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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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Front cover: *Vokesimurex rubidus* (F.C. Baker, 1897) photographed *in situ* by Charles Rawlings in 2011, off Honduras. This is just one of the many muricids with name changes discussed by Dr. Emily Vokes (p. 4).

Back cover: *Popenaias popeii* (I. Lea, 1857), the Texas hornshell. This species is the last of what were once eight native unionid species in New Mexico. It is protected by the state (not federally, dispite years of attempts at such status for both the New Mexico and Texas populations) and is presently found only along an eight-mile segment of the Black River (a tributary of the Pecos River) in southern New Mexico. Photo from Joel Deluxe, Wikipedia.com

Editor's comments: This issue is another eclectic mix of shell-related articles. We start with a great article by Dr. Emily Vokes (p. 4), who presents a bit of insight into the muricid name game. After reading her article and working a bit to update my collection, I bought the most recent murex book - see my review of Roland Houart's *Living Muricinae of the World* on page 22. This is a fantastic reference.

Next is an interesting report on a study of the difficulties properly identifying freshwater Texas unionids (Robert G. Howells, Charles R. Randklev & Neil B. Ford, p. 9). The test described in this report points out the difficulty in identifying freshwater unionids as well as the need for serious study of this group if one is to be involved in unionid field work.

Lisa Fitzgerald then gives us a solid reason for owning shell books for purposes other than research and proper taxonomy. A fun read.

Next is my coverage of the Muricinae by Roland Houart (a great reference with hopefully more to come) and my report on the 2017 Key West COA Convention. It was a fun event.

Our "Memoriam" this issue has too many (again!). All are folks we will miss.

Next are two reports from COA grant winners. The first is an interesting land snail study on Belau (Republic of Palau, Oceania) in the Caroline Islands, by Teresa Osborne and Rebecca Rundell. Then we have Julieta Sturla Lompré, Erica Giarratano & Mónica Noemí Gil who studied arsenic in Argentinian scallops.

We end this issue with several shell show reports, including: the Gulf Coast Shell Club, the Marco Island Shell Club, the Keppel Bay Shell Club, and the San Diego Shell Club. The Sanibel-Captiva Shell Club report will be in the next issue (sorry Sanibel folks, ran out of room!).

As one page "odds and ends" we have a photograph of the rarely seen deep-sea *Alviniconcha hessleri* Okutani & Ohta, 1988, from the Mariana Trench (Marvel form the Deep by Simon Aiken on p. 41). We also have the request for *Neptunea* Award nominations (p. 37) for 2018. Everett Long has graciously accepted the responsibility for this important COA program and he needs your help to identify people worthy of this award. All of the rules and nominating procedures are given by Everett on p. 37. Please note you are encouraged to resubmit a person if they have not previously won and you believe they are deserving of the award. Also note, current COA Board members are ineligible.

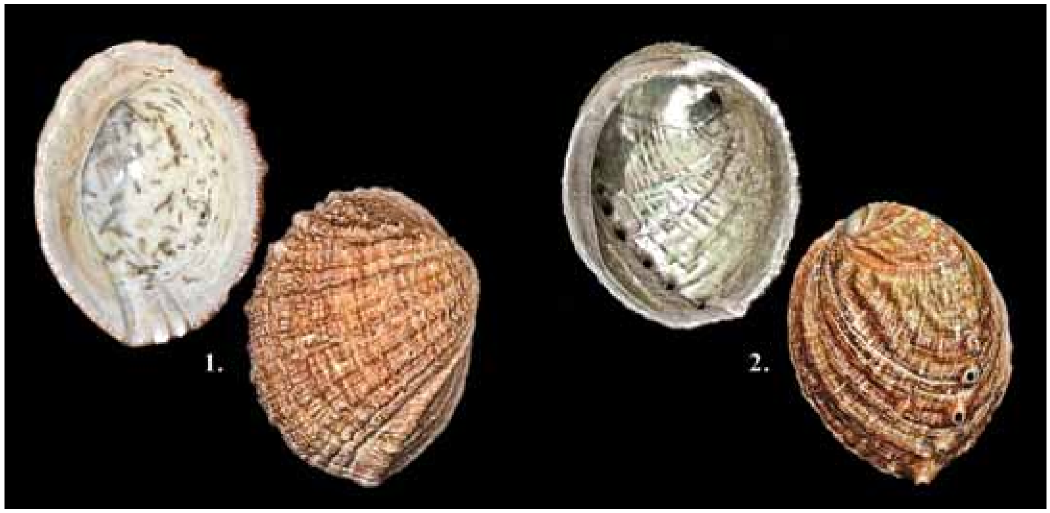
Hope to see everyone in **San Diego at COA 2018** (29 Aug-2 Sep)!

Tom Eichhorst

FIFTY YEARS OF LOOKING AT MURICES

Emily H. Vokes

More and more we are recognizing that convergence, the tendency of unrelated animals or plants to evolve superficially similar characteristics, is a molluscan problem. A prime example is the shells of abalones and the muricid *Concholepas* (now being sold as "Chilean abalone!"), which have both evolved to inhabit wave-battered, rocky shorelines. While this is an extreme case involving two very dissimilar families, similar convergent evolution can occur within a family between distinct genera – presenting quite a challenge to taxonomists. Obviously being armed with long spines deters predators and thus has an evolutionary advantage. The members of the gastropod subfamily Muricinae have taken this to an extreme, with the result that several different lines have evolved three spinose varices. Once upon a time these were all placed in the genus *Murex*, but we are now realizing this is also a prime example of convergence.



The South American muricid 1. *Concholepas concholepas* (Bruguière, 1789) has evolved a similar morphology or physical appearance to the family Haliotidae, in this case, 2. *Haliotis gigantea* Gmelin, 1791. Images courtesy of Femorale.com.

The original genus *Murex* was proposed by Linnaeus (1758) with a total of 58 species included, but it is clear that what he considered a "species" is more what we would consider a genus. Only nine of his species are today even in the family Muricidae, and they are now divided among seven genera in three subfamilies. Interestingly, seven of his nine species are types of their genus.* His concept of the genus comprised all species of gastropod with a (however slightly) extended siphonal canal. So it included not only such expected members as *Fasciolaria, Neptunea, Fusinus*, *Melongena, Ficus, Busycon, Cymatium*, and *Vasum*, but the less canaliculate forms like *Bursa, Ranella, Drupa, Distorsio,* and *Phos*. And the real ringers are *Cerithium, Potomides,* and *Rhinoclavis*!

Of the 58 species today, only one, "*Murex tribulus*," would actually be considered a true *Murex*. For this name he cited ten illustrations from old iconographies (*Systema Naturae* had no illustrations), of which five are what today we call *Murex pecten* Lightfoot, 1786 (based on a single ref. to a Rumphius figure) and only three are actually true *tribulus*. So how do we know what is REALLY the true *tribulus*? Fortunately, there is a type specimen in the Linnaean Collection in London (Ponder and Vokes, 1988, fig. 5). Montfort (1810, p. 619) subsequently designated *tribulus* as the type of the genus *Murex*, and this is where we start.

Some 65 years passed and then Lamarck (1822) came up with what was essentially our modern classification for the next 150 years. Obviously still nothing like what we see today, but certainly better. He split Linneaus's species of *Murex* into their more familiar groupings, introducing such genera as *Fasciolaria, Fusus, Ranella*, and *Cerithium*. He then divided the now restricted genus *Murex* into three groups, the first said to have "a thin canal, longer than the aperture," which included six species that today are still included in *Murex*, plus three of Linnaeus's Muricinae (2 *Bolinus*, 1 *Haustellum*), and one species of *Siratus* (*Murex motacilla* Gmelin, 1791). The second group was said to have a "thick canal, more or less long," and comprises mostly species of *Chicoreus* and *Pterynotus*. His third group was those with more than three varices and is a truly mixed bag of *Hexaplex*

*The seven Linnaean types of their respective genera are: *Murex tribulus*; *Haustellum haustellum*; *Bolinus brandaris*; *Truncularioptsis trunculus* (now in *Hexaplex*); *Chicoreus ramosus*; *Homalocantha scorpio*; and *Ocenebra erinaceus*. His two muricids that are not types are *Murex cornutus* [now *Bolinus cornutus* (L., 1758) and *Murex saxatilis* Linnaeus (auctt.) [now *Hexaplex duplex* (Röding, 1798)].

and assorted others, but all pretty much still members of the Muricidae. For almost 150 years things rocked along generally in Lamarck's pattern with the various taxa usually considered as "subgenera" of *Murex*, such as *Murex* (*Chicoreus*), *Murex* (*Siratus*), *Murex* (*Phyllonotus*), *Murex* (*Pterynotus*), etc.

When I did my first study (Vokes, 1963) of the western Atlantic fossil and Recent species of what I called *Murex* s.s, I included 19 species. Subsequently, in my "Additions and Corrections" (Vokes, 1990), I had to confess that NONE were *Murex* s.s.; in fact there are NO species of *Murex* in the western Atlantic! My former "*Murex*" species were now divided into eight *Siratus*, nine of what I then called *Haustellum*, and one *Dermomurex* (*Takia*).

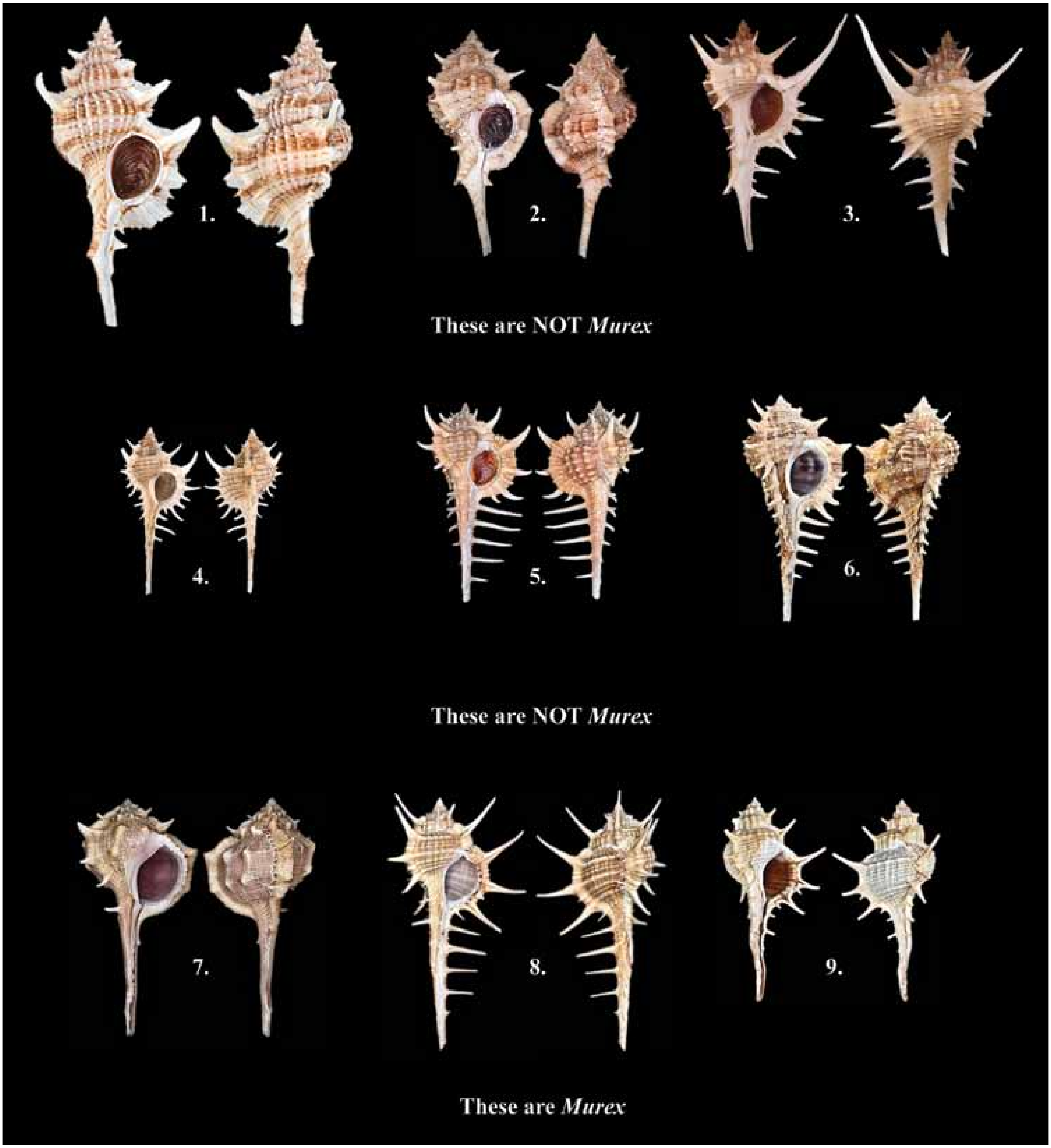
In that original 1963 study I separated the so-called *Murex* species into two groups: the "Indo-Pacific" group, with a straight canal, and the "Western Atlantic" group with a bent canal. Actually I was closer to the truth than I realized. As I studied the various Recent species I quickly recognized that the **bent** siphonal canal readily separated this spiny, three-varixed *Murex*-looking group from the spiny, three-varixed, straight-canaled true *Murex*. And so in 1965, I transferred *Siratus* to *Chicoreus* (*Siratus*), where it remained until 1976 when Radwin and D'Attilio did away with all subgeneric designations and it became the genus *Siratus*.

***Murex pecten* Lightfoot, 1786, a 175mm specimen from the Philippines. This is a true *Murex* and perhaps one of the most spectacular shells found in collections. People are almost always amazed when viewing this shell for the first time. Image from Wikipedia.com.**

But the rest of the so-called Murices, both Western Atlantic and Indo-Pacific, remained intact until my fateful trip to Australia in 1980. That year I had a sabbatical semester, which I spent working at the Australian Museum (Sydney). When I walked in the door Winston Ponder, the head of Mollusks, announced to me that WE were going to monograph the Indo-Pacific species of *Murex*, as part of that major series going on at the time. He had been slated to do the study, and for some time previous he had circled the world (literally) visiting museums to borrow types and other interesting material he uncovered in their collections. It was an amazing array of specimens awaiting me.

