed out that not only were about 25% of the Old World species formerly assigned to *Murex* s.s. not to be so classified, but that ALL of the New World species assigned to *Murex* s.s. should instead be assigned to *Haustellum*. Shortly thereafter, Houart (1992) separated the species of *Chicoreus* s.s. from those of *Triples*, on the basis of the lack of a labral tooth in the latter. I could scarcely fault him, could I? Petuch (1994, p. 273) subsequently placed many of these "*Haustellum*" species into a new genus *Vokesimurex*, including all the New World ones.

Since that time Geraat Vermeij has become extremely interested in the development of labral teeth and together we did a study on the fossil and Recent western Atlantic Ocenebrinae (Vermeij and Vokes, 1997), many of which are characterized by the possession of a labral tooth. Vermeij continued his studies, following our work with a paper (Vermeij, 1998) describing the mode of formation of the tooth, including three new genera. This was followed by a major study on the origins and formation of the tooth (Vermeij, 2001), which is the basis of this article.

In this latter work on the development of the tooth he

found that many different snail lineages have evolved a labral tooth. Every toothed species known is carnivorous. According to Vermeij (2001, p. 468) no herbivorous, detritivorous, or microphagous snails have a tooth. The muricids, being predatory snails, have the largest percentage, comprising half of the "clades," as Vermeij calls them. But there are several others, including the Buccinidae, Turbinellidae, and Fasciolaridae, one of which, *Opeatostoma pseudodon* (Burrow, 1815), has the largest and finest tooth of all. Curiously, this species feeds on polychaetes and the tooth is always sharp and unworn at the tip, indicating that it is not used to subdue prey.

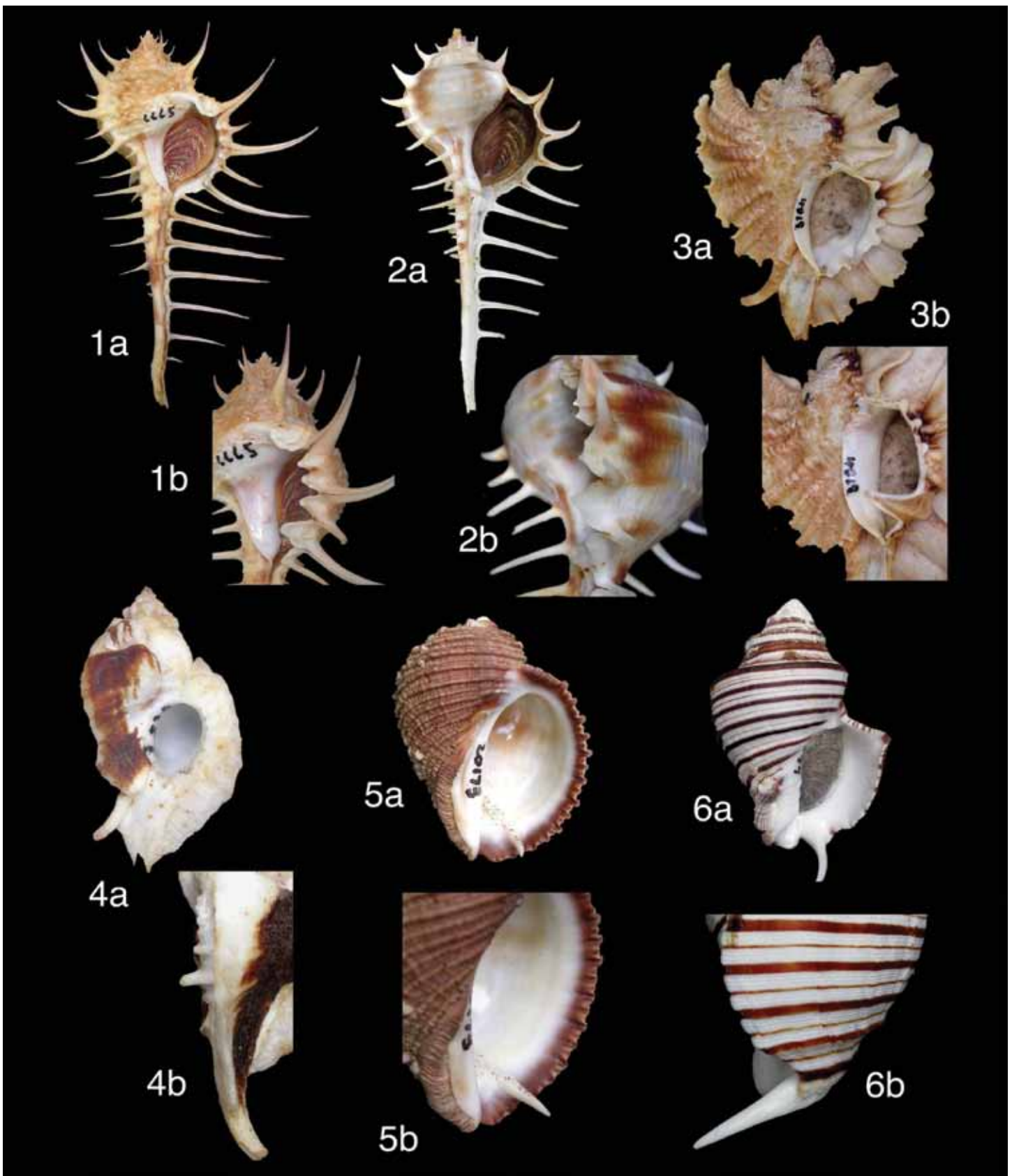
Vermeij has done almost all the work on labral teeth and in his 2001 *magnum opus* he determined that in the entire Neogastropoda there are at least 608 species, of which 251 are Recent, in which the tooth has appeared. But, what is even more critical, he states that the tooth has evolved **independently** at least 58 times! In the Recent fauna these tooth-bearing species are overwhelmingly warm-temperate to tropical in distribution, comprising 240 of 251 species, or 96%.

But as far as I am concerned the most interesting statistic is the preponderance of muricids. In all, 29 of the 58 tooth-bearing groups are muricid, including members of the Muricinae, Ocenebrinae, and Rapaninae. The other muricid subfamilies have no tooth-bearing species.

In terms of geologic time labral teeth first appear in the Late Cretaceous but are mainly concentrated in the Late Oligocene to Pleistocene interval, with the largest number appearing during the Early Miocene. For example, from the Late Oligocene to the Late Pliocene most muricid faunas in the Atlantic have at least two species with a labral tooth, and the Early Miocene Cantaure Formation of Venezuela, and the Pliocene Pinecrest Formation in Florida, have four species each. But there are no Pleistocene or Recent tooth-bearing muricids in the western Atlantic.

Morphologically, the evolution of a labral tooth is a simple matter. Just as spines are formed, the shell-producing mantle is extended to produce a projection. Perhaps because Muricidae are already genetically programmed to make spines, adding a tooth is a simple step. Vermeij has also documented (2001, pp. 464-466) the variations by which a tooth is formed. Although all are on the outer lip, they are not a uniform structure, but may develop in a variety of ways: 1) at the end of an external groove; 2) at the end of an external cord; 3) continuously, or, 4) discontinuously; 5) located anywhere from the upper end of the siphonal canal to about the middle of the lip.

In the Muricidae the most common type is at the end of a spiral groove, located near the siphonal canal. In most it is discontinuous, appearing only at the apertural face of a varix (*Murex* s.s., *Chicoreus* s.s., *Hexaplex*, *Ceratostoma*, *Pterorytis*). There are also species in which teeth on the varices appear discontinuously at the end of a spiral cord (*Jaton*, *Ocenebrina*), and there are



1. *Murex acanthostepes* Watson, 1883 -- Devil Brook, Western Australia. 2. *Murex somalicus* Parth, 1990 -- trawled between Cape Guardafui and Ras Hafun, northeastern Somalia. 3. *Ceratostoma burnettii* (Adams and Reeve, 1850) -- off northeast entrance to Puson Harbor, Korea Strait, divers in 50-80', South Korea. 4. *Jaton decussatus* (Gmelin, 1791) -- Goré Is., Senegal, West Africa. 5. *Acanthina monodon* (Pallas, 1774) -- Playa Larga, 2 km east of Arroyo Grande, Tierra del Fuego, Argentina. 6. *Opeatostoma pseudodon* (Burrow, 1815) -- Contadora Is., Las Perlas Archipelago, Panama.

species in which the tooth, usually a short blunt projection, forms continuously at the end of a spiral cord (*Muricodrupa*, *Nucella*).

As Vermeij notes, the labral tooth has been developed independently numerous different times and occurs in several different configurations. The question then becomes -- why have so many different groups independently come up with the same innovation at so many different times? According to Vermeij (2001, p. 480) the most consistent factor is high planktonic productivity. During times of high planktonic productivity, suspension-feeders such as bivalves, barnacles, and bryozoa, become abundant and large. It has been determined that peaks of first appearances of tooth-bearing groups coincide with times and places of high productivity. The more abundant prey available gives rise to the repeated development of the labral tooth in the predators. A novel structure like the labral tooth makes possible predation on larger, more protected prey (Vermeij, 2001, p. 483). Then escalation of the "arms race" between prey and predator fosters repeated evolution of the structure. The role of this "positive feed-back" in innovation is extremely important, but according to Vermeij "it remains an underappreciated aspect of biological evolution" (Vermeij, *ibid.*).

ACKNOWLEDGMENTS

I wish to express my deepest gratitude to Emilio Garcia for all his help, especially preparing the plate. To Geerat Vermeij, my thanks and that of all molluscan workers, for his seminal works on the underappreciated labral tooth.

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Still more on blood-sucking mollusks: a bivalve?

Tom Eichhorst

Zvi Orlin wrote "More on Blood-Sucking Mollusks" in the June 2007 issue of *American Conchologist*. In this article he discussed his fascination with mollusks that preyed on other organisms by actively sucking blood (Orlin, 2007: 23). He recounts *Cancellaria cooperi* Gabb, 1865, as perhaps the best known blood-sucking mollusk. An attractive nutmeg with a tan shell marked with dark brown spiral lines, it was first reported by O'Sullivan *et al.* (1987) as actively hunting out and attacking (sucking blood) the electric ray *Torpedo californica* Ayres, 1855. Other gastropods that actively parasitize fish in this manner include marginellids observed in the waters off New Caledonia preying on a number of different species of fish as reported by Philippe Bouchet (1989). Scott Johnson *et al.* (1995) observed both Colubrariidae and Marginellidae in the Marshall Islands actively feeding on sleeping fish during nighttime hours. Similar behavior involving non-piscine prey include Eulimidae feeding on echinoderms and Pyramidellidae feeding on bivalves and polychaetes (Bouchet, 2007). All of these predatory, blood-sucking mollusks are gastropods, which makes sense as such activity would seem to require mobility to hunt down and attack selected prey, even if said prey is asleep. The phylum Mollusca, however, seems a continuing source of surprises.

A small (less than 2 mm), deepwater (about 1280 m), blood-sucking bivalve was recently discovered in the Atlantic and given the apropos name of *Draculamyia porobranchiata* Oliver & Lützen, 2011 (the Dracula clam). The holotype of this clam-like white (and almost featureless) shell can be seen at: <http://naturalhistory.museumwales.ac.uk/molluscatypes/browserrecord.php?-recid=383&-sortfieldone=TaxonomySort&-sortfieldtwo=&-skip=0> Although its feeding behavior was not observed, the authors infer a blood-sucking methodology because this bivalve lacks both gills (the ctenidia are reduced to numerous small pores) and labial palps - required to filter feed. Instead there is a modified alimentary tract that acts as a pump, an expanded stomach to hold fluids, and piercing organ at the end of the byssus groove (Oliver & Lützen, 2011). The actual method of feeding and the chosen prey are unknown.

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Report on a dredging expedition off the Louisiana coast, including geographical extensions and new record sizes

Emilio F. García

Last August Drs. Darryl Felder and Suzanne Fredericq, members of the Biology Department at the University of Louisiana at Lafayette, led a dredging expedition to the north central Gulf of Mexico. The expedition was labeled “Gulf of Mexico Research Initiative” and was part of a study project to assess the impact of the Deepwater Horizon oil spill in the surrounding marine biota. A preliminary assessment on the mollusks was reported in *American Conchologist* (2012a). The expedition was sponsored by British Petroleum, and its Primary Investigator was Dr. Nancy Rabalais, Executive Director and Professor at the Louisiana University Marine Consortium, Chauvin, Louisiana.

The dredging equipment consisted of two benthic skimmers, which are large dredges specially designed for the very soft mud bottom found in deep water (see García, 2007b) and three box dredges used for the harder coralline tops of the banks or “pinnacles” that occur in the northwestern Gulf. The plans were to use the skimmer, going east from the Mississippi Delta in roughly 30 m, 100 m, 200 m, and 500 m, then sail to the east side of the Macondo Platform where the spill occurred; work the area; and ultimately sail our way back to the offshore Louisiana “pinnacles,” where the box dredge would be used. This was to be done in a five-day period (August 24–28), with the expectation that we might have to cut the trip short due to hurricane Isaac, which was heading somewhere into the Gulf. Well, as it turned out, the hurricane was going to be the least of our problems.

As usual, the *R/V Pelican*, our vessel, left port one minute after midnight and by 5 a.m. we were *in situ*, dredging at our first station in 27 to 28 m of water (28°44.76'N, 90°14.15'W) in rubble. The results were rich in living mollusks, including *Liriphora clenchi* (Pulley, 1952); *Distorsio clathrata* (Lamarck, 1816); *Solenosteira cancellaria* (Conrad, 1860); *Oliva sayana* Ravenel, 1834; *Conasprelloides cancellatus* (Hwass, 1792); and single or double specimens of *Architetonica nobilis* Röding, 1799; *Tonna galea* (Linnaeus, 1758); *Terebra taurina* (Lightfoot, 1786); *Drillia wolfei* Tippett, 1995; and *Calliostoma yucatecanum* Dall, 1881. One of the juvenile specimens of *Conasprelloides cancellatus* (**Fig. 1**) showed a yellow band on the shoulder when the periostracum was removed, a character I had seen in specimens from the southern Caribbean, but not from the Gulf. The single live specimen of *Calliostoma yucatecanum* that was dredged (**Fig. 2**) is unusually colorful and seems to be a record size for the species at 17.9 mm. Malacolog reports the largest recorded size as 16 mm (Rosenberg, 2009). *Drillia wolfei* (**Fig. 3**) had been recorded from Bahía de Campeche in the southern Gulf (García, 2007a), but had not been reported from the northern Gulf. Besides the two specimens dredged on this trip, in 1996 the species was dredged, but unreported, off Louisiana, in 68–104 m (EFG 28073).