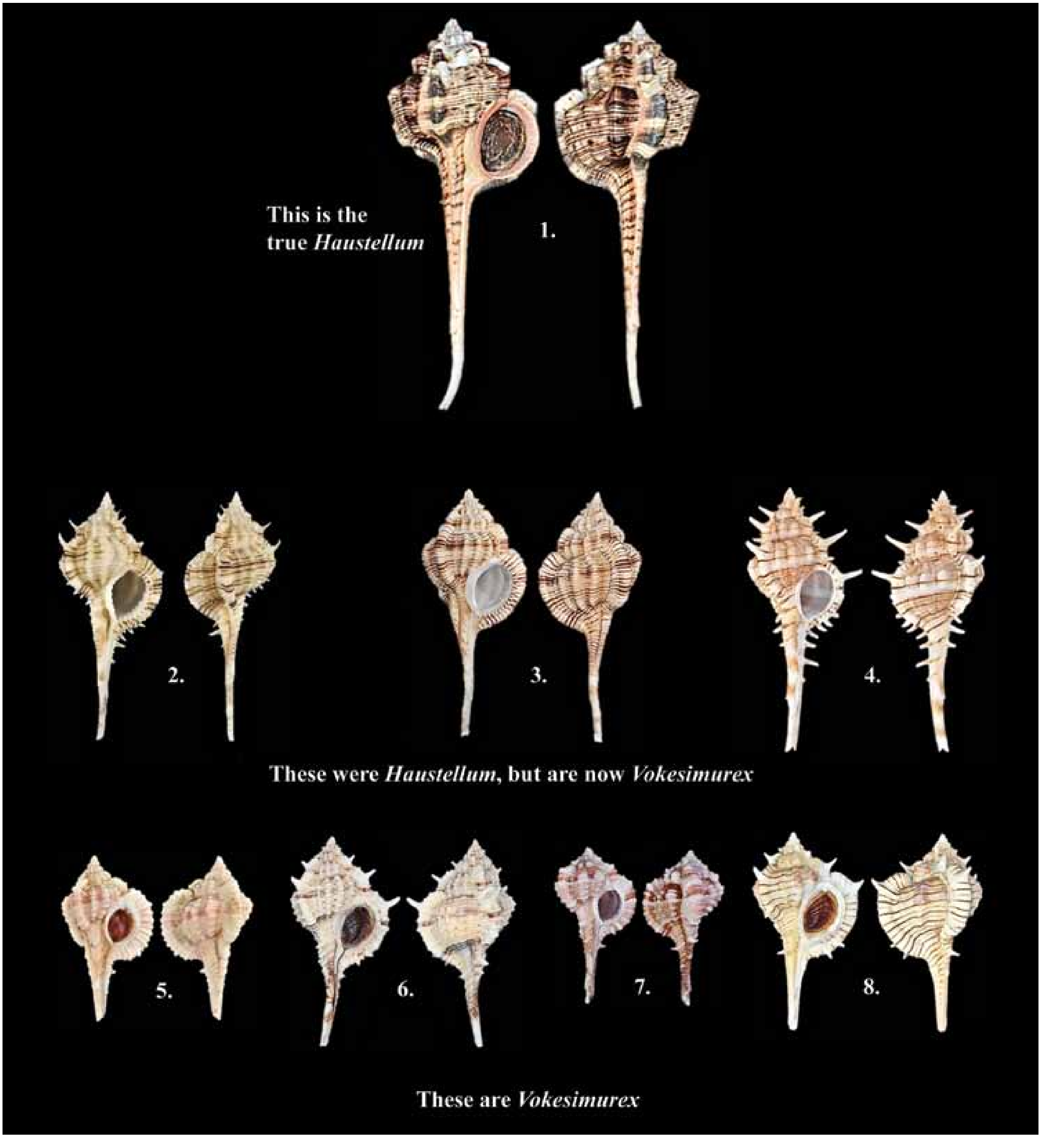
He informed me that my first job was to write up a GOOD description of each species, something which in fact was rather rare. And so for days I sat at a microscope and dictated my observations to my beloved amanuensis Harold. The goal was to have a description of each species in which the various features were all identically cited for ease of comparison between species. I had a mental format, in which I enumerated each of the various features in order, so that one could readily compare different forms. I ultimately wrote descriptions of 55 species. As we toiled away day after day, however, I began to realize that there were two very different sets of shell characteristics within the group of what we thought were all *Murex*.

Both groups have three spiny varices per whorl and long straight, spiny siphonal canals, and superficially all looked like what a *Murex* should be. BUT! The first thing I noted was that, although the protoconchs were indistinguishable, on the first couple of POST-protoconch whorls there were two very different patterns of development. One group has nine small angulate proto-varices; the other has twelve rounded axial ribs. On the second and third whorls, in the first group, every **third** "proto-varix" enlarges to become a true spinose varix. In the second group every **fourth** axial rib enlarges to a similar spinose varix. In the first case the remaining "proto-varices" persist as two intervarical ribs; in the second, there are three intervarical ribs. In the adult



Muricinae examples of: *Siratus*, *Vokesimurex*, and *Murex.*

1. *Siratus beauii* (P. Fischer & Bernardi, 1857) 100mm Caribbean. 2. *Siratus cailleti* (Petit de la Saussaye, 1856) 65mm Bahamas. 3. *Siratus formosus* (Sowerby, G.B. II, 1841) 70mm Dominican Republic. 4. *Vokesimurex blakeanus* (Vokes, 1967) 45mm Colombia. 5. *Vokesimurex cabritii* (Bernardi, 1859) 55mm Florida. 6. *Vokesimurex ruthae* (Vokes, 1988) 70mm Baja California. 7. *Murex brevispina* Lamarck, 1822, 70mm South Africa. 8. *Murex falsitribulus* Ponder & Vokes, 1988, 80mm Indonesia. 9. *Murex trapa* Röding, 1798, 65mm India. Images courtesy of femorale.com.



Muricinae examples of: *Haustellum* and *Vokesimurex.*

1. *Haustellum haustellum* (Linnaeus, 1758) 125mm Philippines. 2. *Vokesimurex dolichourus* (Ponder & Vokes, 1988) 70mm Madagascar. 3. *Vokesimurx hirasei* (Dautzenberg, 1915) 75mm Philippines. 4. *Vokesimurex kiiensis* (Kira, 1959) 79mm Japan. 5. *Vokesimurex bellegladeensis* (Vokes, 1963) 40mm Texas. 6. *Vokesimurex garciai* (Petuch, 1987) 65mm Honduras. 7. *Vokesimurex rubidus* (Baker, F.C., 1897) 40mm North Carolina. 8. *Vokesimurex tricornis* (Berry, 1960) 65mm W. Mexico. Images courtesy of femorale.com.

shells these numbers are more variable, anywhere from as many as nine to none as axial ribs are added or removed.

Using this distinction I then discovered that there were other differentiating characteristics. In group 1 the shell is usually monochromatic (cream to tan); group 2 often has broad brown spiral bands. More importantly group 1 **always** has a labral tooth, group 2 does not. But in group 2 the inner lip is expanded, usually with rugae. It turns out that group 1 comprises the species previously referred to *Murex* s.s, but group 2 now needed a new home. The other group that shares the differentiating features of the early development, brown spirals, and expanded inner lip is the genus *Haustellum,* so we concluded our study by removing those former members of *Murex* s.s. to *Haustellum*. I followed this scheme when I did the revision of the Western Atlantic "Murex" I mentioned previously.

The type of *Haustellum* is unfortunately far different from those we included and so not long after, Petuch (1994) cut the Gordian knot by describing yet another new genus to accommodate the not-quite *Haustellum* species. And this is where we now stand. I suspect that Merle or someone will soon erect a new genus for the Indo-Pacific species that Ponder and Vokes placed in *Haustellum* and we presently place in *Vokesimurex*.

In summary:

Linnaeus (1758) had 58 species of "*Murex*," including only:
- 1 *Murex* s.s.
- 1 *Haustellum*

Lamarck (1822) had 68 species of "*Murex*," including only:
- 6 *Murex* s.s.
- 1 *Haustellum*
- 1 *Siratus*

Radwin and D'Attilio (1976) had 27 species of "*Murex*," which included:
- 10 *Murex* s.s.
- 15 *Vokesimurex*
- 2 *Chicoreus*

Ponder and Vokes (1988) had:
- 27 species of Recent *Murex* s.s.
- 17 *Haustellum* (which really included only 4 *Haustellum* s.s. and 13 *Vokesimurex*)

Houart (2014) (the definitive study to date) had:
- 37 *Murex* s.s. - ALL Indo-Pacific
- 13 *Haustellum* s.s. - ALL Indo-Pacific
- 38 *Vokesimurex* - 21 West Atlantic or East Pacific
17 Indo-Pacific
- 30 *Siratus* - all but 2 West Atlantic

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Accuracy of Freshwater Mussel Identification: Results from a Study in Texas

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Freshwater mussels (family Unionidae) are recognized both as important barometers of environmental quality and one of the most rapidly declining faunal groups in North America, where the most diverse species assemblage occurs. Freshwater mussels can be extremely challenging to identify, however. Not only do many produce morphologically distinct sizes, ages, and sexes, but some display numerous unique ecophenotypes (i.e., different forms in different environments). Often physical differences within a species are greater than the distinctions between two species. Such issues are particularly problematic in Texas, where there are not only many distinct ecosystems, but a large number of isolated drainage basins as well (unlike some states where all waters are those of the Mississippi), both of which complicate mussel identification.

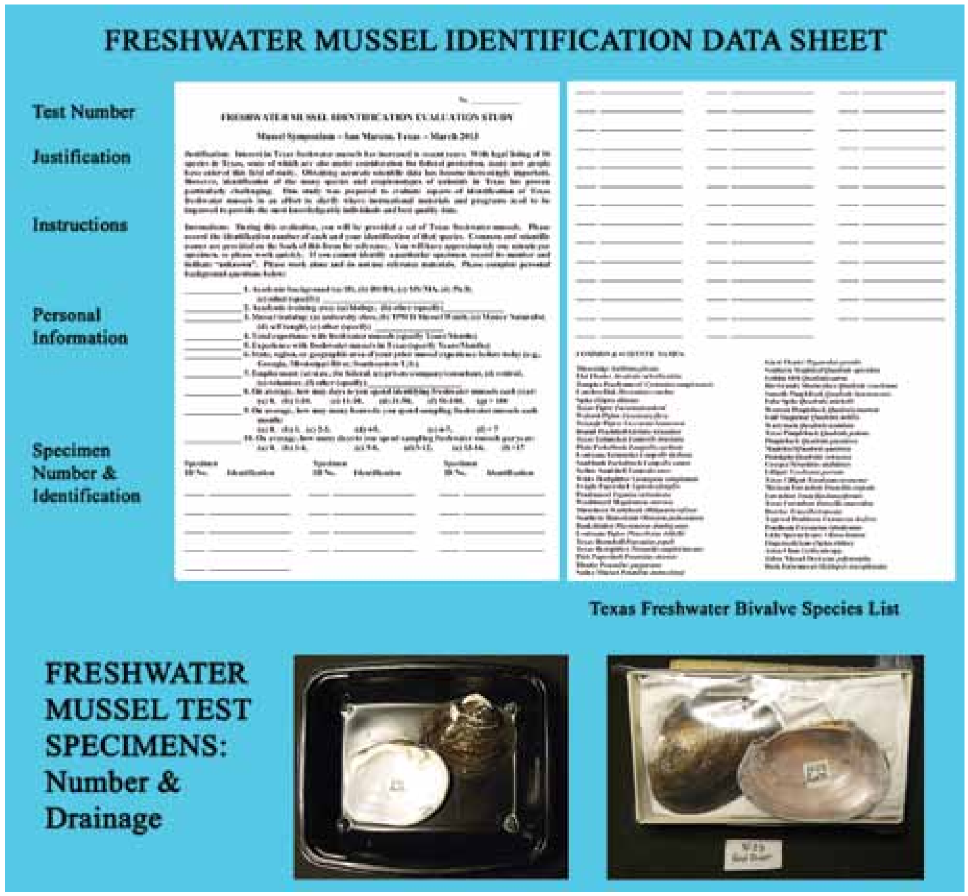

Figure 1. Data sheets used to test the accuracy of freshwater mussel identification by individuals attending a symposium in Texas in 2013. The sheets only identified test subjects by number, but included justification, instructions, an array of personal data, and a list of common and scientific names of bivalves found in fresh water in Texas. Test specimens were placed in trays, except that fragile shells in padded bags, to allow interior and exterior valve examination and only included a number and drainage basin.

Because of the rarity and apparent declines in abundance of Texas unionids, Texas Parks and Wildlife Department (TPWD) moved to list 15 species as legally threatened in 2010. U.S. Fish and Wildlife Department also began to investigate possible federal listing for many of these as well. Legal listing and associated implications soon brought increased interest in Texas freshwater mussels, as well as funding from a number of sources to support new studies. In turn, academic institutions, private consultants, and others stepped up to initiate work in the field. The rush of new people and some resultant work products prompted questions about the quality of some recent efforts.

Despite challenges associated with identification of freshwater mussels, there have been few efforts to document the quality of identification efforts. Shea et al. (2011) examined this subject during a meeting in the Southeastern U.S. (Table 1). Their work included a single drainage basin, the Apalachicola-Chattahoochee-Flint, and included 27 species and 18 biologists. They found an error rate of about 40-50% among individuals with less than 3-4 years of experience.

In an effort to examine the accuracy of freshwater mussel identification in Texas, the authors prepared a group of 52 specimens (50 unionids, Asian clam, and zebra mussel) representing 36 species from drainages throughout Texas (Table 1). Specimens were typical representatives of each species (no atypical or trick examples), but sometimes included large or small shells. Each was marked only with a number and drainage basin and displayed in an open tray, except fragile species that were presented in a plastic bag to resist breakage during examination. Individuals attending a freshwater mussel symposium in San Marcos, Texas, in 2013 were asked to anonymously identify these shells. Attendees were not informed in advance and were not permitted to use identification guides. All subjects were provided an answer sheet that included (1) a sheet number, (2) justification, (3) instructions, (4) personal background information, (5) blanks to be filled in, and (6) a list of common and scientific names of all bivalve mollusks recognized in Texas inland waters (Fig. 1). Several months later, the authors were themselves tested by another biologist using the same group of test specimens. Collectively, 51 individuals working with Texas freshwater bivalves were tested. Later in 2013 at a mussel training class in Junction, Texas, another group of individuals was tested both before and after a week-long training session. Results were presented at the Third Annual Texas Freshwater Mussel Symposium, Kerrville, Texas, in August 2014 (Howells et al. 2014).

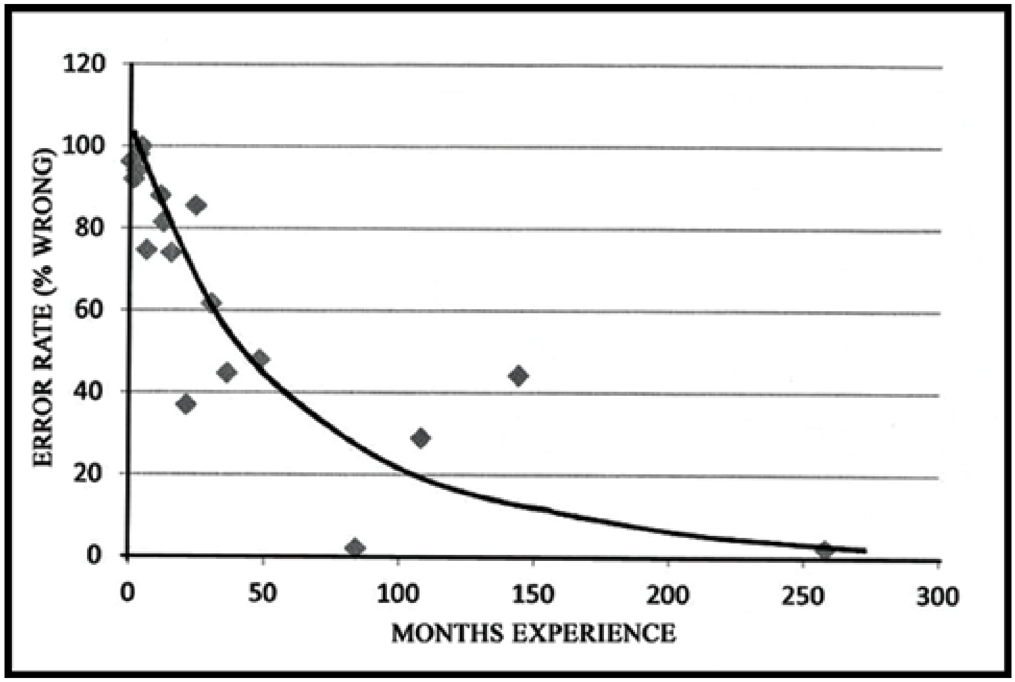

Figure 2. Error rate analysis of freshwater mussel identifications among 51 individuals tested in 2013 in Texas found 4-6 years of experience were needed to exceed a 40-50% error rate.

General Findings:

Identification accuracy was surprising low (Table 2). Less than 24% were correctly identified, with 28% misidentified, and 48% unidentified among all individuals tested. Test subject affiliations impacted accuracy with correct identifications averaging 91% among those from academic institutions, 25% for state employees, 28% for federal employees, and only just over 12% correct for environmental and engineering consultants. Academic degrees also reflected on the accuracy of freshwater mussel identifications with just over 20% correct for bachelor's degrees, less than 28% for master's degrees, and under 19% correct for Ph.Ds. Further, there was one 98% correct score with each advanced academic group and, if those scores were dropped as outliers, percent correct for each group dropped to 15%, 24%, and 8%, respectively. Low scores at the doctoral level may have reflected a small number of subjects in this group and individuals with more administrative and less hands-on roles. Years of experience with freshwater mussel work also impacted accuracy. Experience of 4-6 years was found to be necessary to exceed a 40-50% error rate (Fig. 2).

Group and Species Identification:

Because of issues related to rarity and legal status, we examined accuracy of identification of common, widely-distributed species and those listed as legally threatened by TPWD. Among 1,734 possible identifications of common species, less than 24% were correctly identified (Table 3). Among 816 possible identifications of listed unionids, just less than 21% were correctly identified. Results by individual species were also generally similar for species within these two groups, with correct identifications typically ranging from just over 17% correct to less than 35%. Curiously, giant floater (*Pyganodon grandis*), one of the most widely distributed and often extremely abundant unionids nationwide, was positively identified by less than 8% of people tested (Table 3). No clear reason for failure to identify such a common species was apparent.

Reasons for misidentification by species were sometimes evident, but in other cases were unclear and even suggested simple guessing. Note that incorrect species identification can include two types of errors, for example, when a species like threeridge (*Amblema plicata*) is (1) mistakenly thought to be another species (a Type II error) or (2) when another species is incorrectly assumed to be a threeridge (a Type I error). In fact, with threeridge, both types of errors occurred. Threeridge was correctly identified over 34% of the time, but was misidentified over 28% of the time when it was mistaken for 10 other species (Fig. 3). The most common misidentification was as washboard (*Megalonaias nervosa*), a species that is similar and confusion is not uncommon, but many other species falsely designated as threeridge often had little resemblance to it. Further, seven species were falsely believed to be threeridge. These included washboard (again, an understandable mistake), as well as others that are distinctively different and completely illogical choices.

For Texas fatmucket (*Lampsiis bracteata*), a rare species endemic only to central Texas that is legally listed, nearly 20% were correctly identified, but nearly 26% were misidentified (Fig. 4). Texas fatmucket was incorrectly reported to be six other species and 10 different species were falsely believed to be Texas fatmucket. The test specimen was most often mistakenly thought to be Louisiana fatmucket (*L. hydiana*); again, not an unexpected mistake due to similarity in appearance. It is more difficult, however, to explain confusing it with fawnsfoot (*Truncilla donaciformis*) from eastern Texas, or pimpleback (*Quadrula pustulosa*) from northern Texas, neither of which even vaguely resemble Texas fatmucket. Similar comments apply to the 10 taxa wrongly thought to be Texas fatmucket.

Bogus Names and Species:

Although test subjects were given a list of accepted common and scientific names based on those accepted by the American Fisheries Society and Freshwater Mollusk Conservation Society, some individuals creatively opted to use other names. For example, threeridge was sometimes improperly called "three-ridge", "threeridge mussel", or even "3-ridge mussel". We scored these as correct responses (the respondent knew what the specimen was, but expressed its name poorly). Hybrid names like "Texas wartyback" were rejected as were simple genera (e.g., *Fusconaia* sp.) and group terms like "*Fusconaia/Pleurobema.*"

Identifications of Species Not Found in Texas:

Despite being given a list of species from Texas, a number of participants identified test specimens as species that do not occur in or near Texas. These included eastern pearlshell (*Margaritifera margitifera*) from northeastern North America, spectaclecase (*Cumberlandia monodonta*) and pocketbook (*Lampsilis ovata*) from the upper Mississippi Valley, and spike (*Elliptio dilatata*) from waters north and east of Texas (but admittedly with a single unsuccessfully introduction locally in the 1960s). Failure to recognize species present in Texas (even when clearly given) or the known ranges of non-Texas species led to misidentifications.

Reasons for Misidentifications:

- Multiple drainage basins and varied environments: Though difficult to quantify, the large number of isolated drainages that include many distinct environments, often with an abundance of variable ecophenotypes contributes to challenging identification problems.

- Species names: A number of participants incorrectly assigned species identification based on associating physical appearance with scientific or common name. For example, southern mapleleaf (*Quadrula apiculata* – Fig. 5) has small pimple-like pustules on the disk. This led some subjects to identify it with species names that reflected its sculpturing: wartyback, smooth pimpleback, Texas pimpleback, pimpleback, western pimpleback, and threehorn wartyback. One misidentified Asian clam was reported to be conchos disk (*Disconaias conchos*), apparently due to the drainage of its collection site (i.e., Concho River). All such errors suggest poor attempts at educated guessing rather than solid species familiarity.

- Sculpture: Shea et al. (2011) found the unionids in the Southeast were six times more likely to be misidentified than sculptured species. We did not find this in Texas. Sculptured mussels were correctly identified by over 18% of the subjects, but misidentified by over 83%. Unsculptured species tallied just over 19% and 81%, respectively. Presumably, the multiple drainage basins and ecosystems and associated varied ecophenotypes confound the value of sculpturing as a diagnostic tool in Texas (Fig. 5).

- External coloration: Shea et al. (2011) found distinctive color patterns improved the probability of identification accuracy in the Southeast. Again, we failed to find support for this in Texas, presumably also due to the large number of basins, ecosystems, and ecophenotypes that obscure the value of this trait in Texas (Fig. 5).

- Specimen size: This study did not include enough very small or juvenile specimens to compare to larger adults to allow confident conclusions about size impact on identification accuracy. Physical difference between small individuals and much larger animals in addition to differences among juveniles from different populations likely do confound attaining correct identifications.

- Subject geographic experience: An interesting source of error was found among individuals that trained in other regions of the U.S. compared to those that gained experience locally in Texas. For example, biologists with background history in the eastern or southeastern parts of the country were more often inclined to misidentify local Texas pigtoe (*Fusconaia askewi*) or Louisiana fatmucket (*L. hydiana*), that only occur west of the Mississippi River, as Gulf pigtoe (*F. cerina*) or southern fatmucket (*L. straminea*), respectively, that are only found east of the Mississippi. Test subjects defaulted to those species that were most familiar. Additionally, individuals that train and work primarily in one part of Texas were more likely to misidentify specimens from other regions (e.g., a biologist from the East Texas pineywoods might struggle to recognize unionids from Central Texas or the Rio Grande).

- Failure to recognize distributional data: Although many individuals submitting proposals for funding often claim there is little known about unionid distribution in Texas, historic and present ranges of Texas unionids are, in fact, very well described (Howells 2010, 2013). Many misidentifications clearly indicated a failure to recognize known

Figure 3. **Among the common, widely-distributed species used in mussel identification accuracy testing in 2013, threeridge (*Amblema plicata*) was only accurately identified 34.3% of the time. It was misidentified as 10 other species (and *Quadrula* sp.). Additionally, six other species were mistakenly identified as threeridge. Number of misidentifications are indicated above in parentheses.**

Figure 4. Among the rare, endemic species listed as legally threatened used in mussel identification accuracy testing in 2013, Texas fatmucket (*Lampsilis bracteate*) was only accurately identified 19.6% of the time. It was misidentified as six other species. Additionally, 10 other species were mistakenly identified as Texas fatmucket. Number of misidentifications are indicated above in parentheses.

species distributions that would have impacted identifications. Each test specimen included the drainage from which it had been collected, yet some test subjects incorrectly believed certain shells to be species that do not occur anywhere near the collection site indicated.

Impact of Training on Identification Accuracy:

During a training class in August 2013, identification accuracy of an additional group of subjects was tested both before and after training. Nineteen individuals (7 state/federal, 5 university, 7 consultants) were asked to identify 29 specimens of 23 bivalve species (13 legally threatened and 10 non-listed). Pre-training results indicated a mean of 28% (range 0-90%) correct identifications. After five days of intense training, post-training retesting found an average of 55% (28-90%) were correctly identified. Although this sample size was limited, multiple days of training by experienced unionid experts approximately doubled identification accuracy. This finding, though not unexpected, suggests caution regarding identifications from individuals with limited training or none at all.

Conclusions:

Clearly misidentification rates were far too high for virtually all groups of individuals involved in work with freshwater mussels and need to be improved. Error rates are especially high for individuals with less than 4-6 years of experience. Advanced academic degrees do not guarantee more accurate work. Identification problems are more pronounced at locations in Texas for individuals that trained in other parts of the country or other regions of Texas. Failure to recognize known distributional ranges of unionid species contributes to many misidentifications. Many individuals appear to guess at identifications, sometimes based on common or scientific names that appear to reflect the physical nature of a specimen in question (see Fig. 5). Multiple days of intense training can significantly improve the accuracy of unionid identifications.

Allowing participants more time with each specimen, use of reference manuals, and input from others would likely have increased identification accuracy. During actual field work, however, time to process specimens and available reference materials are often limited. This study also utilized shells with both internal and external valve examination. Living animals where internal valve features cannot be observed will be even more difficult to identify and error rates would be expected to increase. Identification of land or freshwater gastropods or marine mollusks, particularly non-native taxa, is likely to be even more complicated. Finally, we regret not asking each participant to evaluate their own species identification abilities prior to being tested.

Recommendations:

Training is both recommended and apparently often badly needed. Individuals working with unionids must become more familiar with known distributions and the extent of ecophenotypic variations. It is necessary to recognize that some unionids cannot be positively identified based only on external shell features; either internal features or biochemical genetic examination may be necessary. Funding agencies need to consider the experience of individuals and groups requesting support. Quality of data and information presented by individuals and groups also needs to be viewed through the filter of their experience by all.

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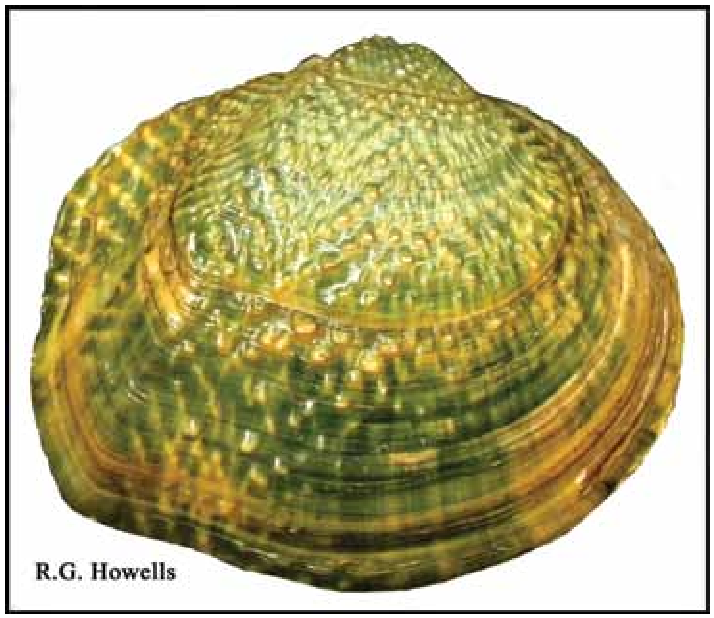

Figure 5. Southern Mapleleaf (*Quadrula apiculata*) is one of the most abundant and widely distributed freshwater mussels in Texas, occurring in all major drainages statewide. In spite of this, 43% of the people tested falsely identified it as Wartyback, Texas Pimpleback, Smooth Pimpleback, Pimpleback, Western Pimpleback, Threehorn Wartyback, *Q. pustulosa*, or *Q. nodulata*. This mistake appears to reflect common and scientific names that allude to pimples, pustules, or nodules because most Southern Mapleleaf specimens are abundantly sculptured with small pimples.

Table 1. Current study and previous freshwater mussel identification accuracy testing.

	Shea et al. (2011)	Current Study (2013)
Specimens selected by	4 experts	3 experts
Expert experience total	50 years	37.5 years
Number of test specimens	74	52
Number of test species	27	36
Subjects (people) tested	18	51
Possible correct identifications	1332	2652
Drainages	One: Apalachicola-Chattahoochee-Flint-	Statewide: Red, Sabine, Neches-Angelina, Trinity, San Jacinto, Buffalo Bayou, Brazos, Colorado, Guadalupe-San Antonio, Nueces-Frio, Rio Grande

Table 2. General freshwater mussel identification accuracy among all individuals combined, by employment affiliation, and educational level for testing in Texas in 2013. *Among advanced degree levels, there was one 98% correct score in each group; results are presented both with and without these outliers.

General Identification Accuracy
All Individuals Combined

	Correct	Wrong	Unidentified
N identifications	627	766	1259
Correct (%)	23.6	28.9	47.5

Mean Percent Correct Identifications
by Employment Affiliations*

University	State	Federal	Private Consultant	Other
91.0	25.1	28.8	12.4	0.0-26.9

** Excludes one test subject due to mixed affiliations over time

Correct Identifications by Educational Background
(Number of individuals; Mean and Range Percent Correct)

Diploma/Degree	High School	BS/BA	MS/MA	Ph.D.	Total
N individuals	1	16	26	8	51
Correct Identifications	4%	20.3%	26.6%	18.9%	
(% Mean-Range)	(4%)	(0-98%)	(0-98%)	(0-98%)	
Correct Identifications	4%	15.1%	23.7%	7.6%	
Minus 98% Scores (Mean-Range)	(4%)	(0-77%)	(0-78%)	(0-37%)	

Table 3. Identification accuracy (identifications correct, wrong, and unidentified) of common, non-listed freshwater mussels and those listed by Texas Parks and Wildlife Department as legally-threatened species including group averages and individual species examples based on testing conducted in Texas in 2013.

Group Averages

	Non-listed Unionids			TPWD-Threatened Unionids		
	Correct	Wrong	Unidentified	Correct	Wrong	Unidentified
N responses	409	527	798	170	227	419
Mean %	23.6	30.4	46.0	20.8	27.8	51.3
Total *N* responses		1734			816	
N species		22			12	

Examples of Common, Wide-spread Species (Non-listed)

Species	*N* Specimens	*N* Responses	% Correct	% Wrong	% Unidentified
Threeridge *Amblema plicata*	2	102	34.3	28.4	37.3
Washboard *Megalonaias nervosa*	2	102	30.4	23.5	46.1
Giant Floater *Pyganodon grandis*	1	51	7.8	39.2	52.9
Yellow Sandshell *Lampsilis teres*	1	51	29.4	23.5	47.1
Southern Mapleleaf *Quadrula apiculata*	2	102	32.4	27.5	40.2

Examples of Legally-threatened Species (Listed)

Species	*N* Specimens	*N* Responses	% Correct	% Wrong	% Unidentified
Texas Fatmucket *Lampsilis bracteata*	1	51	19.6	25.5	54.9
False Spike *Fusconaia mitchelli*	2	102	18.6	20.6	60.8
Golden Orb *Quadrula aurea*	2	102	31.4	23.5	45.1
Smooth Pimpleback *Quadrula houstonensis*	1	51	17.6	35.3	47.1
Texas Pimpleback *Quadrula petrina*	2	102	18.6	23.5	57.8
Texas Fawnsfoot *Truncilla macrodon*	2	102	23.6	28.9	47.5

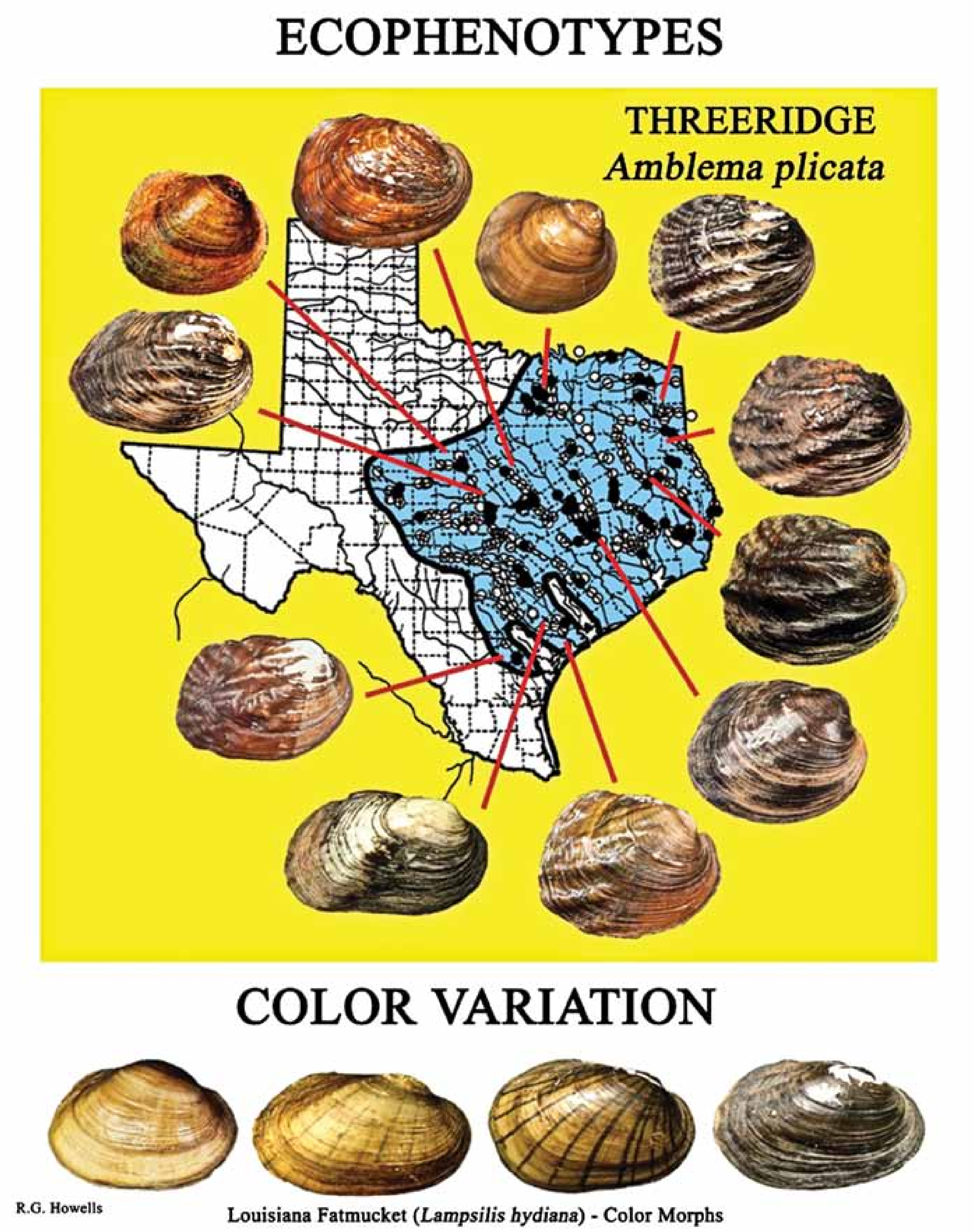

Figure 6. The presence of sculpture and distinctive coloration was found to increase identification accuracy in an earlier study in the Southeastern U.S. Neither trait appeared particularly significant in a similar study in Texas in 2013. Extensive physical variability associated with ecophenotypes (different forms in different environments), age, and sex, and extensive range in color morphs of some unionids, may reduce the value of sculpture and coloration as a diagnostic tool in Texas.