We had problems with the benthic skimmer at Station 2 (at 100 m) because there were issues with the harness as it was

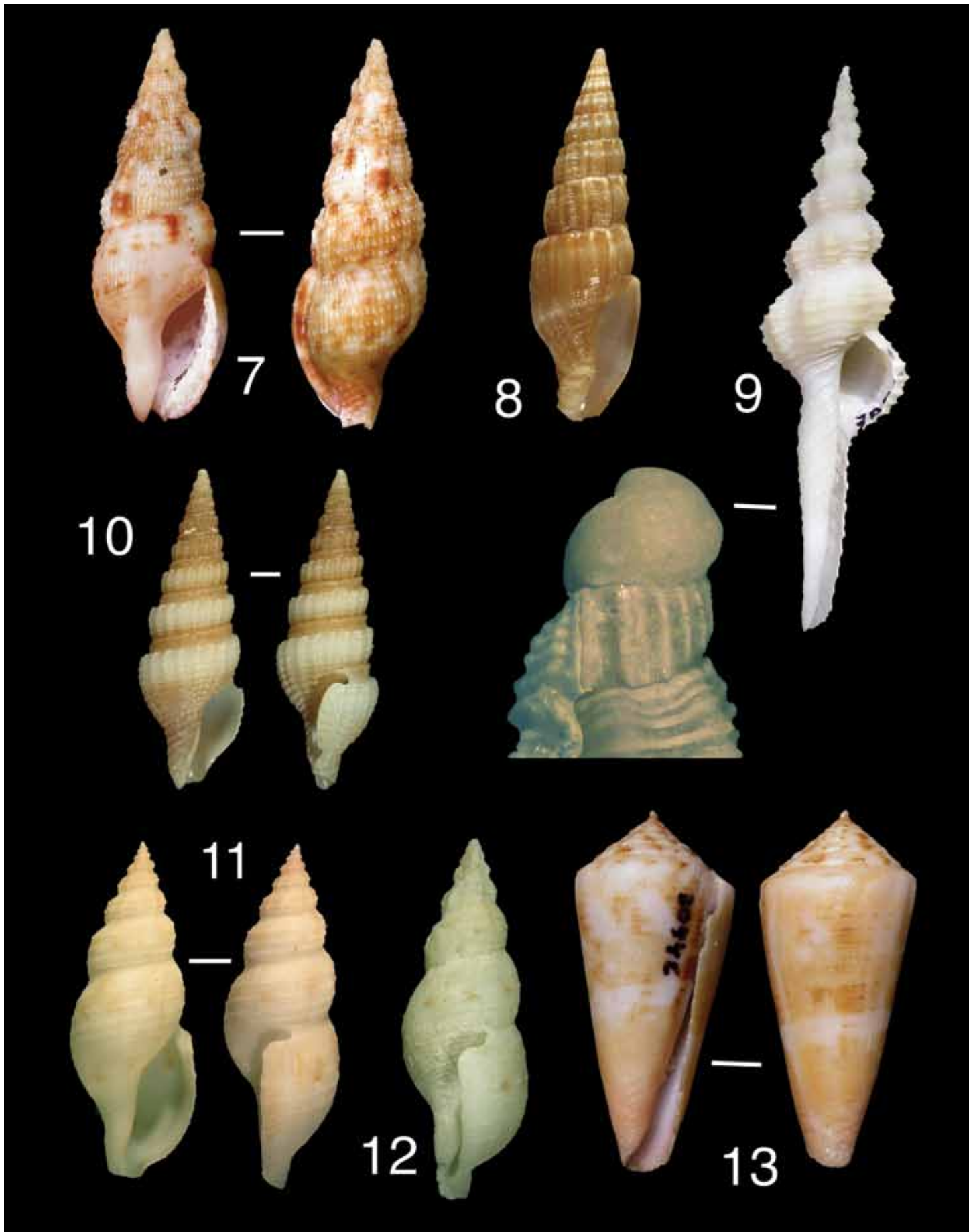
being lowered, and it came up empty. Well... almost. One lump of mud left in the dredge turned out to be an empty *Hindsiclava alesidota* (Dall, 1889). Station 3 (28°37.9'N, 89°46'W; in 200 m) more than made up for it. The dredge brought up many fish and crustaceans as well as numerous *Polystira tellea* (Dall, 1889). It also brought up an empty but rather fresh specimen of *Periploma orbiculare* (Guppy, 1882) measuring 28.9 mm (**fig. 4**). Guppy's taxon had been ignored for many years until it was examined and discussed by Huber (2010: 783).

Huber placed *Periploma orbiculare* in synonymy with *P. coseli* Ardila & Díaz, 1998, a taxon which, like *P. orbiculare*, was known only from the southern Caribbean. Then an empty but complete specimen was dredged in Bahía de Campeche in 2005 (EFG 26044; 20°46.97'N, 91°55.86'W, in 28–48 m, in mud) and in 2011 another empty but complete specimen was dredged off the Alabama coast (EFG 30167; 29°24.724'N, 87°58.597'W, in 73–76 m). These records have been unreported until now. *Periploma orbiculare* has also been reported from the Texas coast (Tunnell *et al.*, 2010: 337), apparently from a single drilled valve, even though it was reported as a “live specimen.” The depth at which the specimen was collected (3 m) also suggests this was not its natural habitat, as all other Gulf specimens have been collected at much greater depths. The same Station 3 also brought up live *Aequipecten glyptus* (A. E. Verrill, 1882), *Scaphella dubia* f. *kieneri* Clench, 1946 (**fig. 5**), and a beautiful specimen of *Pteropurpura bequaerti* (Clench & Pérez-Farfante, 1945) measuring 60 mm (**fig. 6**), which also seems to be a record.

Moving to the next station the dredge was dropped at 500 m, but got caught at the bottom and was lost. Not wanting to risk losing the second dredge in the same spot, we decided to make the long run to the east site of Macondo, the Deepwater Horizon oil spill area. It was a big blow to everyone when soon after dropping the skimmer at our intended station it was also lost. We had never lost a single benthic skimmer before; not a one. We were left with no choice but to start our long run back to the shallower hard pinnacles of Louisiana.

The disappointing results of our dredging experience on the August 2011 expedition to Sackett and Ewing Banks, off the Mississippi Delta, have been published in this magazine (García, 2012a, 2012b). Unfortunately, we did not do better in August 2012. Most worrisome was the fact that the algae on top of the banks did not seem to have been able to recuperate. It was worrisome because in August 2011 my colleague, Dr. Fredericq, had taken rocks from both banks to her lab at the university and in a few weeks a healthy crop of several species of algae was taking over the aquaria. What was preventing the algae from also growing in the wild one full year later? A rhetorical question at this point, but Dr. Nancy Rabalais and Drs. Fredericq and Felder are working on this dilemma.





August 26 was spent busily dredging Sackett and Ewing Banks as well as other banks to the west of them that we had not expected to visit, but after our mishaps we now had some extra time. Twelve stations were logged on August 26. We hoped there would be improvement in the biota of the banks as we moved west, but the improvement was barely noticeable. Under the column for Mollusca I catalogued only twenty-one lots from these twelve stations. The species catalogued do not include the only two gastropod species that we consistently saw alive, *Turbo castanea* Gmelin, 1791, and *Erosaria articularis* (Gmelin, 1791), or the few live *Acrosterigma magnum* (Linnaeus, 1758), *Globivenus listeroides* (Fischer-Piette & Testud, 1967) and *Semele purpurascens* (Gmelin, 1791). Not all was lost, however, if we consider the empty specimens. (Yes, my colleagues were very jealous because I could collect skeletons).

Among the interesting single, empty specimens collected on the Louisiana banks were the following:

Colubraria testacea (Mörch, 1874) (**Fig. 7**); 27°59.189'N, 91°39.466'W to 27°59.106'N, 91°39.156'W; in 77-79 m, in rubble. This species has been reported from three quadrants in the Gulf of Mexico, including the northwestern quadrant (Rosenberg et al., 2009). It is listed here because the specimen measures 54.8 mm, a large size for the species.

Vexillum cf. V. hendersoni (Dall, 1927) (**Fig. 8**); 27°59.28'N, 91°39.28'W to 27°59.34'N, 91°39.15'W; in 77-79 m, in rubble. This specimen is narrower than, and of different coloration from, all other *V. hendersoni* I have seen, including a number of lots dredged off Louisiana; otherwise, it does seem to conform to the characters of *V. hendersoni*. It measures 15.6 mm.

Fusinus cf. F. halistreptus (Dall, 1889) (**Fig. 9**); 28°37.750'N, 89°34.703'W to 28°37.850'N, 89°34.010'W; in 100 - 85m. Similar to Dall's taxon but with a wider shoulder and fewer axial ribs, it is the second such specimen collected off Louisiana, 65.6 mm.

Pyrgospira cf. P. ostrearum (Stearns, 1872) (**Fig. 10**); 27°57.718'N, 92°00.239'W to 27°58.339'N, 92°059.814'W; in 92-105 m, in rubble. The generic placement was suggested by Phil Fallon. It may be an aberrant form of *P. ostrearum*, but I have two other similarly colored specimens from other Gulf stations, including one from Bahía de Campeche, Mexico, which would make the synonymy harder to understand. The specimen, a sub-adult, measures 17.5 mm. The other two lots are single juveniles.

Eucyclotoma cingulata (Dall, 1890) (**Fig. 11**); 27°57.718'N, 92°00.239'W to 27°58.339'N, 92°059.814'W; in 92-105 m, in rubble. I was very pleased and surprised when this specimen came up in the dredge. Although I have a number of lots of this species from Bahía de Campeche, I did not remember collecting it from the northern Gulf, but after checking my collection I did have a juvenile dredged off Alabama in 2006 (EFG 27805; 29°24.43'N, 87°58.63'W, in 74-72 m, in mud). What makes this specimen more remarkable is that it measures 23.5 mm, almost as large as one of the specimens from Bahía de Campeche, which measures 24.7 mm (**Fig. 12**).

Dauciconus aureonimbosus (Petuch, 1987) (**Fig. 13**); 28°05.826'N, 91°01.555'W to 28°05.912'N, 91°01.849'W; in 56-53 m, in rubble. Mr. John Tucker identified as Petuch's taxon two calcified specimens collected during this trip. The specimen shown in this plate (EFG 30446) was collected during the August 2011 trip and I had identified it as *Dauciconus amphiurgus* (Dall, 1889). This specimen measures 34.3 mm, larger than the maximum reported size of 27 mm that appears in Malacolog (Rosenberg, 2009).

So, all in all, it wasn't too bad for "discoveries" for two days of dredging; that is, if we count the skeletons. If the situation on top of the offshore banks does not change, even the skeletons will not be there.

My thanks to Drs. Nancy Rabalais, Darryl Felder and Suzanne Fredericq for once again inviting me to accompany them on another "Pelican" campaign.

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COA *Neptunea* Award

Many of us are beginning plans for the 2013 COA Convention in Sarasota, FL. One of the many events on the agenda is the annual COA *Neptunea* Award(s), and it is once again my privilege to call for nominations.

The consensus of the COA Board is to reopen nominations with a “clean slate” annually. Nominees not selected in previous years are certainly welcome for consideration if renominated - in fact their renomination is encouraged. For the present cycle, nominations will close on June 1, 2013, so as to allow ample time for deliberation before the convention.

By way of background, the *Neptunea* Award (Brunner, 2000; Lipe, 2000) was established at the midyear (1999-2000) meeting of the COA Board in order to recognize outstanding and distinguished service to conchologists and malacologists in recognition of:

1. Service to the Conchologists of America.

AND/OR

2. Service to the scientific interests of Conchologists of America.

AND/OR

3. Service to the science of malacology as it applies to conchologists anywhere.

Although notable exceptions have been made, the COA Board, which serves as the jury for the *Neptunea* Award, has traditionally weighed its consideration for award recipients toward (1) amateurs: those not currently pursuing a principal career involving collection, study, or commerce involving mollusks, (2) individuals “working behind the scenes” and relatively unrecognized, in the COA world, for their contributions, and (3) active members of the COA. Up to three awards have been made at our annual conventions beginning with the Houston event in 2000 (see below). Nomination(s) for the *Neptunea* Award may be made by any COA member, and the format is simple:

Name of nominee:

This person deserves this award because (here a somewhat detailed paragraph will suffice).

..... Signed

And either snailmail or email that nomination to the COA *Neptunea* Award Coordinator.

[currently Harry. G. Lee / 4132 Ortega Forest Drive / Jacksonville, FL 32210 / shells@hglee.com]

Previous *Neptunea* Award winners:

2000 (Houston, TX): Ross Gunderson, Ben and Josy Wiener, Debbie Wills

2001 (Port Canaveral, FL): Emilio Garcia, Harry Lee, Lynn Scheu

2002 (Sarasota, FL): Richard Petit, Bernard and Phyllis Pipher

2003 (Tacoma, WA) Jim and Linda Brunner, Kevin Lamprell, Doris Underwood

2004 (Tampa, FL): Bobbi Houchin

2005 (Punta Rassa, FL): Richard Forbush, Anne Joffe, William Lyons

2006 (Mobile, AL): Jack Lightbourn, Betty Lipe

2007 (Portland, OR): none given

2008 (San Antonio, TX): Bill Frank, Archie Jones

2009 (Clearwater, FL) none given

2010 (Boston, MA): none given

2011 (Port Canaveral, FL): Alan Gettleman

2012 (Cherry Hill, NJ): Gary Rosenberg, Martin Avery Snyder

Brunner, L., 2000. The *Neptunea* Award. *American Conchologist* 28(3): 3. Sept.

Lipe, B[etty], 2000. Presidents Message. *American Conchologist* 28(4): 2. Dec.

Harry G. Lee

Vice President, Conchologists of America

Submitted 23 September, 2012

COA grantees at the AMS/COA meeting

Paul Callomon

The AMS/COA meeting in June 2012 saw the coming together of many old friends and the first meeting of many new ones. United by their enthusiasm for all things molluscan, hard-headed molecular systematists could be seen discussing fine points of shell sculpture and shape with veteran snorkelers and hotel-room specimen triage experts. Scientists from all over the globe chewed the fat with dealers, collectors, and students, and evening bar tabs reached Rabelaisian proportions.

Over the eight days of the meeting the formal talks ran the gamut from the slugs of Pennsylvania to the Vermeij Crushing Analysis, and everything in between. Among the many symposia and activities, however, perhaps the most memorable was the joint session of presentations by former recipients of COA grants that took place on Wednesday and Thursday, June 20-21.

The COA grant program was established in 1985 and has made awards every year since then. The program has grown over the years so that for the last decade COA has been able to provide grants totaling \$15,000 per year. Grantees are mostly graduate students and many have gone on to become leading professionals in the field. A large number gathered in June to present their work. Symposium chairs (themselves grantees) Ellen Strong of the Smithsonian and José Leal from the Bailey-Matthews Shell Museum called things to order at 8:20 and the day's program proceeded as follows:*

Rüdiger Bieler: Beauty and the Beast – diversity, research history, and ongoing challenges in two families of marine gastropods, Architectonicidae and Vermetidae.

Desmond Ramirez & Todd H. Oakley: Characterizing the molecular basis of dispersed photoreception in the cephalopod *Octopus bimaculoides*.