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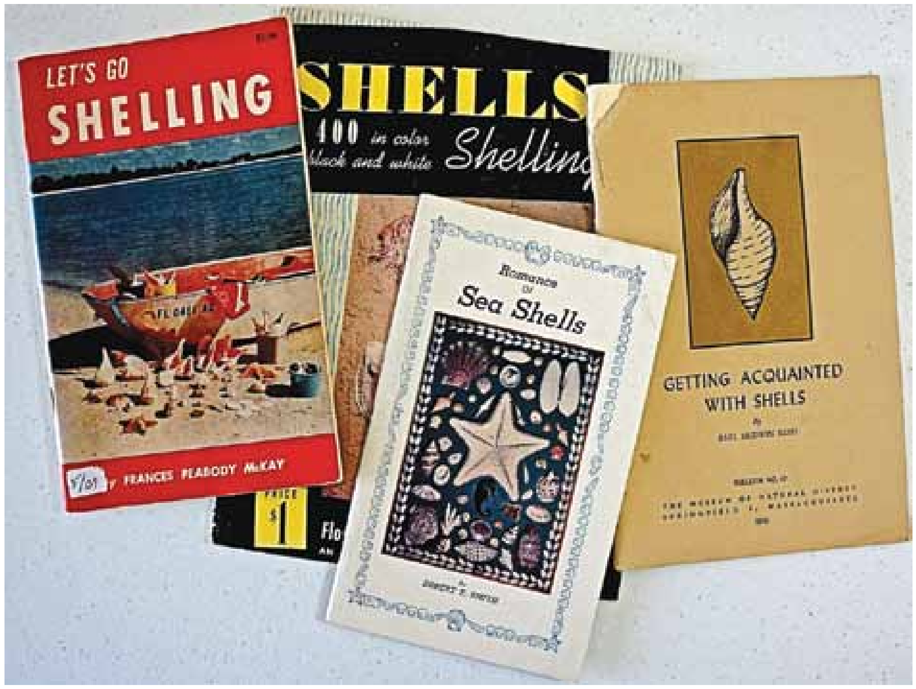
Just What the Doctor Ordered

Lisa Fitzgerald



I don't think I've ever had to justify shelling as a hobby to anyone. Try to explain the allure, perhaps, but justify – no. If for some reason I did need justification, I know where there is plenty of solid evidence that shelling is just what the doctor ordered!

When I can't be at the beach, or working on my shells, I often find myself drawn to used bookstores. Over the years I've managed to amass a decent collection of old shell books and guides. The mid-twentieth century saw a surge in the publication of books about shelling. Not just guide books for identifying shells, but books that actually explained shelling as a hobby.

One of my favorite lines is from a 1956 publication, *Shells, 400 in Color and Black and White, Shelling*, text by Mani O'Mara, (M. W Publishing Co., Tice, FL). The introduction states, "Doctors recommend shell-gathering as a hobby for many tense personalities, who find that the long days of sun and air, the relaxation of pouring over their finds at night, induce deep slumber and soothed nerves." Ah. Truer words were never spoken.

Let's Go Shelling, by Frances Peabody McKay (Great Outdoors Publishing, St. Petersburg, FL) was published in 1968. Mrs. Peabody states: "Here are some of shelling's qualifications as a hobby: it is both an outdoor and an indoor sport, it appeals to the very active person and to the student, wives and husbands can do it together and there is no limit to its areas of interest. Furthermore, shelling is just as beneficial in taking off those extra pounds as floor gymnastics, and a lot more fun. On the beach there is a breeze blowing and the lungs fill with fresh air, or maybe it is necessary to walk a good distance to where the shells are and this calls for a brisk gait to get there before the tide washes the shells back. Stooping over to pick up shells is a perfect waist slimming exercise, for in a shelling expedition a collector will double and even triple the number of times recommended by a therapist. No matter how tired he is a person will always bend for the next bright shell, as it just might be that rare one. And while concentrating on shells the gatherer always goes farther than he realizes and has to walk back the same distance, this time carrying heavy buckets of shells." I knew there was a reason I didn't have to go to the gym!

Romance of Sea Shells was written in 1952 by Egbert T. Smith. In his small, yet elegant pamphlet, Mr. Smith writes, "No hobby excels shell collecting from a therapeutic standpoint, or brings us into closer communion with nature."

Getting Acquainted with Shells was published in Bulletin No. 10 of The Museum of Natural History, Springfield, MA, and was written in 1956 by Earl Hudson Reed. In the journal, Mr. Reed writes, "Shell collecting is also preeminent among those hobbies which have a definite therapeutic value. As a means of relaxation and of counteracting the nervous tension induced by our complex way of life, it is almost ideal." I wonder what Mr. Reed would think of today's "complex way of life!"

S. Peter Dance, in his 1972 book, *Shells and Shell Collecting*, (Hamlyn Publishing, London) writes: "It should be recognized, nevertheless, that shell collecting may have a very useful part to play in modern society as an occupation with considerable therapeutic qualities. Ever since Laelius and Sipio took up shell collecting as a means of relaxation it has given pleasure and peace to those who are troubled, tired or frustrated."

So there you have it. While I didn't expect you to learn anything new in the excerpts from these great old publications, I did know you'd appreciate their sentiments. At least now, the next time someone questions your passion for shelling, you can resolutely tell them, "It's just what the doctor ordered."

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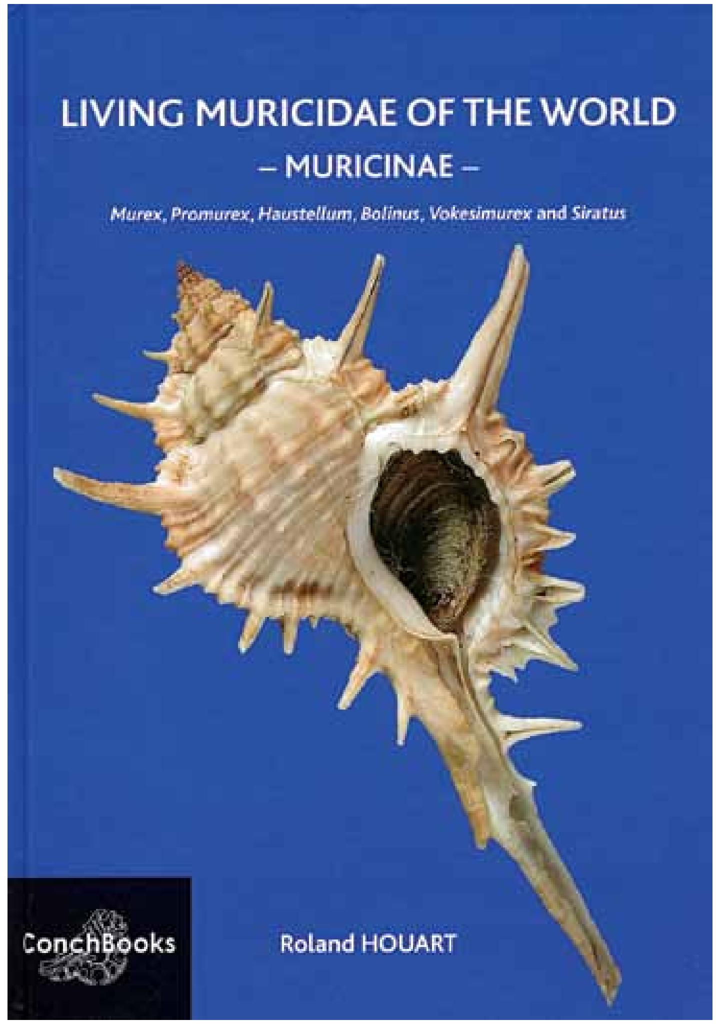
Living Muricidae of the World: Muricinae

Murex, Promurex, Haustellum, Bolinus, Vokesimurex and Siratus

by Roland Houart

ISBN (hard cover) 978-3-93 9767-59-6; published in 2014 by ConchBooks, Harxheim, Germany, 8.5 x 11 in, 197 pages, lavishly illustrated with full color plates displaying multiple specimens of each species, magnified images of key morphological features, and complete descriptive text. Cost approx. $115, avail from MDM Shell Books (mdmshellbooks.com) and Conchbooks (conchbooks.de).



First, I apologize to our readers and to Roland Houart for not publishing this review before now. Until I started working with Emily Vokes on the images for her article in this issue, I was blissfully ignorant of the poor taxonomic condition of my muricid collection. I was saved for purposes of illustrating the article because Jose and Marcus Coltro of Femorale (Femorale.com) are always more than generous with their shell images - and unlike me, their taxonomy was up-to-date (thanks guys). I knew I needed the most recent and most thorough study, and luckily in the Emily Vokes article was, "Houart (2014) (the definitive study to date)..." (Vokes, page 8 in this issue). That was certainly good enough for me and I bought the book at the 2017 Key West COA convention.

"Definitive" is certainly the correct term for the Roland Houart book. In under 200 pages he has put together several features that I believe mark the best of what is available in conchological literature. First, this is not just a picture book. There is actual text describing each shell in detail (critical when trying to separate two look-a-like species) with type information, synonymy, distribution, **description**, and remarks. When I am looking up one of my shells, I want the story behind the shell - Roland Houart provides this. The next "best" feature is the manner in which he illustrates the shells. The second half of the book is full of full page high quality color plates showing multiple specimens of each species and magnified views of key morphological features. You are almost certain to be able to match your shell in hand, rather than settle for, "...it's kind of like..." The book also has a complete bibliography and index, as well as the interesting feature that all species identified after 1971 are in bold (Vokes, 1971, Catalogue of the genus *Murex* Linnaeus, *Bulletins of American Paleontology* 61(268): 1-141, is considered the standard reference to that date).

A lot has happened in the last decade or so to improve the tools available for research and for increasing our knowledge of the natural world. What we "know" today will surely undergo changes in the future. This is an age-old process that has certainly sped up recent years. We know there will be changes, and indeed Roland Houart acknowledges this in his book, but for this point in time, if you collect or are interested in any of the some 1,500+ Muricidae, this book is a must have book. Unfortunately, we must wait for similar volumes on the remaining 10 subfamilies in Muricidae. Until then, for the Muricinae, this is the best $100 you can spend.

Tom Eichhorst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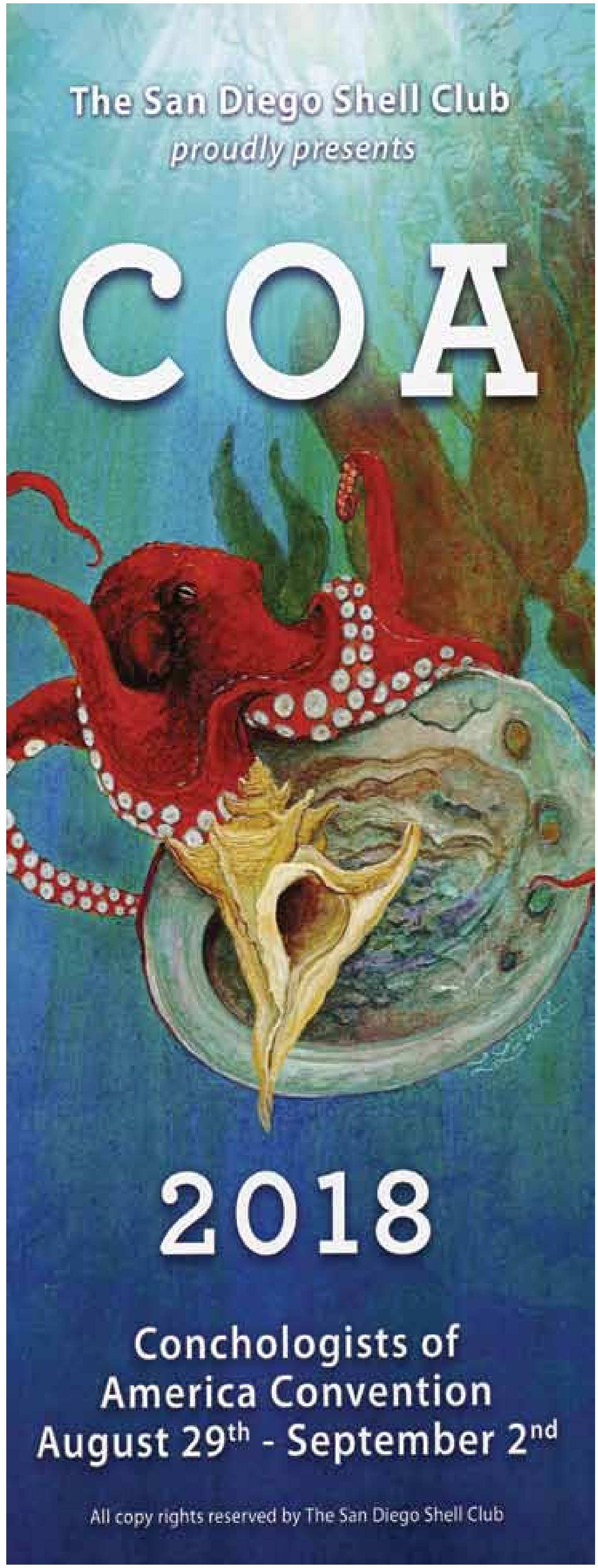
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2017 COA Key West Convention

Tom Eichhorst

Two days home from the 2017 COA Key West convention, and I decided I ought to get some of my thoughts written down as my memory is certainly not improving. Lots of people deserve credit for what was truly a memorable event. I will mention those responsible as I recall events. I apologize now for anyone I may miss. It was a COA convention that will long be remembered.

First, getting to Key West is not always a simple affair. I flew from Albuquerque, New Mexico, and my total travel time was quite a bit faster than those who drove from mainland Florida. On the other hand, I sat in truly uncomfortable seats, suffered a small 8-month-old tossing her cookies on my leg, and rode through some of the worse landings ever. I say that based upon 25 years in the US Air Force and 10,000 hours flight time. Worse landings ever.

The hotel was the Grand Key Resort, a Hilton Doubletree, and while not as large and fancy as some, it certainly was suitable, and the staff was competent and quite gracious. Key West has one resident COA member - our wonderful host, Greg Curry Sr. Obviously he needed help to host such an event, and help he got. The North Carolina Shell Club came down *en masse* to take over the myriad of tasks involved in running a successful convention. Other than the fact that they performed their various duties for free, you would not be amiss in calling the North Carolina folks professional conventioneers. They know how to run the show. There was also much needed help from Florida's Broward Shell Club and others.

The first official day of the convention was Tuesday, August 15th, but the three previous days were filled with pre-convention activities, including snorkeling trips, a Conch Train Key West Tour, a Ghost & Gravestone Tour, a Three Key West Attractions Tour, and a dinner cruise. Everett Long (North Carolina) was the selected herder of cats for the excursions. He was apparently successful as the same number returned as left. I did not get there until Monday evening, so I missed out on all of these, although I did hear the dinner cruise had great food but was a bit crowded and it was hot. That last is certainly surprising. Who would have thought Key West would be hot in August!

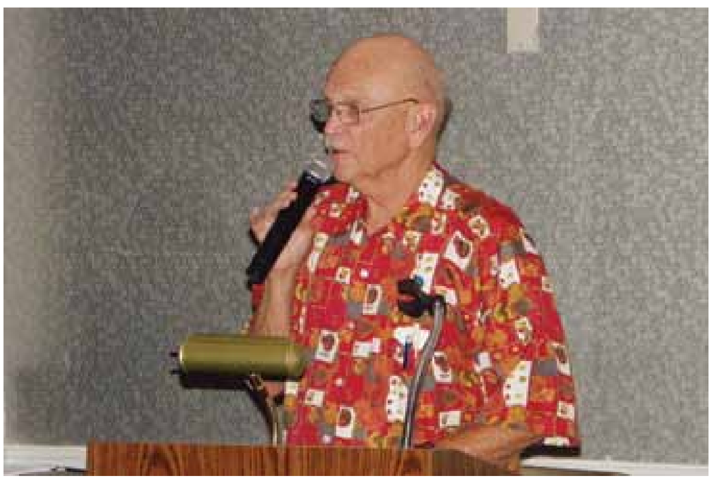
So, Tuesday morning and it was time for the COA Board meeting, scheduled from 8:00 to 10:00 am. While that meant we missed the first silent auction, it also meant we got to participate in a well-run meeting with a tight two hour agenda. Thank you Dr. Harry Lee - well done. We covered all required business and finished on time and I had time to register. Registration was a breeze, set up by Karlynn Morgan (North Carolina).

The opening session of the convention started on time at 10:30 am and the first speaker was Wolfgang Grulke, with truly stunning photographs of various *Nautilus* and relatives. Backing up a bit though, to get into the briefing room you had to pass by the convention raffle items and various shell club tables with COA t-shirts (Jeanette Tysor), COA pins (Vicky Wall), shells from the late Donald Bosch's collection (all from Oman), raffle tickets (Jan Reaves), and several tables of various miscellaneous shells from Florida and the Caribbean. These last were sold by Bob Pace, and all proceeds went to COA. Thank you, Bob.

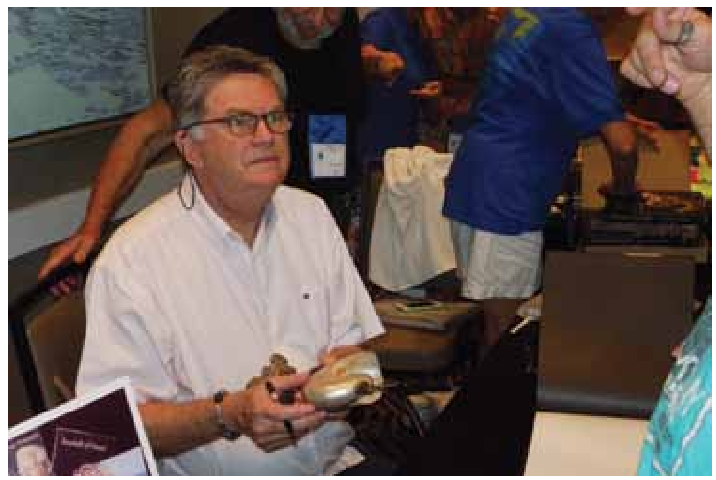
Once in the main room we were greeted by Key West resident Greg Curry and his North Carolinian co-chair and the convention master-of-ceremonies, Ed Shuller. As Greg said of Ed when he would call him in a panic over some vexing convention issue, "It is impossible to listen to Ed for more than a few words without becoming completely relaxed. His calm easy-going manner just drops troubles away." To coordinate, schedule, and oversee the programs, we had Carole Marshall from Florida. Carole set up the programs, including contacting people many months prior and asking if they would like to give a program and then coordinating the various topics to ensure we had an eclectic schedule of programs so interesting that people wanted to attend each and every session. Carole also kept Ed and each

Key West COA Convention 2017 host, Greg Curry Sr. (standing), introduces the banquet speaker, Richard Goldberg. Photo by John Jacobs.

Bob Pace with tables crowded with tubs of Caribbean and Florida shells for sale, the proceeds of which all went to COA. Photo by John Jacobs.



Key West 2017 COA Convention master-of-ceremonies, Ed Shuller. Ed's easy going and calm demeanor seem perfectly suited for his MC role. Photo by John Jacobs.



Our first speaker, Wolfgang Grulke, autographing copies of his books, *Heteromorph* (2014) and *Nautilus* (2016). Photo courtesy of John Jacobs.

Jan Reaves from North Carolina, selling raffle tickets for quite a few popular shell items. Photo by John Jacobs.

***Spondylus americanus* at the silent auction during the welcome party. This size and quality would later be seen at the bourse for $100 to $500. Photo by John Jacobs.**

Silent auction bidding was quite active, setting a new record for COA earnings at such events. Photo by John Jacobs.

Cheryl and John Jacobs worked tirelessly setting up the silent auctions: selecting, packaging, and labeling over a thousand shells. Photo by Bev Dolezal.

Above: There was plenty of good food at the welcome party. Here Doug Wolfe demonstrates the carnivore plate while Cheryl Jacobs has a slightly more balanced approach. Photo by John Jacobs.

Below: The oral auction in progress. Photo by Bev Dolezal.

Seats start filling for the oral auction of shells from the Fredric Weiss collection. The total for the evening was $81,860! Photo by John Jacobs.

COA veteran auctioneers, Hank Chaney (left) and Paul Callomon (right). Photo by John Jacobs.

Donald Dan was presented a plaque for "Outstanding Service to COA" for his tireless efforts to obtain the Weiss collection as well as sort, box, and store it until it could be auctioned by COA. Photo by John Jacobs.

Larry Strange was presented a plaque for "Outstanding Service to COA" because he volunteered his services to professionally catalog and appraise thousands of shells for the Weiss family. Photo by John Jacobs.

speaker to a strict time schedule. While never physically removing a speaker, she was prepared and it looked close a couple of times. Always on hand for each presentation was Tom Ball (Florida) who set up each Power Point presentation and cleared the electronic glitches when the wrong button was pushed on the remote and the screen went blank.

Tuesday afternoon we had more great presentations and a chance at the second silent auction. There had been quite a lot of talk about the auctions this year because Key West was to feature shells donated from the Fredric Weiss collection. Photographs by John Timmerman (North Carolina) of the specimen shells slated for the oral auction had been teasingly sent out as email attachments and caused a bit of a stir. These same quality shells also filled every silent auction except the first one. So we crowded in to partake of the second silent auction on Tuesday afternoon. The shells were stunning, and each was well presented with a printed bidding sheet with bidding increments already filled in so you just had to fill in your registration number. John and Cheryl Jacobs (Florida) had spent untold hours sorting, boxing, preparing labels, and transporting the silent auction shells. It was a wonderful display, and the silent auctions brought in more money for COA than we usually get from the oral auction. There were five regular silent auctions, plus a sixth the night of the welcome party (organized by Dora Zimmerman).

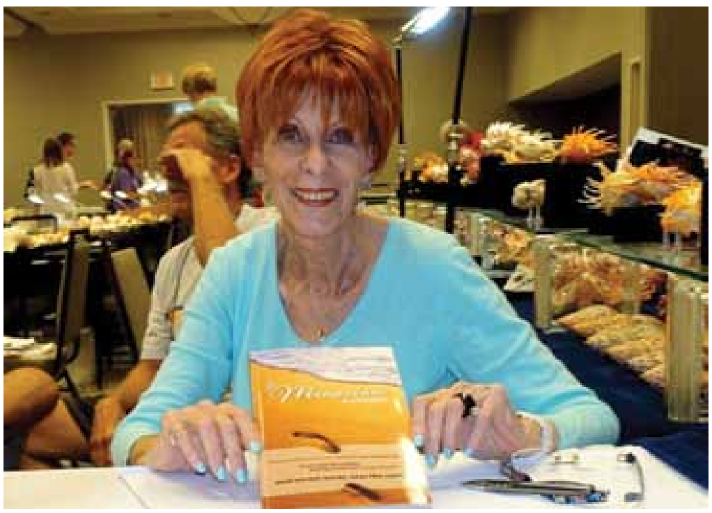
The welcome party was Tuesday night with seating both inside the hotel and on the back patio (where the bar was). The food was good and plentiful, the auction shells great, and the company could not have been better. Lots of shellers and alcohol - always a great combination.

The next day (Wednesday) we had more interesting programs (I found the talk on nerites particularly fascinating) and the third and forth silent auctions (not counting the one held during the welcome party). These auctions maintained the standards for high quality specimen shells and active, if not a bit frenzied, bidding. All of this paled in comparison to the evening's event, the oral auction.

Most attendees had already seen the shells from the Weiss collection online or certainly in the full color brochure with John Timmerman's photos. Seeing them in person, however, was another matter. These were nicely-sized high quality shells and the evening promised to be exciting. Our auctioneers were two well-seasoned (some might say old) pros, who knew how to work their audience. Paul Callomon (Pennsylvania) and Hank Chaney (California) played to a packed room and they played their audience expertly. By the end of the evening a new record had been set for the COA oral auction - 119 lots had been auctioned for approximately $81,860! In total the various auctions brought in more than $110,000 for the 2017 COA convention. There are two things to note here. First, shells from the Weiss collection will also be auctioned off at the 2018 San Diego convention as well as the 2019 Sanibel convention. Second, this is all because of the hard work and dedication of long time COA member Donald Dan. He procured this collection for COA and then spent hundreds of hours boxing, moving, and storing the collection. Also of note is the volunteer help of Larry Strange who examined the thousands of shells and provided a formal appraisal for the Weiss family.

You might think there would be a bit of a letdown after the activities of Wednesday night, but no, Thursday had another silent auction packed full of great looking shells and several superb speakers with shell related presentations. The last presentation was by Ron Bopp on "Shells and Trading Cards." This topic was new to most of us and

Bill Lyons (left) and Hugh Morrison (right) watching "Dora's Adventures" or possibly looking up shell data. The lovely Simone Pfuetzner is in the background. Photo by John Jacobs.



Anne Joffe, when not traveling across the country setting up and promoting COA conventions, had time to write a book (see last issue for review). Photo by John Jacobs.

Bob Janowsky says a few words after accepting his *Neptunea* Award. As one of eight original COA founding members, Bob has been a steady and consistent supporter of COA. Photo by John Jacobs.

A small portion of the gorgeous shell display typically set up, as if by magic, by Sue Hobbs. Although space was limited, this year's bourse was still a special event enjoyed by all. Photo by John Jacobs.

A few of the thousands of bourse shells on display. Photo by Bev Dolezal.

Five of the eight founding members of COA at the intial 1972 Rhode Island meeting. Left to right: Dorothy Janowsky, Kirk Anders, Bob Janowsky, Bette Rachlin, and John Parduano. Not shown are Mavis Walkup, Carl Erikson, and Mrs. Robert Armstrong. Photo anon.

his was an entertaining end to what had proven to be an interesting slate of speakers with a wide variety of topics. After Ron's talk was the annual COA business meeting. President Harry Lee had each board member introduce him or herself, after which were various activity reports. These included the establishment of a nominating committee for next year's COA officer elections (Dave Green, Chair; Tom Grace, and Rick Edwards), the COA financial report, and the academic grants provided by COA in 2017 ($25,652 to 10 recipients). The business meeting ended and we were presented with a tag-team briefing by David Waller and David Berschauer on the 2018 COA convention in San Diego - 29 August to 2 September 2018. They talked about the Sheraton Hotel (easily accessed across the street from the airport) with convention rates of $189 single and double (plus all of the sundry taxes hotels now typically charge) and walked us through the many local attractions. It looks to be a spectacular event. The two Davids ended the day's presentations and we were left to prepare for the evening's annual banquet.

Hazel Andress was in charge of banquet, which this year was buffet style. There was plenty of great food, enough for seconds for those who did not get enough conch fritters the first go-around. After dinner we were served up a presentation by Rich Goldberg of the last COA convention in Key West in 1980. Unlike that year, we had no hurricane to contend with this time around - the weather was perfect. Rich shared a treasure trove of images from the 1980 convention and most amazingly, he knew most of the people in the photographs. There were images of young folks who are still with us, with a few added years, and images folks no longer with us, but fondly remembered. It was a well-done but bitter-sweet presentation. Next Everett Long took the podium (no need for a microphone) to announce the winner of this year's *Neptunea* Award. As he talked about the winner being the only active COA member of the original eight members who started the organization in 1972, it was quickly obvious he was talking about Robert (Bob) Janowsky. Bob is indeed a founding member. Congratulations Bob; it is a well-deserved recognition.

After the *Neptunea* Award, it was all over except the shell club reps' breakfast and the COA bourse (first held in 1978) the next two days (Friday and Saturday). The club reps' breakfast was hosted by José Leal in absence of Vice-President Wayne Humbird who was unable to attend the convention. Lots of issues were discussed and Phyllis Gray promised to send out the minutes to all of the meeting attendees. Then it was time for lunch and the bourse.

There was apparently still some money left after the various auctions as I witnessed plenty of folks with full shell trays preparing to take home their bourse treasures. Lynn Gaulin (Florida) set up the bourse and with some with some fancy "footwork" managed to fit the dealers into a less than optimal space. There were 30 shell dealers this year and, due to room size constraints, they were spread between two rooms and in a hallway. It seemed to work as they all appeared to have plenty of active customers.

And that was the 2017 COA Key West convention – successful beyond our wildest dreams and a vivid indication that ours is a vibrant organization with active and dedicated members. I hope to see you in San Diego next year (29 August to 2 September 2018).