M. Sabrina Pankey & Todd H. Oakley: A phylogenetic and transcriptomic study of convergent evolution in bioluminescent squids.

Anita J. Krause & Jeanne M. Serb: Do scallops see in color? Understanding the visual capabilities of scallops.

Paul Harnik: Biological determinants of extinction risk in the marine bivalve fossil record.

Christy C. Visaggi & Patricia H. Kelley: Equatorward increase in naticid gastropod drilling on bivalves across four ecoregions in Brazil.

Russell Wyeth: Possible alternative strategies for nudibranchs navigating in variable flow.

Gregory B. McCullagh, Cory Bishop & Russell C. Wyeth: The rhinophores are sufficient and necessary during odor-gated rheotaxis in the nudibranch *Tritonia diomedea*.

James M. Newcomb: Developing a model system for investigating how circadian clocks produce circadian behavior.

Manuel António E. Malaquias: How can extant species of molluscs help us understand the evolution of life on Earth?

Melissa A. Frey, Geerat J. Vermeij & Thomas Eichhorst: Diversity and diversification in a group of tropical gastropods (Genus *Nerita*).

Erin L. Meyer: Habitat preferences and intertidal zonation of *Cittarium pica*: what rocks their world.

Nathan Whelan: Systematics and egg laying evolution of Pleuroceridae (Gastropoda: Cerithioidea).

Serena Ciparis, William F. Henley & J. Reese Voshell: Description of gonad development in a pleurocerid snail (*Leptoxis carinata*).

Kenneth A. Hayes: Conchologists of America: fostering the future of Malacology and supporting student research through grants to Malacology.

Kevin J. Roe: Investigations into the systematics and conservation genetics of freshwater mussels.

Christine E. Parent: Galápagos bulimulids: diversification amongst a vanishing tribe.

Dan Chang, Amy M. Olenzek & Thomas F. Duda Jr.: Geographic mosaics in biotic interactions drive evolution: patterns of variation of venom genes tightly associated with prey diversity.

Things continued on Thursday morning:

Elizabeth K. Shea: Structure and function of the fused tentacles in ommastrephid squids: dissertation research funded by the Conchologists of America.

Ilya Tëmkin: The Pterioidea: diversity and disparity.

Jeremy S. Tiemann: Damn those dams - their negative effects on stream ecosystems.

Josh R. Auld: The role of predation risk in mating system expression: avoiding inbreeding when death is on the line.

Aaron B. Stoler & Rick Relyea: The influence of litter species, chemistry and diversity on snail communities.

Norine W. Yeung & Kenneth A. Hayes: Hawaiian land snail biodiversity: conservation status of a vanishing fauna.

Wallace M. Meyer III and Robert H. Cowie: Land snail compositional changes and the functioning of ecosystems.

Paul Callomon
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(Back cover) The official group picture – see how many faces you can name without using the key on page 35.

*The program and abstracts of all the talks at AMS/COA 2012 are available for download from the AMS web site:

http://www.malacological.org/meetings/archives/2012/Program_and_abstracts_FINAL_07Jun12.pdf



1. A mystery bivalve is debated by (left to right): John Taylor (Natural History Museum, London), Tom Waller (Smithsonian), Matt Blaine, and Doug Wolfe.



4. COA President Alice Monroe (left) with a smile that says, "My term of office is complete" and COA Convention Coordinator Anne Joffe (right) with a smile that says, "The next two convention sites are a lock!"



2. Liz Petit (right) prepares for a long session as Guido Poppe (left) and Dick Petit (middle) get started!



5. Despite careful planning and event coordination that pretty much went without a hitch, transportation delays seem unavoidable.



3. Coffee break with (left to right): Adam Baldinger (MCZ, Harvard), Phil Dietz, and Art Bogan.



6. Carole Marshall with Paul Valentich-Scott, Curator at the Santa Barbara Museum and co-author (with Gene Coan) of the new "Bivalve Seashells of Tropical West America."

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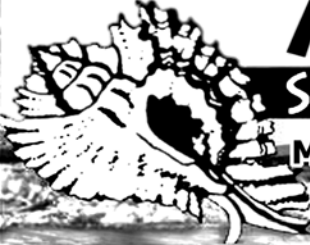
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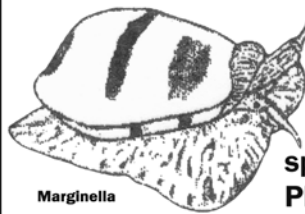
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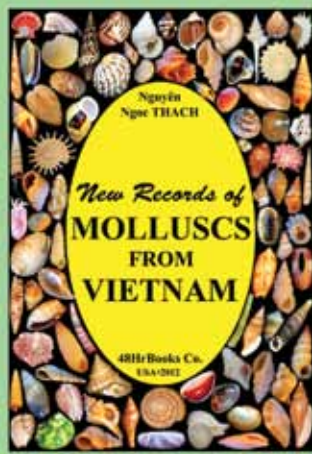


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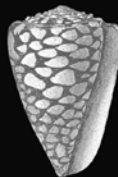
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The 2012 Philadelphia Shell Show

Paul Callomon

The Philadelphia Shell Club presented the 29th Philadelphia Shell Show over the weekend of October 20 and 21, while Hurricane Sandy was still but a wisp out in the Caribbean. Despite a gorgeous day outside and a packed social calendar in the city, over 2,600 people came to the Academy of Natural Sciences to marvel at the wonders on display. This year's show took place partly in the Academy's Ewell Sale Stewart Library, where the high windows provided dramatic natural lighting for both fortuitously sunny days. Portraits of conchological greats including Thomas Say and Isaac Lea gazed approvingly down on this modern-day display of the "citizen science" whose development they did so much to encourage.

Scientific classes

The scientific displays were among the best we've ever seen. Several were what are termed "curvature-of-the-earth" exhibits, grand spreads of impressive size, while others crammed the same levels of detail and scholarship into more modest dimensions. Judges Harry G. Lee and Rich Goldberg had the hardest time of all choosing the "shell of the show," as almost every exhibit had at least one in the running. They settled (finally) on Tom Grace's fine *Calliostoma schroederi* for "Any Source," and Ed Shuller's *Conus tranthami* for "Self Collected."

The year 2012 marks the 200th anniversary of the founding of conchology in the Americas with the establishment of the Academy of Natural Sciences by Thomas Say and several other Philadelphians. To mark the occasion, the Philadelphia Shell Club presented a one-off Bicentennial Award bearing Say's likeness to the best exhibit on the show theme "Shells of the Americas." Darlene and John Schrecke of North Carolina landed the award with their great work "Seashells from the Northwest Atlantic region."

Artistic classes

Philadelphia is justly known as a "Valentine Show," but alongside the usual dazzling display of octagonal artistry many other genres were represented by some very fine work. Hatsue Iimuro and Yasu Suzuki carried two magnificent pieces all the way from Japan, and rightly clinched the "Best in Show" (non Valentine) title for their "Shell Forest." The art of shell flowers was well represented, as were mosaics and shell pictures. Standards of execution were high in all genres and many competitors showed off imaginative new uses for familiar shells.

Competition was fierce among the valentines in several classes and some joint firsts were awarded. At some points it took all the skill and experience of judges Anne Joffe and Hannah Milman to reach a consensus. Several visiting experts over the weekend lauded the high level of innovation this year, with wires, mirrors, and multiple tiers employed to produce dramatic new effects.

The Bourse and Academy

The bourse dealers outdid themselves in putting on a great display and traffic was gratifyingly steady over both days. On



The Bicentennial Award featuring the likeness of Thomas Say, a charter member and founder of the Academy of Natural Sciences. He is best known to conchologists because of his work with North American land and freshwater mollusks. He is perhaps more widely known as an entomologist: describing over 1,000 beetle species alone.

various floors the Academy expanded on the show with activities for kids and families including squid dissections, movies in the auditorium, touch tanks, and craft tables. Bill Jordan once again gave packed master classes in valentine building and shell crafts.

The Saturday evening Awards Ceremony and Supper were well attended, with revelry continuing long afterwards at several local establishments. Sunday saw no let-up in the stream of show-goers, who were snapping pictures and poring over captions right up to the last minute. Malacology Department staff gave tours of the Academy's vast shell collection three times each day and as usual they were fully booked. The 2013 Philadelphia Show will take place at the Academy on October 19 and 20, with setup on the 18th.

Acknowledgments

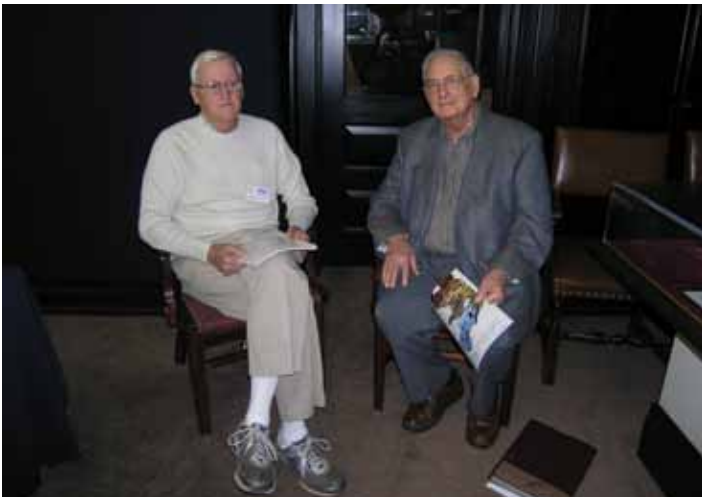
The Philly Show is a joint production of the Philadelphia Shell Club and the Academy's departments of Malacology, Education and Marketing, all of whom put on a major effort starting



The bourse, ready for a crowd of buyers and folks just wanting to look.



Shell of the Show *Calliostoma schroederi*, exhibited by former COA President, Tom Grace.



Harry Lee (left) and Robert Robertson (right) catch up on developments in the fast-moving world of malacology



The artistic classes in their distinguished surroundings, the Academy's Ewell Sale Stewart Library.



“Shell Forest” by Hatsue Imuro and Yasu Suzuki of Japan understandably won the “Best in Show” (non Valentine) title.



An example of the sterling quality of scientific displays at this year's show.

many months ahead of the date. This year there was particularly effective promotion in the local media and the show saw a large jump in visitor numbers over 2011.

Planning and setup: J. B. Sessoms, Al Schilling, Michelle Morici, Anthony Paino, Amanda Lawless, Tommy Thompson, Judy Goldberg, Alex Moede, Nick and Betty Ruggeri, Francisco Borrero, Makiri Sei, Mike Beers, Richard Kaplan, and Bruce Tepper.

Hosting: Mary-Jane Schilling, Happy Robertson, Gary Rosenberg.

Promotion and media: Teri Scott, Carolyn Belardo, Mike Gage, Tom Eichhorst.

List of major scientific awards

Best Shell of Show, any source: *Calliostoma schroederi*, Tom Grace.

Best Shell of Show, self-collected: *Conus tranthami*, Ed Shuller.

John Dyas Parker Award for most creative scientific exhibit: Sheila Nugent, "Native Americans – the first collectors."

Robert B. Fish Award for best small scientific exhibit: Vicky Wall, "Self-collected shells from Hawaii."

R. Tucker Abbott Award for best scientific exhibit by a Philadelphia Shell Club member: Tom Grace, "American Calliostomatidae."

Leonard Hill Award for the most aesthetic scientific exhibit: Al Schilling, "Shells of the Americas."

Judges' special awards: Rich Kirk, "Shells from Antarctica" and Clare Horner, "Out of Africa."

2012 Bicentennial Award for best exhibit on the theme "Shells of the Americas": Darlene & John Schrecke, "Seashells from the Northwest Atlantic region."

Conchologists of America Award: Tom Grace, "American Calliostomatidae."

DuPont Trophy: Ed Shuller & Jeanette Tysor, "Pickups from the Oyster Bar in North Carolina."

Masters' Trophy: Gene Everson, "The Veneridae."

Paul Callomon
callomon@ansp.org

Join Anne Joffe and Gary Schmelz as they lead another Natural History and Shelling Trip to Chub Cay, a charming private island in the Bahamas. Proceeds from Museum trips help the institution's educational programs, while allowing you to have a fantastic experience.

From May 30-June 6, 2013

For more information, contact Anne Joffe at
sanibelchilton@aol.com

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Creature feature

Dan Dourson

(reprinted with the author's permission from the October 2012 online BFREE Newsletter (Belize Foundation for Research and Environmental Education) <http://www.bfreebz.org>)

This article is an excerpt from Dan Dourson's latest book, "Biodiversity of the Maya Mountains with a focus on the Bladen Nature Reserve, Belize, Central America." The book also contains a comprehensive section on common and newly discovered land snails, some never before photographed. He is currently working on "Land Snails of Belize," which will hopefully be published sometime in 2013. This manuscript will be fully illustrated and contain more than 30 undetermined species, many of which are likely new to science. Dan is the resident biologist at the Belize Foundation for Research and Environmental Education.

When my wife and I first came to BFREE in 2006, my primary research focus was the study of land snails. I will never forget Jacob's reaction when I told him I studied snails. The smirk on his herpetologist face said it all. Then I began to study the interspecies relationships of snails and other organisms, like this month's Creature Feature, Speckled Snail-sucker, *Sibon nebulata*. The lowly snails started to gain his respect, if only to serve as dinner for his favorite group of organisms, snakes. The article below describes the amazing art of snail-sucking.

Presented here are observations I made in 2009 (with additional observations by filmmaker Richard Foster) of eight individuals of the species *Sibon nebulata* - Speckled Snailsucker, documenting the foods accepted and rejected by this species. Although the behavior witnessed for *S. nebulata* was based on a meager 25 feeding events, certain characteristics appeared, especially when the snakes fed on land snails in the genus *Drymaeus*. For example, before making grabs for the snail flesh, *S. nebulata* make deliberate and calculated assessments of prey size, movement, and position.

If the snail is on the move, the snake uses its tongue to delicately touch the snail, stopping all movement forward (personal communication - Richard Foster 2012). Occasionally the snail withdraws into its protective shell, but the snake simply waits with great patience until the snail reemerges. At this point, the snake begins to hover over the snail turning its head in contorted angles as it searches for an ideal strike angle, being careful not to make premature contact with the gastropod. Next the snake aligns its lower jaws with the lower opening of the snail aperture (this taking a few minutes). A strike then follows with the precision of a thread passing through the eye of a needle. Only the lower mandible of the snake enters the aperture while the upper mandible comes to rest on the outer surface of the last body whorl of the shell. Without delay, the snake makes a few lower and upper mandible adjustments before seizing down on the live snail flesh, holding the snail securely until it ceases to struggle. The snake begins extracting snail flesh only when all snail movement has ended, which may take upwards of an hour or more for *Drymaeus* species. The hesitation to eat the snail immediately is thought to be a direct response to the effectiveness of the snake's saliva. Actual feeding and extraction of the gastropod's meat takes around five minutes or less and 80 to 90% of the snail flesh is usually retrieved by the snake. The shell remains intact and largely undamaged.