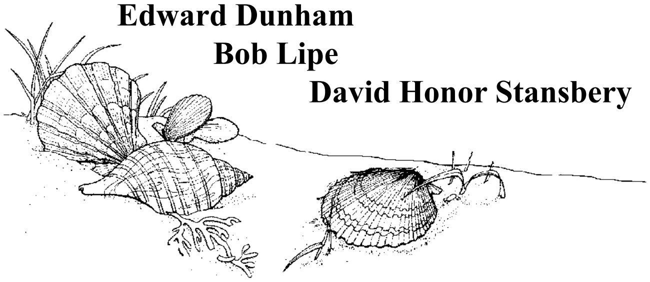
COA Conventions (1972-2020)

1972 – Newport, Rhode Island
1973 – Bahamas
1974 – Seattle, Washington
1975 – Virginia Beach, Virginia
1976 – Portland, Oregon
1977 – Fort Lauderdale, Florida
1978 – Long Island, New York
1979 – Santa Monica, California
1980 – Key West, Florida
1981 – San Francisco, California
1982 – Sanibel Island, Florida
1983 – Sarasota, Florida
1984 – St. Petersburg, Florida
1985 – Philadelphia, Pennsylvania
1986 – Fort Lauderdale, Florida
1987 – St. Louis, Missouri
1988 – Fort Myers, Florida
1989 – San Diego, California
1990 – Melbourne, Florida
1991 – Long Island, New York
1992 – Jacksonville, Florida
1993 – Panama City, Florida
1994 – Corpus Christi, Texas
1995 – San Diego, California
1996 – St. Petersburg, Florida
1997 – Captiva Island, Florida
1998 – Orlando, Florida
1999 – Louisville, Kentucky
2000 – Houston, Texas
2001 – Port Canaveral, Florida
2002 – Sarasota, Florida
2003 – Tacoma, Washington
2004 – Tampa, Florida
2005 – Punta Rassa, Florida
2006 – Mobile, Alabama
2007 – Portland, Oregon
2008 – San Antonio, Texas
2009 – Clearwater, Florida
2010 – Boston, Massachusetts
2011 – Cape Canaveral, Florida
2012 – Philadelphia, Pennsylvania
2013 – Sarasota, Florida
2014 – Wilmington, North Carolina
2015 – Weston, Florida
2016 – Chicago, Illinois
2017 – Key West, Florida
2018 – San Diego, California*
2019 – Sanibel, Florida*
2020 – Cape Canaveral, Florida*

* Planned

In Memoriam:

Ruthie Abramson
Edward Dunham
Bob Lipe
David Honor Stansbery



Ruth (Ruthie) Frances Abramson, 82 (9 May 1935 - 2 July 2017), of Jacksonville, FL, was born to Emma and Lynn Henshaw in North Miami. Ruth attended Miami Edison High school, then received a teaching degree from Florida State University and a Master's Degree from the University of Florida. After teaching High School American History on local Channel 7, Ruth taught at Fletcher High School and Sandalwood High School where she was the Department Head. She was a dynamic and creative teacher who inspired enthusiasm in her students. For many years Ruth served the community through her involvement with the Jacksonville Shell Club and the Greater Jacksonville Coin Club. Ruth's greatest gifts were her endless creativity, her unrelenting graciousness and her ability to light up any room she entered. Ruth is survived by her beloved husband of forty years, Frank Abramson. They loved traveling the country with each other, exploring new things and meeting interesting people. You may remember them from the many shell shows where they were dealers with shell stamps, coins, and other interesting items. She will be missed by all who met her.

1992 one rupee coin from the Seychelles.

Edward Dunham (1939 - 14 May 2017), of Florida, (here with wife Bettye) was a true scientist as a meteorologist for the Air Force and NASA for many decades. He applied the same scientific rigor to malacology. Ed could convey information to the general public on both subjects in a clear, convincing, and easily understood way. This was sometimes critically important in his chosen profession, but also important to us was his long history of communicating the importance and desirability of shells to general audiences. He majored in meteorology at the University of Hawaii and retired as a Senior Master Sergeant after 25 years of service in the U.S. Air Force, where he was the Chief Programmer for the Automated Weather Network for the Air Weather Service. Ed then worked for Raytheon in Massachusetts, where he was the senior meteorologist on the design of the Doppler Radar System. Upon moving to Melbourne, Florida, he helped develop radar systems architecture for both Air Force and NASA for their spacecraft launch ranges as the Senior Meteorologist for Boeing.

Ed was a volunteer meteorologist for several Space Coast area coastal fire departments and provided training during hurricane season. His weather email notifications were eagerly anticipated and always seemed more accurate than other sources. In October of last year, Hurricane Matthew neared the Florida Spacecoast as a major hurricane. Ed's correct prediction of the storm staying farther offshore than other government and public media meteorologist forecasts was remarkable.

***Granuliterebra eddunhami* Terryn & Holford, 2008 (courtesy of www.conchology.be.**

As a student of malacology, Ed specialized in the Terebridae. His reference collection of that family was extensive and comprehensive. He corresponded with the major *Terebra* specialists for the past forty years. A species of *Terebra* from Vanuatu *Granuliterebra eddunhami* was named for him by Terryn and Holford in 2008. Dr. Harry Lee and Ed Dunham coauthored an important article in the Jacksonville Shell Club's *Shell-O-Gram* on the interesting aspect of a white form of a popular *Terebra* that had originally been described as a *Buccinum*. The named shell was described from the collection of the Empress Maria Teresa of Austria (mother of Marie Antoinette).

Ed made provisions for his collection to be donated to the Florida Museum of Natural History in Gainesville, Florida, where his *Terebra* collection and other shells will be available for malacological research.

He was a longtime member of the Astronaut Trail Shell Club (ATSC) where he worked diligently for many years on the club's scholarship raffle. By obtaining exceptional shells from dealers at the annual ATSC shell show, sufficient funds were generated for grants to Master's or Doctoral candidates in marine biology annually since 1989. Ed was honored by the ATSC with a Certificate of Appreciation in January for his lifetime of scientific work for malacology and for his work for the club and local education to others about shells. He was also one of the subset of shellers who in addition to mollusks enjoyed growing orchids.

Ed Dunham was laid to rest after a military honor guard service at the Cape Canaveral National Veterans Cemetery.

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[Lee, H.G. and E. Dunham], 2016b. Corrigendum. *Shell-O-Gram* 57(2): 3. March. http://www.jaxshells.org/pdfs/marapr16.pdf

Terrum Y & Holford M. (2008) The Terebridae of Vanuatu with a revision of the *'Granuliterebra'* Oyama 1951. *"Visaya"* Supplement:3: 1-96.

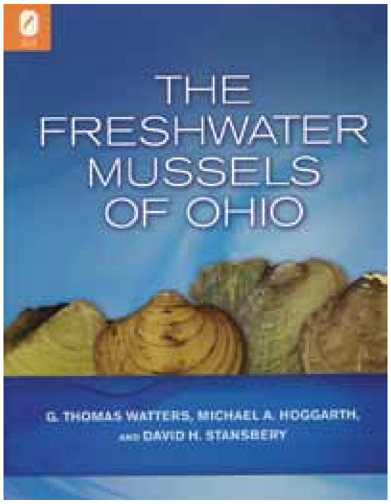
Robert (Bob) Lipe (1936 - 2017), of St. Petersburg, Florida (here with wife Betty, who we also lost this year) was a soft-spoken gracious man. He and Betty operated The Shell Store in St. Petersburg, and were the backbone of the St. Petersburg Shell Club for more than 50 years. It is truly the end of an era with his passing. It doesn't seem like enough to simply say that he will be missed. Bob and Betty supported the club and the shelling community for so long, it is difficult to believe they are gone.

Bob and Betty were a great team. They were members of the club since 1959 and never stopped working for the club. Bob loved all the ladies and he made every lady feel special. You knew you had "made it" when you got one of his famous neck rubs. He was always generous in his support of our shell show, donating his time to the layout and shells such as golden cowries for the raffle.

The marginellid *Canalispira lipei* is named for Bob Lipe.

Bob developed a passion for marginellids and in 1991 he literally wrote the book (Lipe, R. 1991. *Marginellas*. The Shell Store, St. Petersburg Beach, Florida. 40 pp.). About being a shell dealer, Bob wrote, "I was a collector, especially a *Marginella* collector long before I sold shells. The trip to West Africa in the 1970s was responsible for me becoming a shell "proprietor." I hate the word "dealer." Car dealer, drug dealer, etc. are looked upon distastefully. For some collectors, shell dealers are not your favorite people either. Just remember most of us are shell lovers too." (Conch-L, 3 June 2007) Both *Prunum lipei* (Clover, 1990), and *Canalispira lipei* E.F. García, 2007, are named after Bob. Both he and Betty were two of the nicest people you could ever meet in the shell world and both will be sorely missed.

David Honor Stansbery (1926 - 2017), of Columbus, Ohio, was born on May 5, 1926 in Upper Sandusky, Ohio, to Honor G. and Daisy E. (Kirby) Stansbery. David was a graduate of Upper Sandusky High School, served in the U.S. Navy from 1944-1946, and earned his Ph.D. at Ohio State University. He held the positions of Professor Emeritus at Ohio State University, Curator of the Ohio State Museum of Natural History, Educator, Author, Editor, Researcher, Ecologist, and Malacologist. David served on the National Board of The Nature Conservancy and as President of the American Malacological Union. He received numerous rewards and recognitions for his work to protect the environment and promote biological diversity.



Along with collegues, G. Thomas Watters and Michael A. Hoggarth, he published *The Freshwater Mussels of Ohio* in 2009. He was preceded in death by his parents and his wife Mary Lois Pease Stansbery. Survived by his brother, Daniel Keith (Gloria); children, Michael (JaNae), Mark (Debbie, deceased), Kathleen (Francis) Pang, and Linda (Bruce) Anschutz; eight grandchildren and several great grandchildren. Published in *The Columbus Dispatch* on Aug. 26, 2017.

Land snails of the rocks, trees, and leaves

Teresa Rose Osborne and Rebecca J. Rundell

In 2003, Rundell conducted her first field season in Belau, funded in part by Conchologists of America. Belau (Republic of Palau, Oceania) is an archipelago of ≥500 islands totaling 415km^2 in the Caroline Islands (Fig. 1). This small island system is home to as many as 200 native land snail species found in leaf litter, emergent vegetation, and limestone karst microhabitats (Rundell 2008). Belau land snails are also found on two dramatically different soil types, volcanic and limestone, since some of the largest Belau islands are volcanic in origin, but most of the archipelago was formed by limestone and coralline uplift.

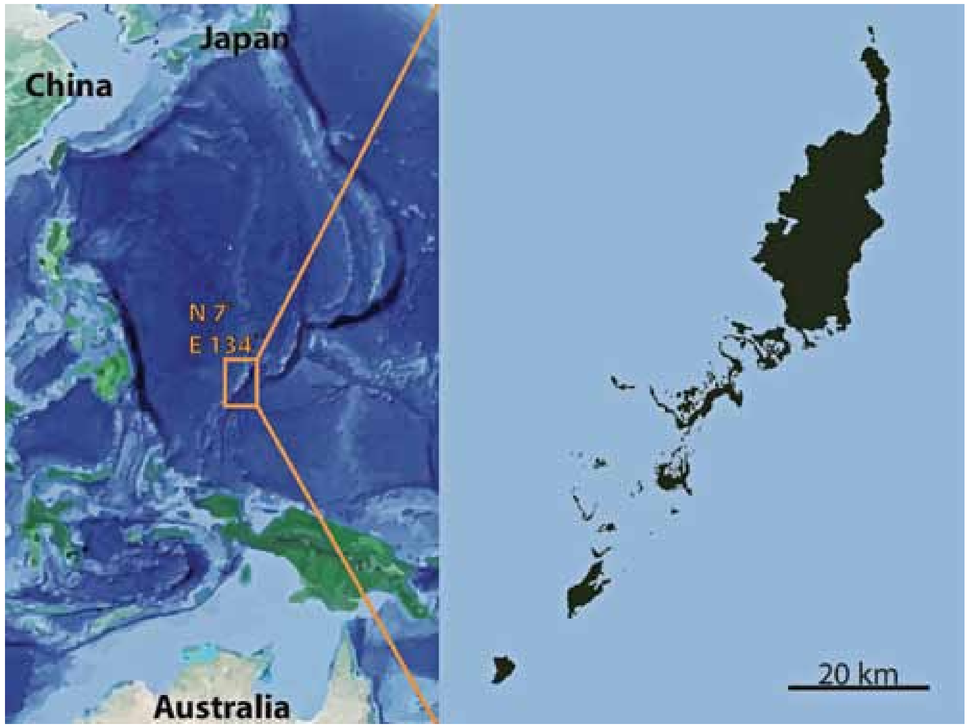


Fig. 1. Map of the Belau archipelago (Republic of Palau, Oceania), N 7°, E 134°. Map created by and reproduced with permission of J. Czekanski-Moir.

Rundell was particularly interested in the land snail family Diplommatinidae in Belau. Like most Belau land snails, diplommatinids are tiny micromollusks. All are less than 1 cm in shell height (Yamazaki *et al*. 2013, 2015a, b). Diplommatinidae is the most species-rich land snail family in Belau (Rundell 2008).

Rundell visited numerous islands in her search for diplommatinids in 2003, recording 63 sites in Belau and 9 in neighboring islands. She and her field assistants visually searched for snails in all three microhabitat types present and, at some sites, collected bags of leaf litter as well. In contrast to previous studies that stress the importance of litter collection for finding micromollusks (Durkan *et al*. 2013), all but one leaf litter-dwelling morphospecies were detected by visual searches. Perhaps, since searchers in Belau were looking almost exclusively for micromollusks, their eyes were better trained to find even the most diminutive snails. Rundell identified snails to morphospecies based on shell morphology (e.g. shell ribs and spines, color, shape, size), and several of these morphospecies were later supported by DNA sequences (Rundell 2008). In total, Rundell and her field assistants found 42 diplommatinid morphospecies in 2003, representing *Hungerfordia*, *Diplommatina*, and *Palaina* genera (Rundell 2008). Specimens were integrated into Field Museum of Natural History Invertebrate Collections and remain on long-term loan to Rundell.

Osborne recently decided to re-examine the 2003 collections to better understand Belau diplommatinid ecology. She used site codes to determine microhabitat type, island, soil type (based on island geology), and political state where snails were collected. She found that all diplommatinid morphospecies were recorded in leaf litter. Over half the morphospecies (25) were leaf litter specialists, and 9 were found in limestone karst and leaf litter (Fig. 2). We were surprised to find so many leaf litter specialists and no limestone karst specialists, since *Hungerfordia* are generally considered limestone specialists (Rundell 2008, Yamazaki *et al*. 2013, 15a, b). Numbers of leaf litter specialists may be inflated, since many snails were found in substrates consisting of leaf litter-limestone rubble mixtures. These were considered “leaf litter” microhabitats at the time. Snails found in mixed substrates may be more properly considered limestone karst specialists, particularly if they were also found in unambiguously limestone karst sites. Only two morphospecies were found in emergent vegetation and leaf litter, and six were found in all three microhabitat types.

We used three alpha diversity metrics calculated in the R package “vegan” (morphospecies richness, Shannon index, and Simpson’s index) and use (combined live-dead specimen counts) to estimate the resource bases in different microhabitat and soil types. We reasoned that sites with larger resource bases would support greater alpha diversity and land snail use. We compared alpha diversity and use

Table 1. Significance of ecological and geographical variables in explaining Belau diplommatinid alpha diversity and use as tested using four-way ANOVA.

		p-value			
Explanatory variable	df	Morphospecies Richness	Shannon Index	Simpson's Index	Use
Political State	13	**<0.001**	**<0.001**	**0.003**	**0.017**
Soil Type	2	**0.010**	**0.018**	0.861	0.140
Microhabitat Type	2	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Soil Type: Island	9	0.059	0.087	0.298	0.258
Residual	122				

across microhabitat type, soil type, political state (as a proxy for geographic region), and island nested within soil type using ANOVA and Tukey's HSD in R. All three alpha diversity measurements and use varied by political state and microhabitat type (Table 1). Soil type explained variability in morphospecies richness and Shannon index but not Simpson's index or use, and no pairwise comparisons across soil types were significant. This could be because soil type data were missing for many sites. Variability explained by political state implies regional differences in alpha diversity and use that could be explored more thoroughly in future analyses.

Alpha diversity and use were significantly lower in emergent vegetation than in limestone karst or leaf litter (Fig. 3). Alpha diversity and use are highest in limestone karst, but alpha diversity differences between limestone karst and leaf litter were nonsignificant. Leaf litter had the greatest range in alpha diversity, with morphospecies richness ranging from zero to six, and limestone karst had the greatest range in diplommatinid use. These results are not surprising. High calcium availability in limestone karst is expected to support many individuals and many morphospecies. Emergent vegetation may provide less calcium and may have fewer humid resting places for snails to exploit, providing a limited resource base and supporting smaller populations and fewer morphospecies. Diplommatinids in emergent vegetation may also face competition from more specialized tree snails, however, Rundell and her field assistants generally spent less time visually searching emergent vegetation sites, since they perceived emergent vegetation searches as less fruitful. It is possible (though unlikely) that a few vegetation-dwelling diplommatinids were overlooked. Leaf litter may provide an intermediate microhabitat type in terms of resource base, with less available calcium than limestone karst but many humid resting places and more food sources from decay plant matter. Inclusion of litter-limestone rubble mixed microhabitats with leaf litter microhabitats may also obscure alpha diversity differences between litter- and limestone-based microhabitats.