For other species of land snails, such as the larger Mayan Marauder [ed. note: *Euglandina ghiesbreghti* (Pfeiffer, 1856)], *S. nebulata* execute the usual strikes (as seen in other snake species), grabbing, yet sometimes missing, whatever portions of the snail remain outside the shell. Upon securing the snail's body, the snake holds its prey without moving, up to 24 hours or more until the snail ceases to struggle at which time it is then consumed. Slugs

eaten by *S. nebulata* are seized promptly and eaten without the hesitation seen with shelled species, whole feeding events usually lasting only a few minutes.

Perhaps species equipped with operculum structures (snail doors) act as a deterrent to the snakes, preventing the snake's lower jaw from entering the aperture of the shell. This however remains to be investigated. Non-mollusk organisms offered to the snakes included frogs, lizards, small snakes, earthworms, beetle larva and other invertebrates, all of which were declined. All foods presented were found locally and native to the Maya Mountains with the exception of *Veronicella floridana* (a native slug to Florida, USA, and Cuba).

These feeding behaviors suggest that *S. nebulata* is able to distinguish shelled and non-shelled gastropods (slugs) and is able to differentiate shelled snail species based on size and aperture shapes, perhaps through visual or olfactory senses. Clearly, *S. nebulata* uses different feeding strategies for dissimilar snail species. Further, these sequences of events strongly suggest that the snakes use immobilizing saliva to relax or even kill shelled snails before consumption. This is thought to make extraction of the muscular and slippery snail flesh easier to take. Another interesting fact: Sibons are reported to have a greater number of teeth in their lower right jaw than their lower left jaw, an evolutionary response to land snails in this region having right-sided apertures (openings). This allows the snake to reach deeper into the shell, resulting in removal of a higher percentage of snail flesh.

These evolutionary marvels are just a small taste of the fantastic biodiversity of the Maya Mountains of Belize. So next time you dine on the delicacy of escargot, know that you are part of an elite group of "snail-suckers" like the *Sibon nebulata*!

Are snails slowing down?

Tom Eichhorst



We all know that few mollusks are going to set any speed records. According to the BBC (yes, things are a bit tarnished around the edges over there, but they still get their science correct most of the time) a couple of researchers in Chile, have found that some snails may in fact be slowing down. Disclaimer - we are talking metabolism not speed, though they think speed might also be involved.


Robert Nespolo and Paulina Artacho of the Southern University of Chile, in Valdivia, have been watching and measuring about 100 garden snails (*Cornu aspersum* (Müller, 1774), or *Helix aspersa* as it is still often termed) in an attempt to test the "energetic definition of fitness" hypothesis. The EDF holds that animals that expend less energy for day-to-day maintenance will have an evolutionary edge as they have excess energy for growth and reproduction, and thus an edge in the survival game. To test this the team determined the metabolism of the snails by measuring how much carbon dioxide each snail produced while at rest. The snails were kept in garden containers so they were readily accessible. After seven months they collected the snails (including the dead empty shells). They found that shell size had no correlation with measured metabolic rate, but longevity did. The snails still alive after the seven month period were typically those that had been initially measured as having a 20% lower metabolic rate. It seems that a lower metabolic rate meant a greater chance for survival.

Previous attempts to study the EDF hypothesis involved wild mice. These studies failed as it proved rather difficult to recapture all of the mice after an extended period and it could not be determined if the missing mice had died or simply left the area. Robert Nespolo and Paulina Artacho kept their snails in a confined area and they could thus account for all of the study snails as the dead snails left behind their shells. The team now want to see if the slower metabolic rate correlates with a slower snail crawling speed. Anyone who has read any of the many works by Geerat Vermeij will immediately spot the absence of a key evolutionary force in this study - the predator-prey relationship. It could be that the wild mice that could not be recaptured were the slower group and were all eaten. Let's put a box turtle in that snail container and see what happens to the slower snails.

bbc.co.uk/go/pr/fr/-/earth_news/newsid_8043000/8043689.stm
5/11/2009

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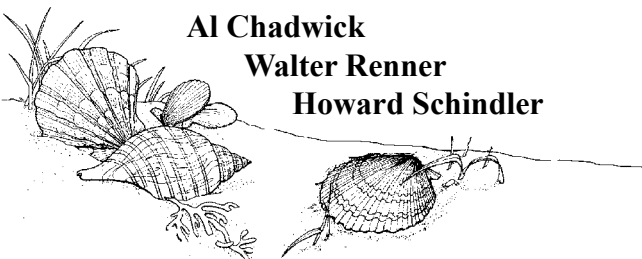
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Quarterly Journal of the Conchologists of America, Inc.

In memoriam:

Al Chadwick
Walter Renner
Howard Schindler



A re-description of the du Pont Trophy (Shell Show Award: Outstanding Exhibit) with notes on distribution and morphology

Elizabeth K. Shea and Leslie L. Skibinski

Department of Mollusks, Delaware Museum of Natural History, Wilmington, DE 19807

Introduction: The du Pont Trophy for the overall outstanding exhibit at a shell show has been awarded by the Delaware Museum of Natural History (DMNH) since 1969, the year Dr. R. Tucker Abbott left the Academy of Natural Sciences of Philadelphia (ANSP) to become the founding Curator of Mollusks at DMNH. One of Tucker's enduring legacies is his reputation as a bridge between the amateur and professional communities. In keeping with that legacy, the du Pont Trophy celebrates the important contributions that amateur naturalists make in popularizing and advancing the study of mollusks.

Over the last 42 years, the du Pont Trophy has been presented more than 600 times at over 40 different shell shows in 14 different states. Prior to 1991, the trophy was occasionally awarded overseas (Table 1), but its distribution has become more restricted over time (Fig 1). In the last 10 years, the trophy has been awarded primarily in Florida, although robust shell clubs and shell shows remain in the mid-Atlantic and the Pacific Northwest.

History of the du Pont Trophy: The du Pont Trophy originated at ANSP as the "Academy Award" (Fig 2a), but when Tucker moved to DMNH in July of 1969, the award moved with him. In September 1969, Tucker sent a letter to the amateur shelling community via the shell shows announcing the beginning of the du Pont Trophy and the retirement of the Academy Award (Fig. 3). Although the name of the award changed to acknowledge museum founder John E. du Pont, the intent of the trophy has never changed.

The first du Pont Trophy was a statue similar in size to the Academy Award, but inserted on a cup rather than a column. Our research shows that the first du Pont Trophy was awarded to Mrs. Faye B. Howard for her exhibit, "Symbiosis" at the first Santa Barbara Shell Show, October 10-12, 1969 (Fig 2b). The statue form of the trophy was relatively short-lived, awarded at just 28 shows over a two year period from 1970 - 1971.

In 1972, the year the museum opened to the public, the trophy was changed from a statue to a walnut plaque, with a slice of polished "*Turritella* agate" on top and a metal plate engraved with the year and name of the shell show on the bottom (Fig. 4a). The stone came from fossilized freshwater lake deposits in the Green River Formation (53-42 million years ago). The freshwater snails

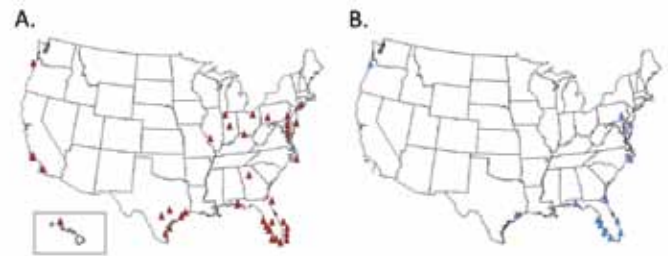


Fig. 1. The distribution of the du Pont trophy has changed over the last 40 years. A) Red triangles mark the location of all American shell shows that have awarded the trophy. B) Blue triangles mark the shell shows offering the trophy in 2010-2011.

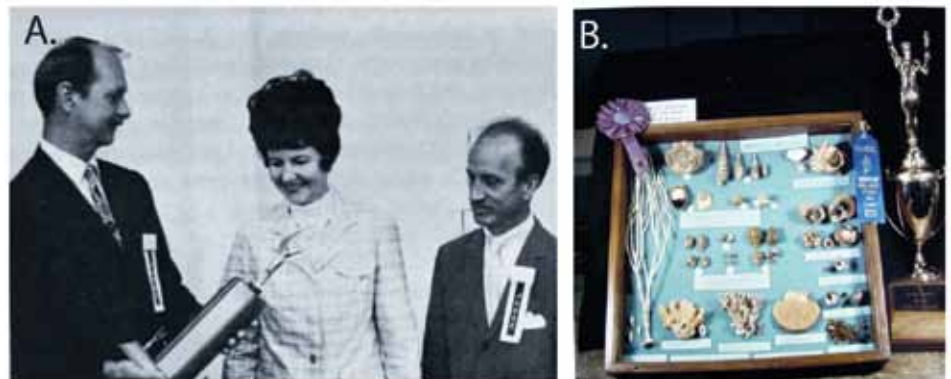


Fig. 2. The transition from the Academy Award to the du Pont Award. A) Mrs. J.R. Black was the 1969 winner of the Academy Award at the Sanibel Shell Fair. The text accompanying the photograph reads in part, "Dr. Donald R. Moore and Dr. Vincent Conde present the trophy from the Academy of Natural Sciences of Philadelphia to Mrs. J.R. Black of Fort Myers, for the outstanding exhibit of the Show." Photos used with permission of the Sanibel Shell Club. B) The 1969 Santa Barbara Shell Club winning entry "Symbiosis" by Mrs. Faye B. Howard. Photos used with permission, Santa Barbara Museum of Natural History, Archives.

seen in cross section are *Elimia tenera* in the family Pleuroceridae, suggesting the name "*Turritella* agate" is a bit of a misnomer.

In 1982, the trophy was re-designed again in conjunction with the 10th anniversary of the museum opening. Collections staff, especially Russell Jensen, worked with the Brey Studio Lotus Tile Company in Pennsylvania, to custom-design a porcelain bas-relief *Nautilus* on green Jasperware. The 4" x 5" tiles were used in place of the *Elimia* agate, but the engraved plate with the shell show name and year was retained (Fig 4c). This "Wedgewood" trophy

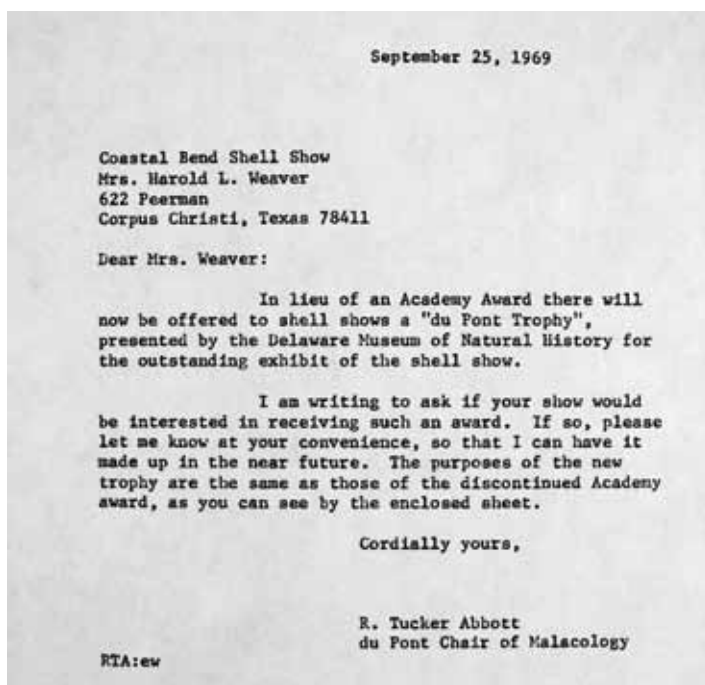


Fig. 3. Example of a letter sent by R. Tucker Abbott signaling the change from the Academy Award to the du Pont Trophy.

debuted in 1983.

Why the trophy changed from a fossil snail to a cephalopod is not documented, but it is likely a reflection of the large amount of *Nautilus*-based research underway at the museum during this time period. Starting in October 1974, Museum Trustee Horace "Dug" Dugdale founded and was the editor of the *Chambered Nautilus Newsletter*. This newsletter provided a venue for *Nautilus* researchers to connect and communicate (e.g., announcing the first observations of *Nautilus* embryos in 1985). Since 1982, the image of a *Nautilus* in cross-section has been associated with the trophy, and for a long time it was the unofficial emblem of the museum.

When the Jasperware supply ran out in 1990, the plaque was simplified to a single etched brass plate with a cross section of a *Nautilus* on top and the year and shell show on the bottom. (Fig. 4c). This simple but elegant dark walnut plaque has been the standard for the last 20 years.

The 2012 du Pont Trophy: In 2012, the trophy was reimagined and updated to mark the 40th Anniversary of the opening of the museum, bringing us back to the original intent of updating the trophy regularly. After careful consideration, we decided the new design had to:

- develop a stronger link between the trophy and the museum's mollusk collection,
- appeal to shell lovers by focusing on the beauty of shells,
- appeal to collectors by incorporating a new design each year, and
- maintain the feel of an award.

The new trophy is a signed, limited-edition print of a commissioned watercolor based on a shell from the mollusk collection (Fig. 5). The shell show name and year of the award are engraved onto brass coated plates attached to the frame. On the

back of each award is a short description of the shell, the DMNH catalog number, and background information on the artist.

The 2012 du Pont Trophy celebrates the scholarship of the early days of the museum's Collection and Research Division, and recognizes the museum founder and trophy namesake by selecting the volute *Festilyria duponti* Weaver, 1966 (Holotype, DMNH 13706). The shell rests on a copy of the book, "*Living Volutes: A Monograph of the Recent Volutidae of the World*" written by Clifton S. Weaver and John E. du Pont and published by the museum.

Philadelphia artist Lauren Sweeney, Ph.D. worked with collections staff on the shell and book composition, and painted the watercolor. Lauren received a Ph.D. in anatomy and cell biology from the University of Nebraska. After a career in research and teaching, she transitioned to a life as a full-time artist in the early 2000s and has been finding inspiration at the museum since 2006.

Moving forward: We will select a new shell, or group of shells, from the museum's mollusk collection to highlight for the trophy artwork. The twelve to thirteen trophies awarded each year will be limited edition, signed prints. The original watercolors, however, will be donated to the museum with the expectation that they will be sold or auctioned to raise money for the Collections and Research Division.

As part of the redesign process, we asked shell show award chairs, participants and winners to provide feedback on the trophy redesign. Reviews thus far have been mixed, with many thoughtful comments received. Overall, the trend suggests that exhibitors appreciate the new style, but would like it to feel more like an award. We will do our best to incorporate these suggestions as we move forward.

Please feel free to send any additional suggestions or comments to either Leslie Skibinski (lskibinski@delmnh.org) or Liz Shea, Ph.D. (eshea@delmnh.org). We are especially interested in updates and corrections to our records regarding dates, shell club mergers or name changes, and winner names and exhibit titles.

Acknowledgments: Many thanks to collections volunteers Karen O'Donnell and Sarah Lewis, who helped us pull together and organize all the archival material about the du Pont Trophy, and to Meredith Hatzinikola and Rosemary Ginzberg, who took pictures of the trophies. We thank Gary Rosenberg, Ph.D. of the Academy of Natural Sciences for donating a Jasperware trophy to the DMNH archives thus completing our set. Thanks to all the shell show organizers and especially the awards chairs for their thoughtful input as we have moved through this process. Parts of this article were presented as a poster at the 2012 American Malacological Society meeting in Philadelphia, PA.

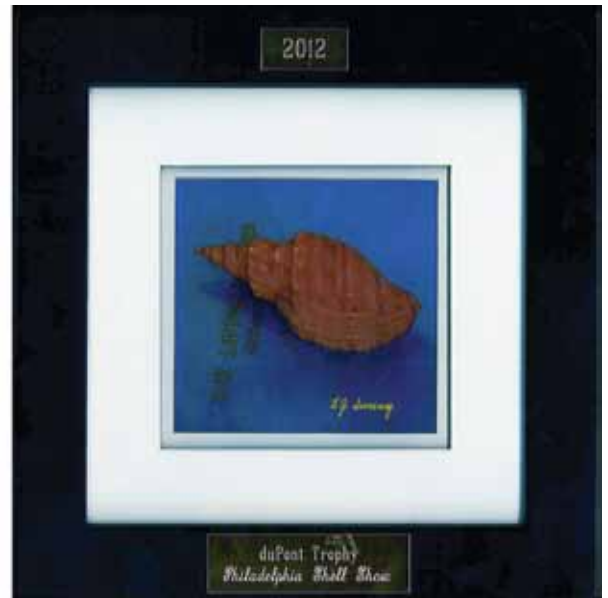
Table 1. (page 24) A complete listing of the du Pont Award presentations.

Fig. 4. (right) Awardees (left) and a close up of the changing du Pont Trophy (right) between 1971 and 2011. A) “*Turritella* agate” version of the trophy was awarded to Minnie Lee Campbell and Don Campbell (right) in 1980 at the Jacksonville Shell Club, Inc. Photo used with permission of the Jacksonville Shell Club. B) John and Mary Flentz win the Wedgewood plaque version at the West Coast Shell Show in 1984 for their exhibit, “The spell of the shell on stamps.” Photo used with permission of the Santa Barbara Museum of Natural History, Archives. C) Virginia Geyer wins the etched plaque version at the Marco Island Shell Club in 1991 for her exhibit, “Seashells – Birth to Maturity.” Photo used with permission of the Marco Island Shell Club.



Fig. 5. (above) “The Delaware Museum of Natural History opened to the public in 1972 to excite and inform people about the natural world through exploration and discovery. As the only natural history museum in the state, the Museum welcomes more than 75,000 visitors each year to experience an African watering hole, gaze up at a giant squid, encounter a jaguar face-to-face, and marvel at the diversity of shells from around the globe. Gallery highlights also include the only permanent dinosaur collection in Delaware, a simulated coral reef, and a Science in Action paleontology lab.” (quoted from www.delmnh.org/about.php)

Fig. 6. (below) The 2012 du Pont Trophy redesign was conceived by Museum staff and painted by artist Lauren Sweeney (www.inliquid.com; ljsweeney1@verizon.net). The first winners of the redesigned trophy were Pat and Bob Linn of the Astronaut Trail Shell Show for their exhibit, “Those Amazing Conchs-Lambis” (left). A close up of the new du Pont Trophy (right) shows the volute (*Festilyria duponti*) on the classic volute book.



Shell Club	Associated Shell Show	Location	Years Trophy Awarded	No.
(National)				
Astronaut Trail	Astronaut Trail ^a	Melbourne/Merritt Is, FL	1979-1983, 1985-1990, 1992-2012	31
Broward County	Broward	Fort Lauderdale/Pompano Beach, FL	1977, 1998-2012	14
Central Florida	Central Florida	Orlando, FL	1970-1973, 1977-1983, 1985-2004	32
Cincinnati	Tri-State	Cincinnati, OH	1980, 1982, 1984	3
Cleveland	Cleveland	Cleveland, OH	1975-1980, 1982	7
Coastal Bend	Coastal Bend ^b	Corpus Christi, TX	1970, 1972-1974, 1976, 1982	5
Crown Point Shell Collector's Study Group	Crown Point	Crown Point, IN	1983, 1985, 1987, 1989	4
Fort Myers	Fort Myers ^c	Fort Myers, FL	1970-1980	12
Galveston	Galveston	Galveston, TX	1972	1
Georgia	Georgia		1980-1994	15
Greater Miami	Greater Miami ^d		1978-2001	24
Greater St. Louis	Greater St. Louis ^e	St. Louis, IL	1970, 1972, 1974, 1976, 1978, 1980, 1984, 1986, 1988, 1990, 1991, 1992, 1994, 1996, 1998	16
Gulf Coast	Gulf Coast ^f	Texas	1970, 1983-1985, 1987-1992, 1994-1996, 2003, 2011	15
Hawaiian Malacological Society	Hawaiian	Honolulu, HI	1971-1973, 75, 77, 79, 1981-1982, 1988	9
Indianapolis	Midwest Regional	Indianapolis, IN	1978-1984, 1986, 1988, 1990	10
Jacksonville	Jacksonville	Jacksonville, FL	1972-1973, 1975-1991, 1993-2010	37
Jersey Cape	Jersey Cape	Stone Harbor, NJ	1988, 1995-2011	17
Long Island	Long Island	Flushing/Baldwin, NY	1982, 1984, 1987-1988, 1990	5
Marco Island	Marco Island	Marco Island, FL	1983-2012	29
Naples	Naples	Naples, FL	1970-1998, 2000-2004	35
North Carolina	North Carolina	Mayodon/Morehead City, NC	1974, 76, 79, 1981-1982, 1984-2011	33
Oregon Shell Club/Oregon Soc. of Conchologists	Oregon Society of Conchologists ^g	Portland, OR	1970-1993, 1995-1997, 1999-2008, 2011-2012	40
Pacific	Pacific	Downey, CA	1994-1997	4
Palm Beach County	Palm Beach County	Florida	1970-1971, 1976-1987, 1991, 2000	16
Philadelphia	Philadelphia	Philadelphia, PA	1993-2011	18
Pittsburgh	Pittsburgh	Pittsburgh, PA	1972-1977	6
Port Isabel/South Padre Island	South Padre Island	Port Isabel, TX	1970	1
San Antonio	San Antonio Shell Expo.	San Antonio, TX	1970	1
San Marcos	San Marcos	San Marcos, TX	1973, 1975	2
Sanibel-Captiva	Sanibel Shell Fair / Show	Sanibel Island, FL	1970-2012	43
Sarasota	Sarasota	Sarasota, FL	1970-2006, 2009-2012	41
Sea Shell Searchers of Brazoria County	Sea Shell Searchers	Lake Jackson, TX	1970, 1971, 2000-2010	13
Santa Barbara Malacological Society	West Coast	Santa Barbara, CA	1970-1972, 1974, 1980-1985	11
South Florida	South Florida ^h	Miami, FL	1970-1978	9
Southwest Florida Conchologist Society	Southwest Florida ⁱ	Fort Myers, FL	1971-1989, 1992-1997	25
St. Petersburg	St. Petersburg	St. Petersburg, FL	2009-2012	3
Tidewater Shell and Fossil Club	Tidewater Shell Exhibit	Tidewater, VA	1971, 1972	2
Treasure Coast	Treasure Coast	Palm City, FL	1988-1996, 2004-2006	12
(International)				
British Shell Collectors Club	British Shell Show	London, England	1977	1
Salon Internationale du Coquillage	International Shell Show of Lausanne	Switzerland	1988, 1989, 1991	3

a Trophy may have been awarded in 1977

b Coastal Bend and Bay City may be the same show in 1973; 1982 Texas State Shell Show put on by Coastal Bend Shell Club

c South West Florida merged with this club in 1981

d South Florida Shell Club 1972-1976

e Metropolitan Sea Shell Show in 1980 & 1982

f This may be 2 different shows; earliest is in Texas, 2nd may be Florida; 1989 FL show claims it is holding its 9th show

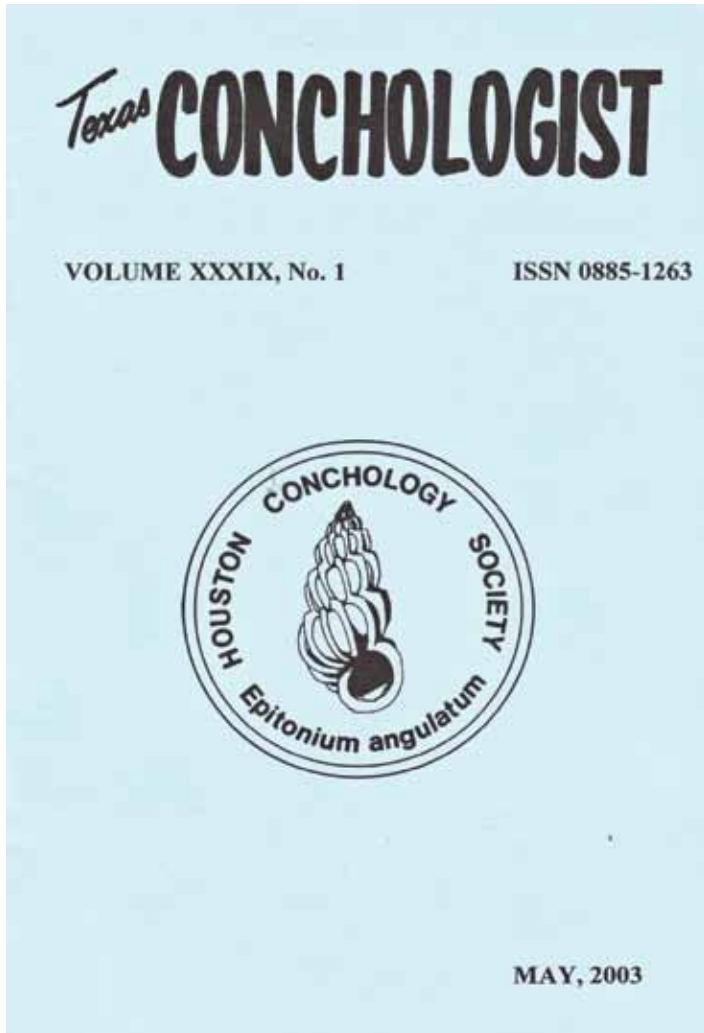
g Changed name in 1972

h Renamed Greater Miami Shell Club in 1977

i Merged with Fort Myers Shell Club in 1981

The *Texas Conchologist*

Lucy Clampit



The Houston Conchology Society is pleased to announce that its scientific publication, the *Texas Conchologist*, is in the process of being posted online at the Biodiversity Heritage Library website. The direct link to the TC is: <http://www.biodiversity-library.org/bibliography/50836>. At this time, volumes 1-3 are in the process of being scanned and posted. The posted volumes are not in numerical order, but will be in order when the posting is finished.

This article is written to acquaint readers with the history and the scientific importance of the publication. In Vol. 25, No. 1, Editor Constance “Connie” Boone celebrated the 25th anniversary of the TC with an article about its history, which this writer used as a guide. Through the years, the TC had many editors, but Connie held the position the longest. For her, the publication was a labor of love.

When the TC began publication in September of 1964, it had no name and the HCS was known as the Conchology Group of the Houston Outdoor Nature Club. The society’s goal was to publish 10 issues a year on a monthly basis (August-May). In the December 1964 issue, the name became the *Texas Conchologist*.

The number of issues per year was changed to nine. Money was scarce, so some issues were combined. Beginning with volume 9, the TC became a quarterly publication. It eventually became 1, 2, or 3 issues a year until its demise after volume 39 in 2003.

The TC contains articles by numerous professional and amateur malacologists and conchologists from Texas and around the world. All contributors were held to the same high standards and if one did not use Latin names for the mollusks, the article was not printed. A few of the many contributors were: T.E. Pulley, Dr. W.W. Sutow, Raymond W. Neck, Harold W. Harry, Roger T. Hanlon, Emilio Garcia, Paula M. Mikkelsen, Dr. Harry G. Lee, Helmer Odé, Henk K. Mienis, Connie Boone, and Joseph P.E. Morrison. The articles cover a wide variety of topics, including reports on collecting trips around the world, biographical information about Texas malacologists, shells on stamps, etc., but most are about Texas shells – marine, land, freshwater, and fossils.

In 1969 the Houston Museum of Natural Science teamed up with the US government to use divers and destroyers to collect mollusks for a population study of the Northwestern Gulf of Mexico. Helmer Odé helped to direct the operation. He spent many years studying and writing about the material collected. His monograph “Distribution and Records of the Marine Mollusca in the Northwest Gulf of Mexico” began in Vol. 11, No. 1, and became the core of the TC.

Helmer was invaluable to the TC. He served as editor for several years and compiled an Index for volumes 1-10 that was published in Vol. 10, No. 9, beginning on page 92. An index to Helmer’s “Bivalvia” was published in Vol. 18, No. 4. Helmer also studied worldwide Pyramidellidae, especially the genus *Turbonilla*. TC Vol. 32, No. 1, contains some of his work on northwest Gulf of Mexico material. Numbers 2 and 3 of volume 32 are “A List of *Turbonillid* Taxa for the Western Atlantic.” Volumes 33-35 have lists of *Turbonillids* from the west coast of the Americas, the Indo-Pacific, the Mediterranean, and the west coasts of Europe and Africa.

Since the TC is a valuable resource about Gulf of Mexico and Texas shells, members of the Houston Conchology Society are happy to make it available for everyone to use. We thank Pat LaFollette for helping and encouraging us in this endeavor.

Lucy Clampit
lclampit@comcast.net



An analysis of the microsnails from six habitats in the “Kochi Hill” area, Bernheim Arboretum and Research Forest, Bullitt County, Kentucky

Harry G. Lee and Lori Schroeder

Abstract - Now in its third year, a land snail biodiversity study is being conducted in the Bernheim Arboretum and Research Forest (BARF), headquartered in Clermont, Bullitt County, Kentucky, but covering some 14,000 acres in Bullitt and Nelson Counties. This report focuses on a special collecting campaign within the study. It was designed to document abundance and diversity of microsnails (adult shells 5.5 mm or less) at a single location, “Kochi Hill,” in the Bullitt Co. portion of BARF. We employed a strategy of studying duff samples taken from distinctly differing microhabitats within this small area, previously found to be unusually productive in numbers and diversity of mostly larger snail species. The results revealed the site to be a “biological hotspot” in terms of microsnail abundance (951 specimens identifiable to the species level) and diversity (31 species). Ecological implications of the qualitative and quantitative attributes of the data are discussed.