We were also curious whether beta diversity varied across microhabitat or soil types. Beta diversity might give

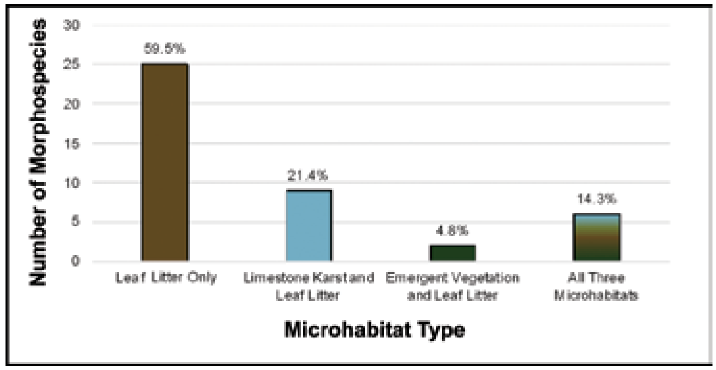


Fig. 2. Number of morphospecies found in each microhabitat type.

an indication of snails' dispersal abilities, since easily dispersing snails may become widespread and drive down beta diversity. We measured beta diversity using Sørensen Coefficient and ubiquity index, the proportion of sites occupied by each morphospecies. Sites in which no diplommatinids were found were excluded from analyses. Sørensen Coefficient measures average dissimilarity in morphospecies assemblage between sites that share common soil or microhabitat type and was calculated using the R package "vegan." Ubiquity index was calculated by dividing total morphospecies occurrences in each site of a given soil or microhabitat type by the total number of sites in that environmental category. Ubiquity index is inversely related to beta diversity, since it measures morphospecies composition similarity between sites. Using the program R, beta diversity in volcanic and limestone soils were compared with two-tailed t-tests, and microhabitat types were compared with ANOVA and Tukey's HSD.

Beta diversity was not significantly different between soil types ($p_{Sørensen} = 0.7488$, $p_{ubiquity} = 0.4902$) but was significantly different between microhabitat types ($p_{Sørensen} < 0.001$, $p_{ubiquity} < 0.001$). Beta diversity was lower in limestone karst than in leaf litter (Fig. 4). Emergent vegetation beta diversity grouped with limestone karst using Sørensen Coefficient but with leaf litter using ubiquity index. This is because the two measurements are calculated very differently. Sørensen Coefficient measures the number of shared

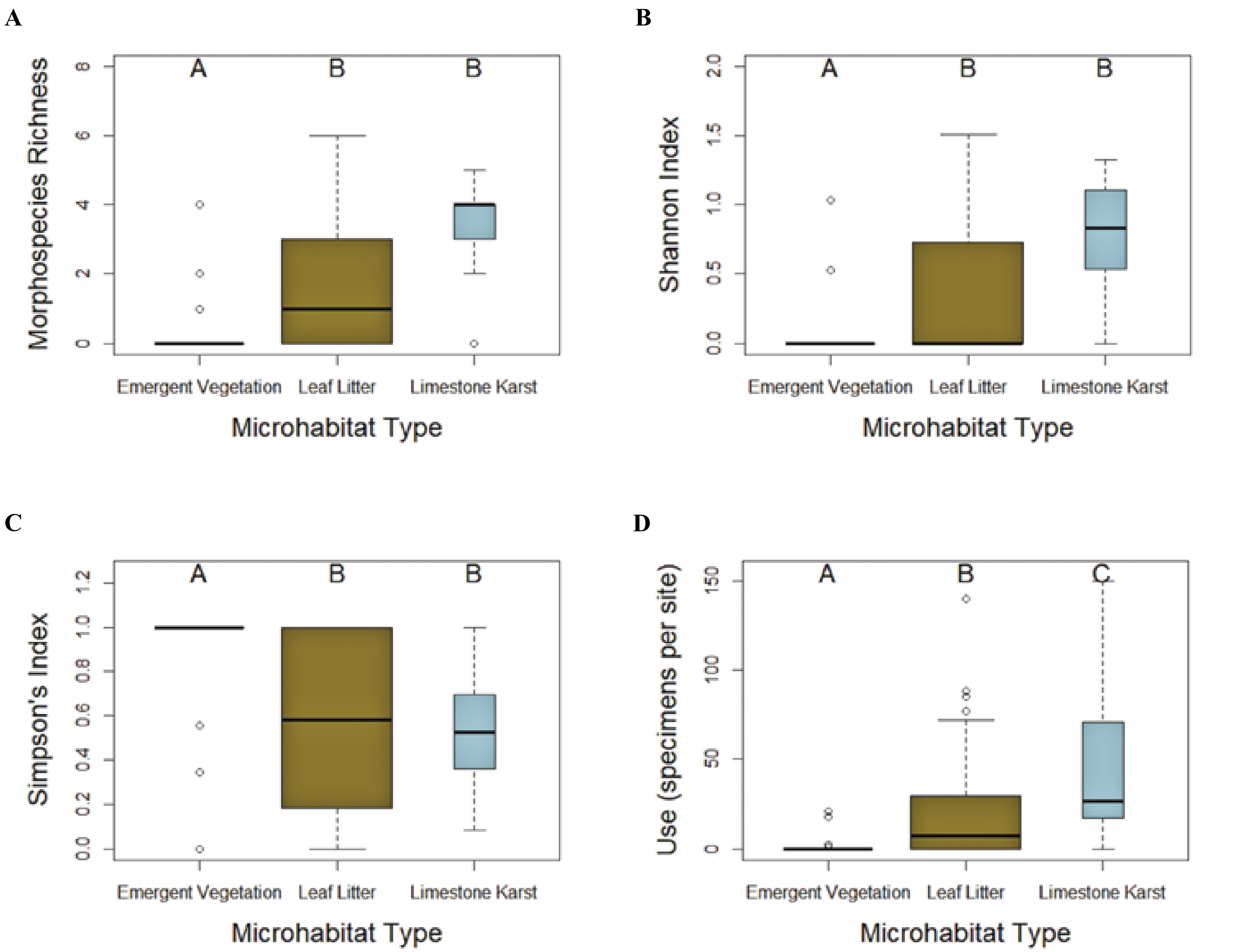


Fig. 3. Alpha diversity and use in different microhabitat types as measured by (A) morphospecies richness, (B) Shannon index, (C) Simpson's index (inversely related to alpha diversity), and (D) use (combined live-dead specimen counts). Microhabitats with the same letter are not significantly different from one another.

morphospecies between sites, while ubiquity index measures the proportions of sites a given morphospecies occupies. Since some emergent vegetation sites were occupied by only one morphospecies, there was relatively high morphospecies turnover between sites. Because there were only six emergent vegetation sites occupied by diplommatinids, even morphospecies found at only one site were relatively "ubiquitous." When unoccupied sites of all microhabitat types were included in analysis, emergent vegetation ubiquity grouped with leaf litter, not limestone karst.

Low limestone karst beta diversity suggests that karst-dwellers are more likely to disperse between limestone karst sites than snails in other microhabitat types are. Since limestone karst is a relatively unsheltered microhabitat type, wind may be the most common dispersal mechanism (Vagvolgyi 1975). Limestone karst snails may more frequently encounter birds as well, who might inadvertently disperse snails stuck to their feathers or that survive the avian digestive system (Wada *et al.* 2012). Prominent shell ornamentation of many limestone-dwelling *Hungerfordia* (Yamazaki *et al.* 2013, 2015a, b) may increase the probability of passive aerial dispersal, either by becoming entangled in features or acting as "wings" when a breeze blows across them. Snails in emergent vegetation may also encounter birds more frequently than do leaf litter-dwellers.

Body size often correlates with ecological variables, and we wondered if this were the case in Belau diplommatinids. For example, smaller animals tend to reach higher densities (Maurer and Marquet 2013), whereas larger animals tend to have larger geographic ranges linked to greater dispersal abilities (Roy *et al.* 2001, Lyons and Smith 2013). We compared maximum species shell heights and collection

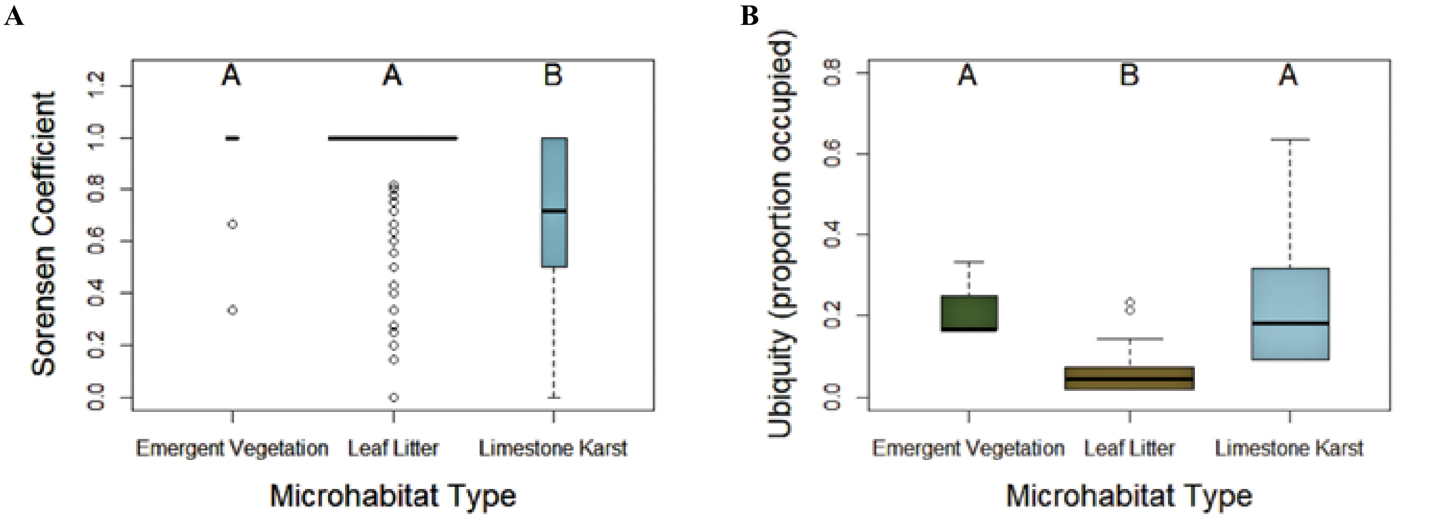


Fig. 4. Beta diversity in different microhabitat types as measured by (A) Sørensen Coefficient and (B) ubiquity index. Microhabitats with the same letter are not significantly different from one another.

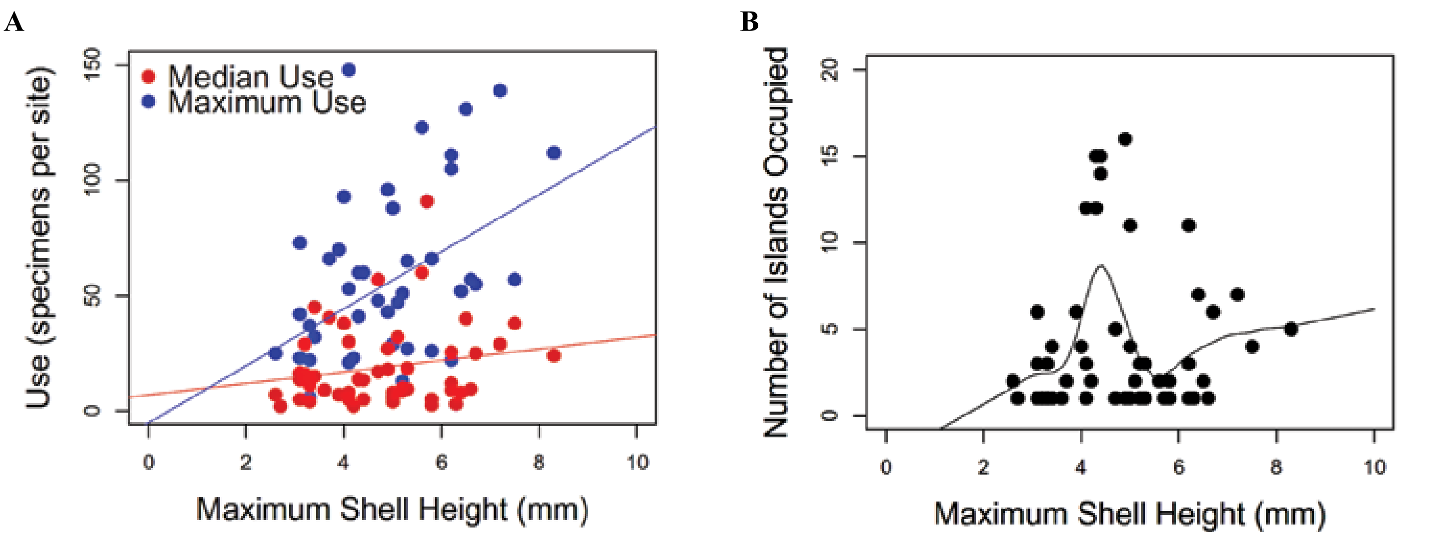


Fig. 5. (A) Correlation between maximum shell height and use (combined live-dead specimen counts) in *Hungerfordia*. Median use in red and maximum use in blue. Lines are best-fit linear regressions; $R^2_{med} = 0.03819$ ($p_{med} = 0.165$), $R^2_{max} = 0.2065$ ($p_{max} < 0.001$). (B) Hump-shaped relationship between maximum shell height and number of islands occupied in *Hungerfordia*. Line is best-fit LOESS regression; α = 0.35, df = 1, GCV = 16.14. Data from Yamazaki *et al*. (2013, 2015a, b).

data reported in recent taxonomic revisions of *Hungerfordia* published by Yamazaki *et al*. (2013, 2015a, b) and found that larger species reach higher densities (as measured by use) and mid-sized species have larger geographic ranges (found on a greater number of islands; Fig. 5).

Hungerfordia are typically found in limestone-rich microhabitats. These findings are in line with alpha diversity and use patterns observed in limestone karst sites in that they are likely the result of a greater resource base in karst. Limestone karst may support not only many morphospecies and individuals but also many individuals from large species. Larger species may have higher fecundity and/or resistance to stress and may thus have a competitive advantage. High beta diversity in limestone karst sites seems to be driven primarily by dispersal of mid-sized snails. Dispersal mode is unknown, and subject of much speculation. Mid-sized species may have higher aerial dispersal rates than smaller species if their larger shell projections increase the probability of attachment to birds (Fig. 6). They may be better dispersers than larger snails, because stronger winds are required to lift and carry larger snails (Vagvolgyi 1975). Our findings are in stark contrast to previous body size research, perhaps because the field has traditionally focused on large vertebrates like birds and mammals. Large vertebrates may have greater nutritional needs and therefore be more resource-limited than land snails, and their dispersal mechanisms are

Fig. 6. A Belau *Hungerfordia* sp. on a limestone rock showing the "prominent shell ornamentation" that may aide in dispersal by wind or feather entanglement.

very different from those of land snails. Perhaps more body size research should focus on small invertebrates like land snails to round out our understanding of body size ecology.

We concluded that diplommatinid specimens collected in 2003 included many leaf litter specialists with low morphospecies turnover between leaf litter sites, suggesting that high resource base and low dispersal rates led to high allopatric speciation. There were few morphospecies or individuals and high morphospecies turnover in emergent vegetation, possibly indicating a resource-poor, relatively exposed habitat, and/or competition from non-diplommatinid tree snails better adapted to emergent vegetation. Limestone karst morphospecies were diverse, widespread, and numerous, possible because of high calcium availability and high aerial dispersal rates between these sites. High calcium availability may support high population densities of large species in limestone, and aerial dispersal seems to favor mid-sized snails.

Compared to other diplommatinids, the Diplommatinidae of the Caroline Islands including Belau are particularly taxonomically diverse and morphologically divergent (Webster *et al.* 2012). High numbers of poorly dispersing leaf litter-dwellers may facilitate allopatric speciation. Microhabitat type specialization may in part drive morphological differentiation. Both leaf litter and limestone karst contained moderate to high alpha diversity and use, suggesting that both microhabitat types can accommodate high degrees of sympatry. Perhaps different ecological processes occurring in each microhabitat type facilitated Belau diplommatinids' remarkable diversification.