Key words: Bernheim; Bullitt County; biodiversity; ecology; Kentucky; land snails.

Introduction - Located in the Knobs region of Kentucky, “Kochi Hill” is a feature within the Bernheim Arboretum and Research Forest (BARF) on Harrison Fork Road in Bullitt County. The location was thus informally named after extraordinary numbers (44 total) of dead *Anguispira kochi* (L. Pfeiffer, 1846), Banded Tigersnail, were found strewn about the hillside at the time of initial reconnoiter (7 June, 2009). Considering the abundance and biodiversity of land snails and their remains [18 species] found at that time, we determined a systematic re-collection of the site was advisable. This decision was based on three considerations: (a) since only visual reconnaissance was employed, microsnails were nearly excluded from the initial inventory (only two species found), (b) previous work had demonstrated a distinct synergy between duff sampling and microscopic examination, and visual reconnaissance techniques in detecting biodiversity (Lee, 1990, 1993, 2008a, 2008b), and (c) differing microhabitats occur on and in the immediate vicinity of the hill. Consequently a strategy was employed to liberally sample and analyze duff from a variety of ecologically distinctive sites in the area in expectation of a much augmented biodiversity inventory and to allow analysis of possible microhabitat-microsnail species interplay.

Materials and Methods - Perched atop the southern end of a low ridge between Overalls and Wilson Creeks, “Kochi Hill” rises rather abruptly some 30 m and is capped by scarps of moss-laden limestone. Beginning at the base of the scarps a mature hardwood forest rapidly becomes dominant. The area included in the study was limited to an area somewhat less than an acre (see Appendix: Map). Due to heavy foliage during the summer months, fall was chosen as the optimal time for sampling.

All samples were collected by the junior author and Jeff Schroeder on 25 November, 2011. Six one gallon Ziploc™ bags were labeled and each filled with ample material from one of the following loci on and immediately adjacent to “Kochi Hill: (1) a limestone escarpment high on the slope, (2) a tree crotch downhill, (3) soil (paucity of leaves), (4) leaf litter roughly 2 m distant from the soil sample, (5) under decayed hardwood deadfall, and (6) a low grassy tract along Wilson Creek, a portion of which was

particulate alluvial material (wrack). For further elaboration see Appendix: Images 1-5.

Samples were processed by the junior author using a slight modification of the technique of Lee (1990, 1993): (1) drying of each sample in an oven set to 180° for 24 hours, (2) cooling for one or more hours at room temperature, (3) and sifting through a (2.2 mm square porosity) kitchen strainer to remove large objects such as rocks, stems, leaves, and nut hulls followed by a second sifting through a finer sieve (1.3 mm square porosity). It should be noted that, although an attempt was made to sample roughly equal volumes of material at the six sites, after the exclusion of material not clearing the 2.2 mm square sieve, apparently due in large part to the physical composition of the sample material, the remaining volumes differed somewhat: sample 1: 700 mL; 2: 925 mL; 3: 550 mL; 4: 700 mL; 5: 500 mL; 6: 900 mL.

With the use of a stereomicroscope at 10-20X, shells and shell fragments of microsnails from each of the three subsamples (retained on sieve 1, retained on sieve 2, and that which passed through both) were segregated into no. 3 gelatin capsules. Two-dram clear glass vials were utilized for protection of the capsules thereafter. The relative homogeneity within each subsample improved the ease and efficiency of this culling process.

Subsequently the senior author reviewed the cullings by species using similar microscopy. Material too fragmented or otherwise degraded for species-level identification was discarded at this point. Identification was made by reference to a number of works (notably Pilsbry, 1940, 1946, 1948, and Dourson, 2011) as well to material in the Lee collection. All specimen lots are vouchered in the Lee collection.

Results - A total of 951 microsnails of thirty-one species in 111 lots was identified. The great majority were empty (dead) shells. Table 1 indicates the species identified; the number of specimens for each species appears in parentheses. Overall microsnail abundance varied widely, with species being represented by 1 to 199 specimens. Figure 1 illustrates this species distribution graphically. Figure 2 shows the occurrence of individuals by sample site. Figure 3 shows distribution of species by sample.



Despite nearly equivolumetric sample sizes, disparate specimen richness (33 to 394) at each site can be seen in Table 2 and is graphically depicted in Figures 3 and 4. Much less variable was the species richness by site (14-22), which is also indicated in Table 2 and graphically represented in Figures 3, 4, and perhaps best in Figure 5, where it is expressed as **percentage** of the sample.

Discussion - This dedicated search for microsnails produced prodigious numbers of specimens (951) and species (31); see Table 1. Corollary to this discovery is its complementarity with more traditional collecting methods, which target larger snail species. As anticipated, this combination of strategies greatly enhanced the scope of overall land snail biodiversity sampled at “Kochi Hill.” Appendix Table 3 combines these 31 microsnail species with 22 others, only one of which is a microsnail, taken principally by visual surveillance. The product is a total of 53 species of land snails collected here from 7 June, 2009 to 25 November, 2011.

Another noteworthy attribute of the data is the relatively uniform level of species richness across the six sampling sites (14-22 species per sample) despite the wide variation in specimen abundance (33-394); see Table 2. Corollary to this finding, and evidenced in Table 2 and Figures 3, 4, and 5, is the surprising frequency of any single species across samples. The average number of stations per species was 3.3 of the six stations, and only seven species were unique to a single station. Interestingly, of the seven, all but two records reflect a single specimen, the exceptions being two shells of *Lucilla* cf. *L. nummus* and five of *Gastrocopta tappaniana* (both species in sample 6).

What difference does microhabitat make? While it certainly seems to influence the richness of microsnail abundance, its effect on species composition is far from obvious. The following analysis attempts to formulate an answer to the latter question, which is central to the design of this study, and which Table 2 and Figures 1-4 are intended to help clarify.

Sample 1.

The expected salutary effect of surface calcium carbonate manifest at sample site 1, limestone escarpment, seems confirmed in this study, with nearly half the microsnail specimens found at this one site. Yet, if one were to remove the 157 specimens of *Carychium exile* from consideration, the differences would be far less evident and a statistical analysis would likely refute this correlation – at least with consideration of sites 2 and 3.

Of the 21 species found in sample 1, only one, *Gastrocopta corticaria*, represented by a single specimen, was unique to the sample. Ecologically, *G. corticaria* has been associated with the bark of hardwood trees since its original description (the species

epithet means “of bark”), and although it seldom occurs in great numbers, it has not previously been associated with limestone-rich habitats. The likelihood of its unique occurrence at site 1 may be considered as a stochastic (random) event. On the other hand, the finding of 77% of the specimens of *Hawaiiia alachuana* in sample 1 not unlikely reflects the favorable influence of a calcium-rich microhabitat on this species, which was recognized as a calciphile by Hubricht (1985: 29).

The remainder of the species at site 1 (19) were shared with an average of 3.5 of the other five stations. Thus it is difficult to tease out any species that is strongly dependent on abundant calcium, an obligate calciphile

On the other hand, the absence of *Zonitoides arboreus*, which occurred, albeit in relatively small numbers, at all of the other five sample sites, two of which had relatively few microsnails, may well indicate this species’s affinity for trees or wood (*arboreus* means “of trees”) and/or disaffection for abundant calcium, a recognized attribute of calcifuge snails.

Sample 2.

The 18 species found at site 2, the tree crotch, were shared with an average of nearly four of the other five stations, and none of the sample 2 species was unique to the site. Examination of Table 2 fails to reveal evidence of any clustering by specimen count of species in this sample.

Sample 3.

Of the 20 species found in the sample taken at site 3 (soil sample with a paucity of leaf litter), none was unique and each was shared with an average of 3.75 other site samples. Table 2 fails to reveal evidence of any clustering of species by specimen count in this sample.

Sample 4.

This sample (leaf litter) contained 22 species, the highest species richness of all six sites. Two snails, *Punctum blandianum* and *Glyphyalinia lewisiana*, were unique to this sample, and each was represented by only a single specimen. Of the remaining 20 species, each was found in an average of 3.5 other samples. Further, a comparison with sample 3, taken 2 m away in a leaf-poor microhabitat, shows a high concordance in species composition (18 in common). Two species were present in sample 3 not 4 and four in sample 4 not 3, but, of these six species, all but one, *Carychium exiguum* (two individuals in sample 4), was represented by only a solitary specimen. Examination of Table 2 fails to reveal evidence of any clustering of species by specimen count in this sample.

Sample 5.

The number of specimens found at this site (under hardwood deadfall) was relatively quite low, but the relative species richness was high (33 shells of 14 species). No species was unique to this sample, and each was found in an average of 4.2 other samples. A single quantitative anomaly, a disproportionate contribution by the uncommon microsnail, *Zonitoides limatulus*, is noteworthy.

Sample 6.

The sample of grass and wrack near Wilson Creek had the most atypical composition of all six sites. Comprised of only 50

specimens, it had a relatively high species richness (16), and most notably, contained four species not found at any other sampling site. Only three species in all the other 901 specimens distributed over five samples were thus unique. The sample 6-only species (no. specimens): *Pupoides albilabris* (1), *Vallonia costata* (1), *Lucilla* cf. *L. nummus* (2), and *Catinella* species (1), although rare, were unique to this site. Another species, *Gastrocopta tappaniana* (5), was represented by only one specimen in the remaining 901 shells. Each of these five species is recognized as preferring at least two of the attributes of this site: low, moist, relatively open, grassy, and disturbed (Hubricht, 1985).

In order to determine if there are actual ecological forces driving the distribution of the species whose shells were found during this survey, one must address two overarching considerations: (1) Is it correct to presume the shells found accurately represent the species that actually lived at the respective sites? Two principal factors bear on the legitimacy of this assumption: (a) Taphonomy: movement of the shells over space and time. Transport of shells by water drainage, wind, foraging animals, etc., can certainly rearrange a natural thanatocenosis (snail mortuary) in a confusing manner. (b) Persistence of the shells under natural conditions: how long has the average specimen been around? (2) To what extent do random (stochastic) forces shape the composition of our samples?

Admittedly a bit hazardous, in the interest of expedience, we have accepted assumption (1) above for samples 1-5. Although the possible taphonomic forces of downhill displacement of shells may well have contributed to this homogeneity, on consideration of the **remarkable similarities in species composition** of these five samples, along with the **rarity of exceptional species occurrences**, the findings appear best explained by stochastic factors. The relatively few exceptions specifically cited above might be put to the test at a later date using different protocols, but it appears that ecological partitioning among these five samples (sites) played only a minor role in their species composition.

In interpreting the Station 6 fauna we must, however, confront the taphonomic issue of the constantly running water of nearby Wilson Creek and the consequent delivery of shells from upstream origins to the sample site, especially the (unsegregated) wrack moiety, producing a biased sample. While there is no certainty that the shells of some of the four unique Station 6 species and *Gastrocopta tappaniana* naturally occurred there, it seems reasonable to consider that the case for at least the latter, based on the species' well-documented preference for wet places including stream margins (e.g., Hubricht, 1985: 9). As noted above, the five species are adapted to ecological conditions prevailing at the sample site and not characteristic of the other five sites.

It must be remembered that the study was driven by a quest for a more thorough biodiversity inventory. Limited ecological implications notwithstanding, the gathering of multiple samples and specifically the inclusion of grass and wrack along Wilson Creek (Station 6) certainly accomplished that aim. The contribution of the latter sample to overall diversity distinctly exceeded that expected from the habitat distinctions upon which the Stations 1 through 5 were based.

It is anticipated that a more focused sampling of the Wilson Creek bank, floodplain, and immediately adjacent uplands with limited tree cover but less moisture may provide further insight into land snail ecology in this relatively scarce habitat in BARF.

Another consideration would be to test assumption (1) above and somehow determine the presence of snails actually living at each of these substations. In order to empower such a study with robust sample sizes, a more selective and efficient collecting strategy would probably be necessary, e.g., snail trapping; see Lee (2002).

In retrospect the peninsular shape of "Kochi Hill," with two very long sides exposed to the elements, might not have been a landscape particularly hospitable to land snails and their collecting. The southern terminus, the area of the most focus of this report, is very near a road, albeit lightly traveled, which exhibits ample evidence of human impact some distance from its swath. The steepness of the terrain poses a challenge to collecting since gaining solid footing is not easy. These apparent detractions notwithstanding, the thriving land snail populations discovered in this somewhat disturbed yet reasonably accessible location has proven of significant interest and lends itself well to continued study.

Conclusions - A systematic sampling of the microsnails of a small area on and immediately adjacent to "Kochi Hill," BARF, Bullitt Co., KY succeeded in greatly augmenting the assessment of land snail biodiversity at the location. Despite strategic sampling of discrete microhabitats to test ecological interactions with the faunal composition, the microsnail species distribution generally conformed to a stochastic model. A noteworthy exception was one low streamside sample in which ecological factors were likely operative, but taphonomic forces may have introduced a certain bias.

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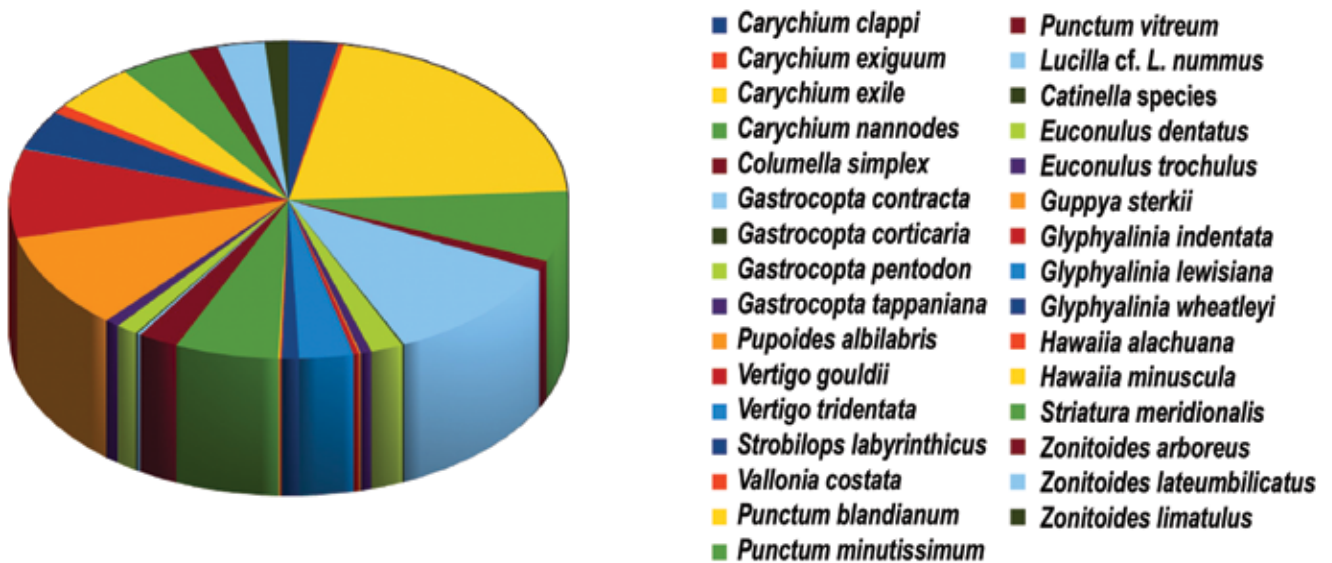
Table 1. The 31 microsnail taxa and individuals (951) collected.

<i>Carychium clappi</i> Hubricht, 1959, Appalachian Thorn (27)	<i>Punctum minutissimum</i> (I. Lea, 1841), Small Spot (57)
<i>Carychium exiguum</i> (Say, 1822), Obese Thorn (3)	<i>Punctum vitreum</i> (H.B. Baker, 1930), Glass Spot (22)
<i>Carychium exile</i> H.C. Lea, 1842, Ice Thorn (199)	<i>Lucilla</i> cf. <i>L. nummus</i> (Vanatta, 1899), cf. Wax Coil (2)
<i>Carychium nannodes</i> G. Clapp, 1905, File Thorn (68)	<i>Catinella</i> species unknown Ambersnail (1)
<i>Columella simplex</i> (Gould, 1840), Toothless Column (10)	<i>Euconulus dentatus</i> (Sterki, 1893), Toothed Hive (12)
<i>Gastrocopta contracta</i> (Say, 1822), Bottleneck Snaggletooth (104)	<i>Euconulus trochulus</i> (Reinhardt, 1883), Silk Hive (8)
<i>Gastrocopta corticaria</i> (Say, 1817), Bark Snaggletooth (1)	<i>Guppya sterkii</i> (Dall, 1888), Tiny Granule (94)
<i>Gastrocopta pentodon</i> (Say, 1822), Comb Snaggletooth (18)	<i>Glyphyalinia indentata</i> (Say, 1823), Carved Glyph (86)
<i>Gastrocopta tappaniana</i> (C.B. Adams, 1841), White Snaggletooth (6)	<i>Glyphyalinia lewisiana</i> (G. Clapp, 1908), Pale Glyph (1)
<i>Pupoides albilabris</i> (C.B. Adams, 1842), White-lip Dagger (1)	<i>Glyphyalinia wheatleyi</i> (Bland, 1883), Bright Glyph (37)
<i>Vertigo gouldii</i> (A. Binney, 1843), Variable Vertigo (3)	<i>Hawaiiia alachuana</i> (Dall, 1885), Southeastern Gem (9)
<i>Vertigo tridentata</i> Wolf, 1870, Honey Vertigo (30)	<i>Hawaiiia minuscula</i> (A. Binney, 1841), Minute Gem (46)
<i>Strobilops labyrinthicus</i> (Say, 1817), Maze Pinecone (9)	<i>Striatura meridionalis</i> (Pilsbry and Ferriss, 1906), Southern Striate (40)
<i>Vallonia costata</i> (Müller, 1774), Costate Vallonia (1)	<i>Zonitoides arboreus</i> (Say, 1817), Quick Gloss (16)
<i>Punctum blandianum</i> Pilsbry, 1900, Brown Spot (1)	<i>Zonitoides lateumbilicatus</i> (Pilsbry, 1895), Striate Gloss (26)
	<i>Zonitoides limatulus</i> (A. Binney, 1840), Dull Gloss (13)

Table 2. Microsnail taxa and specimens collected by sample site.

	1. Limestone escarpment	2. Tree crotch	3. Soil sample	4. Leaf litter	5. Under deadfall	6. Creek & wrack
<i>Carychium clappi</i>	2	25				
<i>Carychium exiguum</i>				2		1
<i>Carychium exile</i>	157	1	16	12	2	11
<i>Carychium nannodes</i>	6	4	39	16	3	
<i>Columella simplex</i>	1		1	2	4	2
<i>Gastrocopta contracta</i>	37	13	15	31	2	6
<i>Gastrocopta corticaria</i>	1					
<i>Gastrocopta pentodon</i>	6	2	4	3	1	2
<i>Gastrocopta tappaniana</i>	1					5
<i>Pupoides albilabris</i>						1
<i>Vertigo gouldii</i>		2		1		
<i>Vertigo tridentata</i>	3		5	20		2
<i>Strobilops labyrinthicus</i>	3	1	1	4		
<i>Vallonia costata</i>						1
<i>Punctum blandianum</i>				1		
<i>Punctum minutissimum</i>	22	6	12	14	2	1
<i>Punctum vitreum</i>	1	1	9	10	1	
<i>Lucilla</i> cf. <i>L. nummus</i>						2
<i>Catinella</i> species						1
<i>Euconulus dentatus</i>	2		1	7		2
<i>Euconulus trochulus</i>		1	2	4	1	
<i>Guppya sterkii</i>	45	20	21	4	4	
<i>Glyphyalinia indentata</i>	35	13	19	8	4	7
<i>Glyphyalinia lewisiana</i>				1		
<i>Glyphyalinia wheatleyi</i>	7	7	8	13	2	
<i>Hawaiiia alachuana</i>	7	1	1			
<i>Hawaiiia minuscula</i>	31	8	5	2		
<i>Striatura meridionalis</i>	15	10	8	1	2	4
<i>Zonitoides arboreus</i>		2	3	8	1	2
<i>Zonitoides lateumbilicatus</i>	4	9	9	4		
<i>Zonitoides limatulus</i>	8		1		4	
Total specimens collected	394	126	180	168	33	50
Total species found	21	18	20	22	14	16
Species unique to substation	1	0	0	2	0	4

Figure 1. Overall microsnaill abundance (all six samples); n = 951



Slices begin at noon and progress clockwise in customary phylogentic order as per legend.

Figure 2. Microsnaill abundance by sample; n = 951.

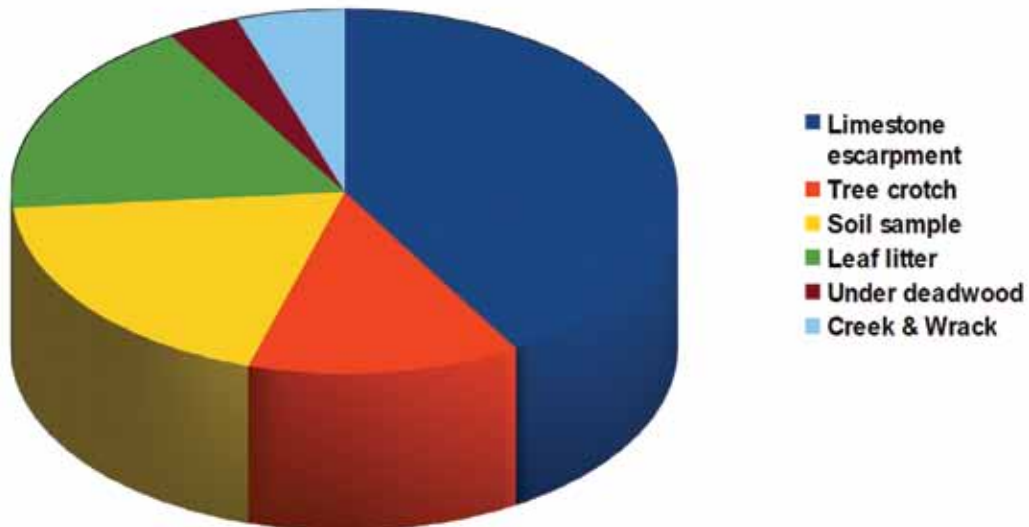


Figure 3. Microsnail species abundance showing contribution by sample.

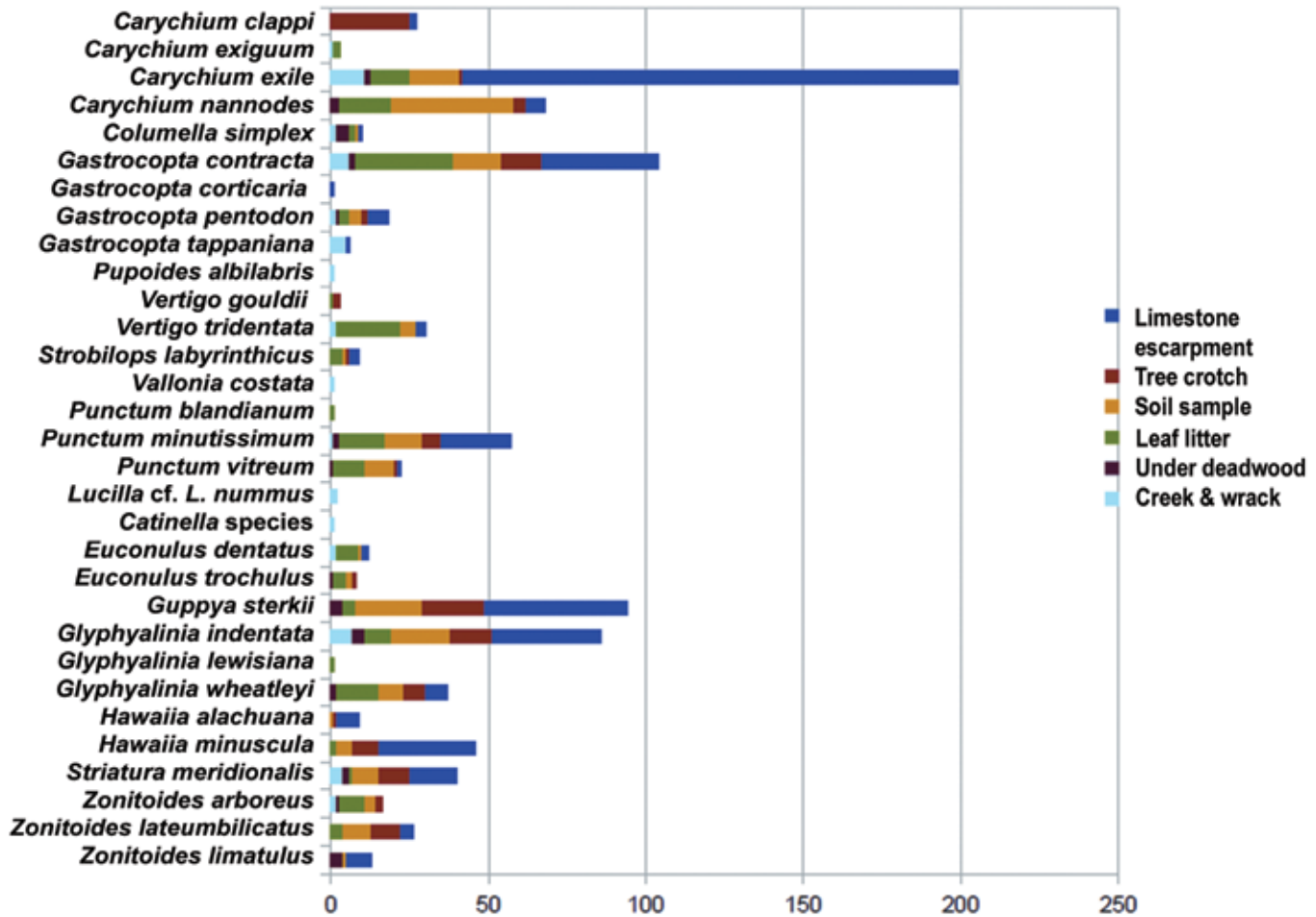


Figure 4. Absolute microsnail abundance by species for each sample.

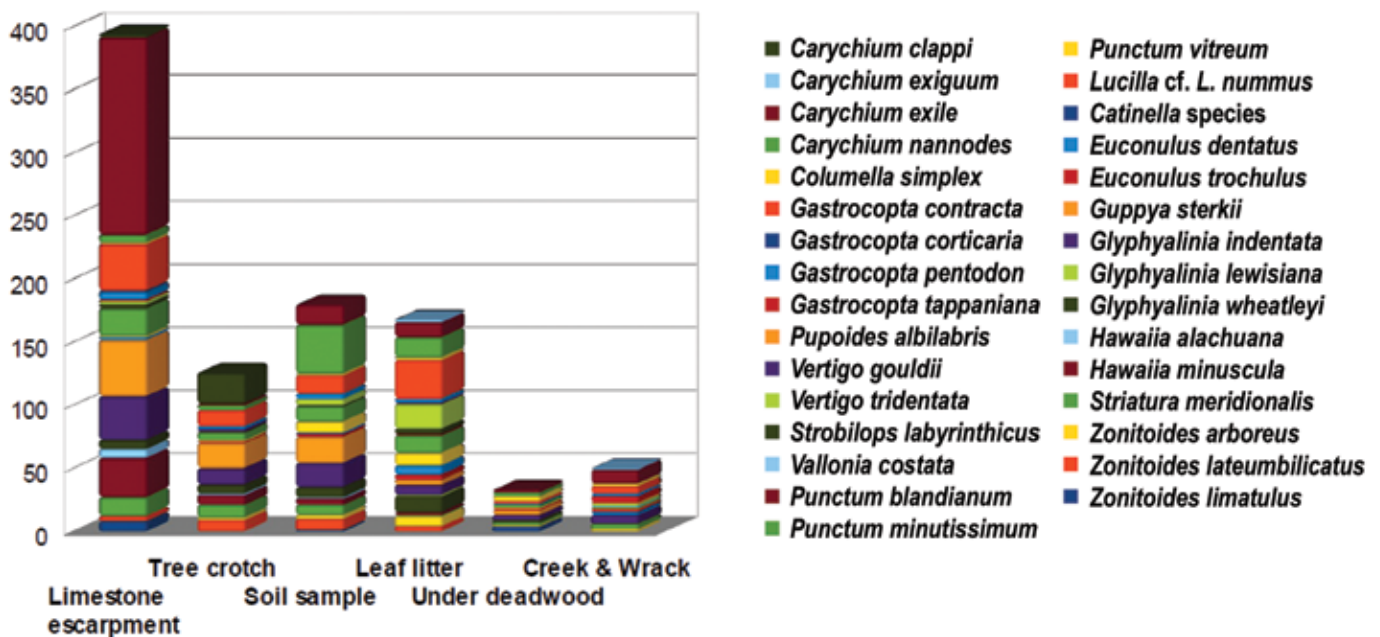
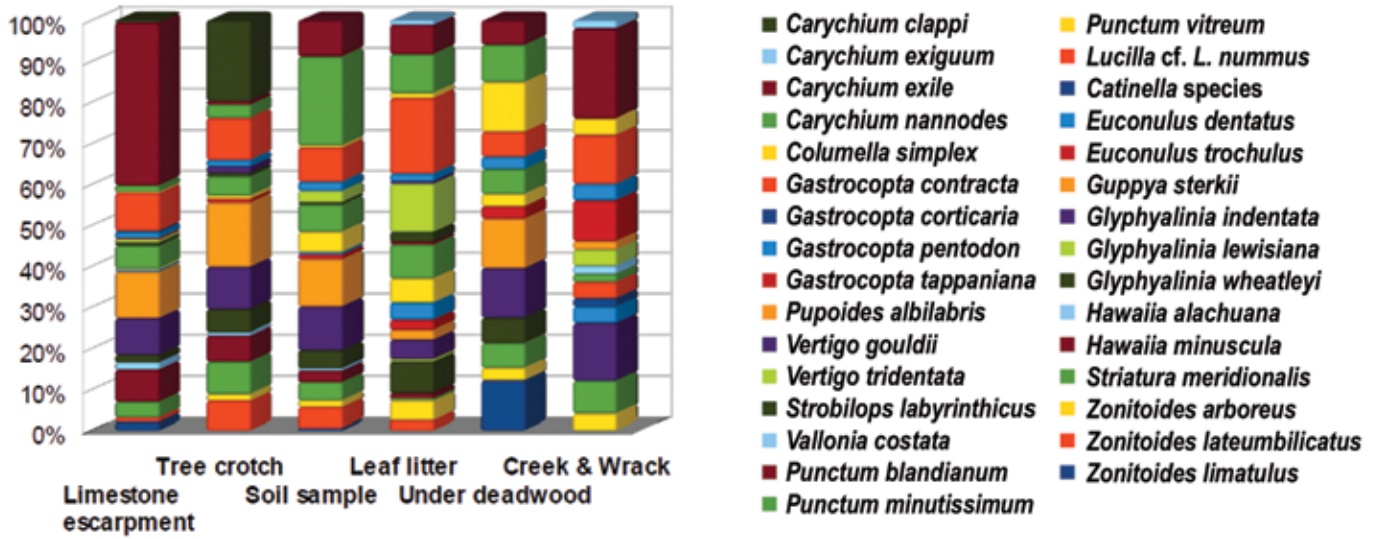


Figure 5. Relative microsnail abundance by species for each sample (as percentage).



Appendix



Map 1. Location of sampling sites at “Kochi Hill.”



Images 1, 1a (above & bottom right) Limestone escarpment at summit of “Kochi Hill.” Elevation about 30 m above road grade (sample site no. 1).



Images 2, 2a (left & above) Tree crotch site, situated within a larger fallen tree (site no. 2).



Images 3, 3a (left & above) Foot of "Kochi Hill." Here both soil and leaf litter samples (sites nos. 3 and 4) taken in close proximity.



Images 4, 4a (left & above) Wilson Creek at site no. 6. The photo above shows the close proximity of "Kochi Hill" (background, right). On the left is a view looking in the opposite direction.



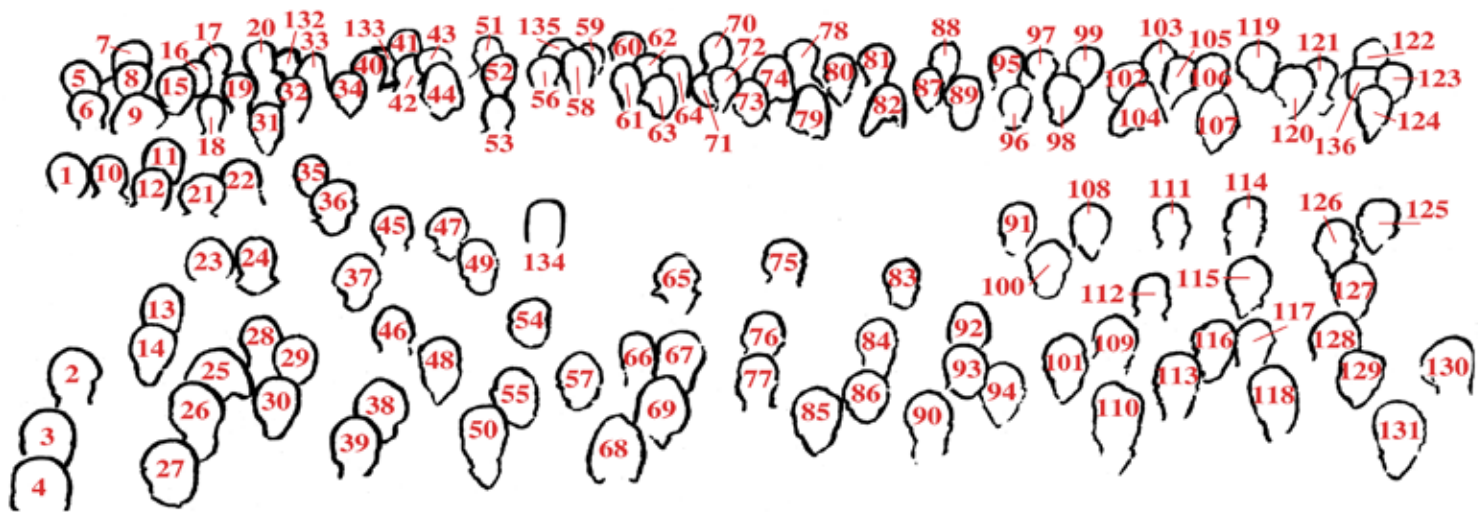
Images 5, 5a (above & right) Deadwood just below limestone escarpment near summit of “Kochi Hill.” A fresh *Mesomphix* species shell was uncovered when bark was lifted to obtain the sample (site no. 5).

Table 3. Cumulative list (53 species) collected at “Kochi Hill,” BARF from 7 June, 2009 to 25 November, 2011*

Pomatiopsis cincinnatiensis (I. Lea, 1840), Brown Walker
Pomatiopsis lapidaria (Say, 1817), Slender Walker
Carychium clappi Hubricht, 1959, Appalachian Thorn
Carychium exiguum (Say, 1822), Obese Thorn
Carychium exile H.C. Lea, 1842, Ice Thorn
Carychium nannodes G. Clapp, 1905, File Thorn
Columella simplex (Gould, 1840), Toothless Column
Gastrocopta contracta (Say, 1822), Bottleneck Snaggletooth
Gastrocopta corticaria (Say, 1817), Bark Snaggletooth
Gastrocopta pentodon (Say, 1822), Comb Snaggletooth
Gastrocopta tappaniana (C.B. Adams, 1841), White Snaggletooth
Pupoides albilabris (C.B. Adams, 1842), White-lip Dagger
Vertigo gouldii (A. Binney, 1843), Variable Vertigo
Vertigo tridentata Wolf, 1870, Honey Vertigo
Strobilops labyrinthicus (Say, 1817), Maze Pinecone
Vallonia costata (Müller, 1774), Costate Vallonia
Haplotrema concavum (Say, 1821), Gray-foot Lancetooth
Punctum blandianum Pilsbry, 1900, Brown Spot
Punctum minutissimum (I. Lea, 1841), Small Spot
Punctum vitreum (H.B. Baker, 1930), Glass Spot
Catinella species unknown Ambersnail
Lucilla cf. *L. nummus* (Vanatta, 1899), cf. Wax Coil
Anguispira alternata (Say, 1817), Flamed Tigersnail
Anguispira kochi (L. Pfeiffer, 1846), Banded Tigersnail
Euconulus dentatus (Sterki, 1893), Toothed Hive
Euconulus trochulus (Reinhardt, 1883), Silk Hive
Guppya sterkii (Dall, 1888), Tiny Granule
Glyphyalinia indentata (Say, 1823), Carved Glyph
Glyphyalinia lewisiana (G. Clapp, 1908), Pale Glyph

Glyphyalinia wheatleyi (Bland, 1883), Bright Glyph
Hawaiiia alachuana (Dall, 1885), Southeastern Gem
Hawaiiia minuscula (A. Binney, 1841), Minute Gem
Mesomphix cupreus (Rafinesque, 1831), Copper Button
Mesomphix globosus (MacMillan, 1940), Globose Button
Mesomphix vulgatus H. B. Baker, 1933, Common Button
Paravitrea cf. *P. capsella* (Gould, 1851), Dimple Supercoil
Striatura meridionalis (Pilsbry and Ferriss, 1906), Southern Striate
Ventridens ligera (Say, 1821), Globose Dome
Zonitoides arboreus (Say, 1817), Quick Gloss
Zonitoides lateumbilicatus (Pilsbry, 1895), Striate Gloss
Zonitoides limatulus (A. Binney, 1841), Dull Gloss
Allogona profunda (Say, 1821), Broad-banded Forestsnail
Euchemotrema fraternum (Say, 1824), Upland Pillsnail
Inflectarius infectus (Say, 1821), Shagreen
Mesodon thyroidus (Say, 1817), White-lip Globe
Mesodon zaletus (A. Binney, 1837), Toothed Globe
Neohelix albolabris (Say, 1817), Whitelip
Stenotrema angellum Hubricht, 1958, Kentucky Slitmouth
Stenotrema barbatum (G. Clapp, 1904)/*S. hirsutum* (Say, 1817), Bristled/Hairy Slitmouth
[single immature shell denuded of periostracum; ID limited to two taxa]
Stenotrema stenotrema (L. Pfeiffer, 1842), Inland Slitmouth
Triodopsis vulgata Pilsbry, 1940, Dished Threetooth
Xolotrema denotatum (Férussac, 1821), Velvet Wedge
Xolotrema obstrictum (Say, 1821), Sharp Wedge

*Microsnails in black (32), boldface this study (31); non-microsnails in red (21).



AMS/COA Group photo dramatis personae (long version)

- | | | |
|---|---|--|
| 1. Peggy Williams | 46. José Leal, Bailey-Matthews Shell Museum, Sanibel, FL | 91. Al Schilling, Philadelphia Shell Club |
| 2. Paul Valentich-Scott, Santa Barbara Museum of Natural History | 47. Caryl Hesterman, New Jersey | 92. |
| 3. | 48. Guido Poppe, Conchology Inc., Philippines | 93. Charlie Sturm, Carnegie Museum of Natural History, Pittsburgh |
| 4. Phil Fallon | 49. Dick Petit, Myrtle Beach, SC | 94. Ed Shuller |
| 5. Diarmaid O'Foighil, University of Michigan | 50. Fred Zimmerman, USDA, Miami | 95. Peter Marko |
| 6. Carol Lyons, St. Petersburg, FL | 51. Russell Wyeth, St. Francis Xavier Univ. Canada | 96. Amy Wethington |
| 7. Eike Neubert | 52. John Taylor, Natural History Museum, London, UK | 97. R. T. Dillon Jr. |
| 8. Rich Kirk, Philadelphia, PA | 53. Norine Yeung, University of Hawaii | 98. Tom Duda |
| 9. Sue Hobbs, Cape May, NJ | 54. Donald Dan, Fort Myers, FL | 99. David Scheel |
| 10. James H. McLean, Santa Barbara Museum of Natural History | 55. David Friedman | 100. Doris Underwood |
| 11. Phil Dietz, Cape May, NJ | 56. Gregory B. McCullagh, St. Francis Xavier Univ., Canada | 101. Tim Pearce, Carnegie Museum of Natural History, Pittsburgh |
| 12. Hans Reiman | 57. Sheila Tagaro, Conchology Inc., Philippines | 102. Tom Waller, Smithsonian Institution |
| 13. Jay Cordeiro | 58. Jack Lightbourn, Bermuda | 103. Alistair Moncur |
| 14. Matt Blaine | 59. | 104. Holly Hale |
| 15. Arthur Bogan, North Carolina Museum of Natural History | 60. Klaus Groh, Conchbooks, Germany | 105. M. G. Harasewych, Smithsonian Institution |
| 16. Robert Prezant, Montclair University, NJ | 61. James B. Newcomb | 106. Jim Brunner |
| 17. Chuck Owen | 62. | 107. Linda Brunner |
| 18. Angela Field | 63. Desmond Ramirez | 108. Alan Gettleman |
| 19. David G. Robinson, USDA | 64. Roland Anderson | 109. Scott Martin |
| 20. Rüdiger Bieler, Field Museum, Chicago | 65. Robert Robertson, Academy of Natural Sciences, Philadelphia | 110. Patrick LaFollette |
| 21. Arline Reiman | 66. Beth Davis-Berg | 111. Christine E. Parent |
| 22. Carole Marshall | 67. Asel Zhetigenova Busuioc, New York | 112. |
| 23. Elizabeth K. Shea, Delaware Museum of Natural History | 68. Amanda Lawless, Academy of Natural Sciences, Philadelphia | 113. John Slapcinsky, Florida Museum of Natural History |
| 24. Colleen Winters, Towson University | 69. Adrienne Jochum | 114. Ed Nieburger |
| 25. Dona Blaine | 70. Jeff Nekola, University of New Mexico | 115. Jesus Troncoso |
| 26. Alan Kabat | 71. Mary-Jane Schilling | 116. Jeannette Tysor |
| 27. Alan Kohn, University of Washington, Seattle | 72. Anita Krause (?) | 117. Gary Rosenberg, Academy of Natural Sciences, Philadelphia |
| 28. Megan Paustian, Carnegie Museum of Natural History, Pittsburgh | 73. M. Sabrina Pankey | 118. Henry Chaney |
| 29. Mike Severns, Hawaii | 74. Jeanne Serb | 119. Doug Wolfe |
| 30. Makiri Sei, Academy of Natural Sciences, Philadelphia | 75. Bob Lipe | 120. Nancy Wolfe |
| 31. Mary Lou Pojeta | 76. Kyle Bennett | 121. Fabio Moretzsohn |
| 32. | 77. Timea Neusser | 122. Lyle Campbell |
| 33. Ellen Strong, Smithsonian Institution | 78. John Sime, Academy of Natural Sciences, Philadelphia | 123. Terry Gosliner |
| 34. John Pojeta | 79. | 124. Francisco Borrero |
| 35. Victor Dan, Manila, Philippines | 80. Jeremy Tiemann | 125. Adam Baldinger, Museum of Comparative Zoology, Harvard University |
| 36. Lucy Clampit | 81. John Pfeiffer | 126. Paul Callomon, Academy of Natural Sciences, Philadelphia |
| 37. Liz Petit, Myrtle Beach, SC | 82. | 127. Rodger Bunnell, Sanibel, FL |
| 38. Elaine Friedman | 83. Betty Lipe | 128. Erin Mayer, University of California, Berkeley |
| 39. Suzete Gomes, Academy of Natural Sciences, Philadelphia | 84. Nathan Whalen | 129. Ira Richling, Stuttgart |
| 40. Bill Fenzan, Norfolk, VA | 85. Philippe Bouchet, Museum national d'Histoire Naturelle, Paris | 130. Carole Hickman |
| 41. Jan Johan ter Poorten | 86. Aydin Örstan | 131. Manuel A. E. Malaquias, Bergen, Norway |
| 42. Frank Köhler | 87. Paul Harnik | 132. Bill Lyons |
| 43. Tom Eichhorst, New Mexico | 88. Kevin Roe | 133. Bruce Neville, College Station, Texas |
| 44. Serena Ciparis, Virginia Polytechnic Institute and State University | 89. Phyllis Gray | 134. Anne Joffe, Sanibel, FL |
| 45. Happy Robertson, New Jersey | 90. Francisco Welter-Schultes | 135. |
| | | 136. Mary Owen |