We wish to thank the Field Museum of Natural History Division of Invertebrates for their support of RJR's work and R. Ueshima, K. Yamazaki, and M. Yamazaki for their published data that enabled our analyses. We also thank J. Czekanski-Moir for inspiring body size analyses and providing a fine map of Belau, E. Clark for transcribing collection data, and RJR's many field assistants. Conchologists of American, The Lewis and Clark Fund for Exploration and Field Research, and the SUNY College of Environmental Science and Forestry Alumni Association fund TRO's work on Belau land snails.

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Yamazaki, M., K. Yamazaki, R.J. Rundell & R. Ueshima. 2015b. Systematic review of diplommatinid land snails (Caenogastropoda, Diplommatinidae) endemic to the Palau Islands. (3) Description of eight new species and two new subspecies of *Hungerfordia*. *Zootaxa* 4057, pp. 511–538.

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COA *Neptunea* Award

Many of us are beginning plans for the 2018 COA Convention in San Diego,CA. One of the many events on the agenda is the annual COA *Neptunea* Award(s), and it is my privilege at this time 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 re-nominated - in fact their re-nomination is encouraged.** For the present cycle, nominations will close on June 1, 2018, so as to allow ample time for deliberation before the convention. Please note that members of the COA Board of Directors are not eligible to receive the *Neptuna* Award while actively serving on the Board.

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 of 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:

Everett Long
422 Shoreline Dr.
Cedar Point, N.C. 28584-7204
nlong3@earthlink.net

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
2013 (Sarasota, FL): David and Lucille Green, Marlo Krisberg, Charles Rawlings
2014 (Wilmington, NC): Colin Redfern, Tom Rice
2015 (Weston, FL) John and Cheryl Jacobs, Kevan and Linda Sunderland
2016 (Chicago, IL) Rich Goldberg, Homer Rhode, Charlotte Thorpe
2017 (Key West, Fl) Robert (Bob) Janowsky

In advance I thank you for taking time to submit your nominee for consideration.
Everett Long
Award Coordinator

Brunner, L., 2000. The *Neptunea* Award. *American Conchologist* 28(3): 3. Sept.
Lipe, B[etty], 2000. Presidents Message. *American Conchologist* 28(4): 2. Dec.

LC50 of arsenic in Tehuelche scallop *Aequipecten tehuelchus* from San José Gulf in Patagonia, Argentina

Julieta Sturla Lompré, Erica Giarratano & Mónica Noemí Gil

The fishing industry is an important economic activity in Argentina, and in recent years there was a trend of growth in exports, with the main consumer countries Spain (27%) and China (14%). In 2015, 11% of total exports of marine resources were mollusks (Ministry of Agro-industry, 2016). Among the main commercial species of bivalves are the mussel *Mytilus edulis platensis*, the Tehuelche scallop *Aequipecten tehuelchus*, the Patagonian scallop *Zygochlamys patagonica* and the ribbed mussel *Aulacomya atra*. Seafood is considered as the main source of arsenic (As) in the human diet (Mania et al., 2015; Muñoz et al., 2005; Sigrist et al., 2016) and recent reports have shown the presence of this metalloid in some mollusks (Mohamed, 2008; Urtubey et al., 2016) and also in seaweed from North Patagonian Gulfs (Gil et al., 2015). San Jose Gulf is located in northern Patagonia (42º20'S, 64º20'W) in Valdes Peninsula and presents geographical and ecological conditions favorable for the settlement of natural populations of great commercial interest. In this place, the Tehuelche scallop has historically represented the support species of the shellfish activity, especially for the families of artisanal fishermen who live there. Thus, the human influence on the ecosystem is limited to artisanal shellfish activity and the area is not contaminated by urban-industrial effluents (Neyro, 2017).

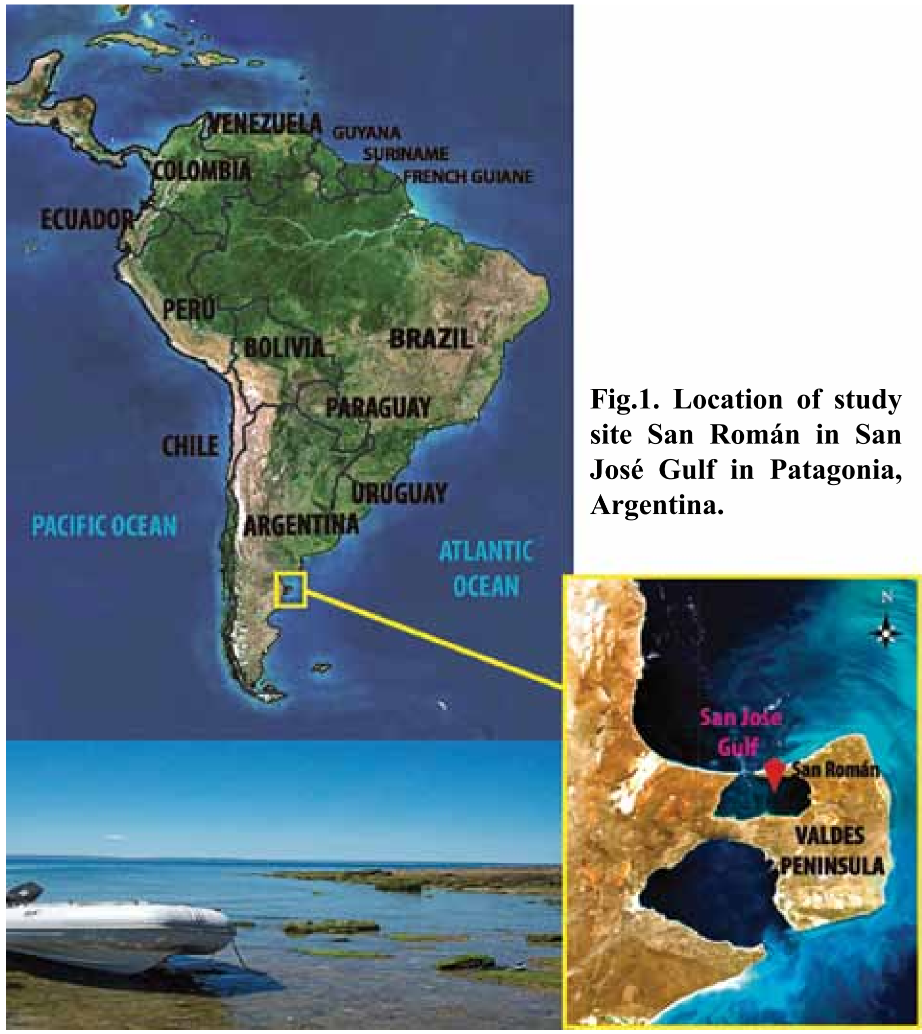

Fig.1. Location of study site San Román in San José Gulf in Patagonia, Argentina.

The goal of the present study was to determine environmental concentrations of As in seawater, sediment, and tissues of scallops, and to define its LC50 by bioassays performed in independent aquariums.

Field and lab work

For the study of total As concentration in the field environment, samplings were carried out in San Román, located in the San Jose Gulf, in winter (August) and summer (January) (Figure 1). Samples of bottom seawater, sediment, and scallops *Aequipecten tehuelchus* (Figure 2) were collected by scuba diving and stored in bottles and plastic bags. In the laboratory, water samples were stored at 4°C, sediments were lyophilized and scallops were dissected into gills, digestive gland, and muscle. Analysis of total As in scallops and sediments was performed in the Laboratory of General Chemistry and Elemental Analysis (LAQUIAE) of National Patagonian Centre (CCT CONICET-CENPAT) using inductively coupled plasma (ICP) Agilent 720 with axial configuration and multi-element simultaneous detection, previous digestion with HNO_3 20 % using a NOVAWAVE SA microwave digester.

The toxicological bioassays were carried out during the winter season. Collected scallops were immediately transported in a cool box to the experimental aquarium in CENPAT to avoid thermal stress during the journey. Animals were acclimatized for one week in filtered seawa-

Figure 2. A) *Aequipecten tehuelchus* in experimental aquaria. B) Soft tissues of *A. tehuelchus*, C) Scallop not exposed to As and D) Scallop exposed to 7.9 mg As L^{-1} for 96 h.

ter at 13±1 °C, without feeding, with continuous aeration, 35 $^{0}/_{00}$ salinity, and 12:12h light:dark cycle. Short-term toxicity tests, with different concentrations of As and controls without As were run by triplicate with six organisms per aquarium containing 6 L of testing solution. Scallops were exposed to 4, 5, 6.3, 7.9, and 10 mg As L^{-1} for 96 hours and those that died were counted and removed every 24 hours. Stock solutions were prepared by dissolving appropriate amounts of sodium arsenite ($NaAsO_2$) in filtered seawater. After the experiment was completed, water was disposed of as Occupational Safety and Biosafety Committee of CENPAT requires. LC50 values and 95% confidence limits were estimated by probit analysis (Finney, 1971).

Relevant results

Total As was detected in sediment and in water samples, with important differences between seasons noted in the case of water (Table 1). This could be due to the seasonal vertical stratification that prevails in winter in the studied area (Amoroso and Gagliardini, 2010). Even though concentrations of As in sediments were below Canadian Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 2002), levels measured in water were above the corresponding safety levels (Canadian Council of Ministers of the Environment, 1997). According to Neff (2002), mean concentration of total As in clean open-ocean waters is about 1.7 µg.L^{-1}, several times lower than the values found in this research. Because of the lack of anthropogenic activities in the San José Gulf, the presence of this metalloid in the environment would be the result of natural processes and probably related to contributions through groundwater and volcanic ashes (Conti et al., 2016; Farnfield et al., 2012; Nordstrom, 2002), however, further research is required to confirm this hypothesis.

Table 1. Arsenic values in water and sediment in San Román in winter and summer. *Canadian Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment, 2002, 1997).

	Winter	Summer	Canadian Guideline value*
Water (µg.L^{-1})	51	14	12.5
Sediment (µg.g^{-1} dw)	4.55 ± 0.40	3.76 ± 0.23	7.24

Levels of total As measured in gills and the digestive gland exhibited strong seasonal variability, with the highest values registered in winter for the digestive gland (Figure 3). The opposite trend was found in gills, where the highest accumulation was measured in summer. These variations could be attributed to seasonal changes in reproductive cycle and food availability leading to alterations in body weight and composition (Giarratano et al., 2011). Conversely, there were no significant seasonal differences in As concentrations in muscle, suggesting that other factors than seasonal availability of food affect accumulation in this organ. Scallops are filter feeders and therefore accumulate high concentrations of many inorganic and organic pollutants in their tissues from dissolved and particulate phases present in the water column (Benali et al., 2015). Gills are one of the main pathways by which metal ions enter into aquatic organisms, being the first target organ of accumulation. There is an ion transfer from gills to digestive organs in bivalves and for this reason, metal concentrations are generally unstable in gills, unlike concentrations in other tissues that remain roughly constant (Zhang et al., 2015).

According to the Undersecretariat of Fisheries and Aquaculture of Argentina, mollusk consumption represented 12.5 % of the total of fishery products placed on the local market in 2016. Despite scallops representing a relatively small percentage in the Argentinian dietary makeup, it is worrying that As in all the analyzed tissues and in both seasons exceeded the limit of 1 µg.g^{-1} in wet weight established by the Argentinian Food Code (2012). While the muscle is the tissue exported to consumers in the USA (1996 tons) and France (1300 tons), according to the Ministry of Agro-industry (2016), in Argentina, the entire soft body is consumed. Because of this, in order to assess the actual human risk, data of whole soft tissue concentrations, consumer characteristics (such as age and weight) and amount and frequency of intake are required.

LC50 bioassays

All physicochemical parameters were constant throughout the experiments and no mortality was recorded in controls. No animal died in concentrations below 5 mg As.L^{-1} while 17 % mortality occurred in 6.3 mg As.L^{-1} concentration after 96 h. For doses higher than 7.9 mg As.L^{-1} the proportion of dead scallops increased after 72 h exposure and reached as high as 78% at 96 h. At the the highest

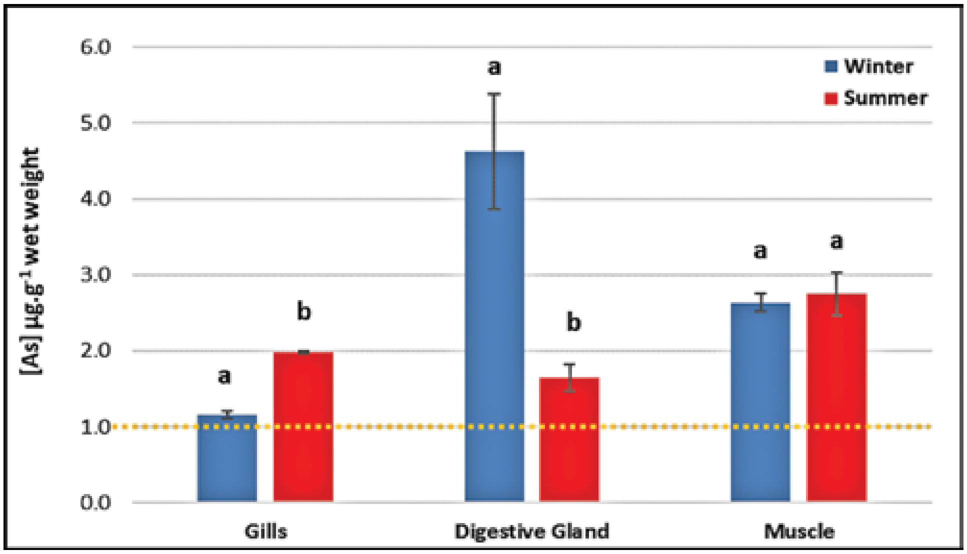

Fig. 3. Total concentration of As in gills, digestive gland and muscle of scallop *A. tehuelchus* from San José Gulf (mean values ± standard deviations). For each tissue, different letters indicate that seasonal variation is significant at $p < 0.05$ (no significant seasonal difference in muscle measurements). The dotted line represents the limit set by the Argentinian Food Code (2012).

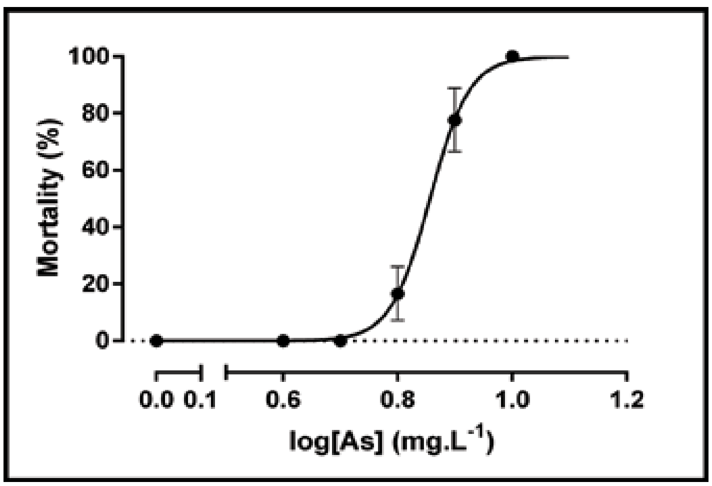

Fig. 4. Dose-response curve for *Aequipecten tehuelchus* exposed to As for 96 h (*n*=3; bars correspond to error standard).

concentration (10 mg As.L^{-1}), 100% mortality was recorded (Figure 4).

The lethal median concentration calculated for 96 h was 7.1 mg As.L^{-1} with 6.7 and 7.6 mg As.L^{-1} 95% confidence intervals. The results obtained in this study indicate that As presented low acute toxicity for *A. tehuelchus* compared with other scallop species such as *Argopecten irradians*. In that sense, Nelson et al., (1976) reported a lethal concentration of 3.4 mg As.L^{-1} for *A. irradians*, but this experiment was carried on at 20 °C in contrast with our study at 13 °C. The metabolism of animals is closely related to the temperature and that could be the reason for the remarkable difference between the species. It is likely that exposure of *A. tehuelchus* to natural stress due to high environmental As in San José Gulf provides an adaptation for tolerance to As.

Even though the high LC50 value would indicate that *A. tehuelchus* has As tolerance, this toxic could affect at cellular level, threatening the health of the organisms as well as the sustainability of the related shellfish activity. Thus, it can be expected that in the near future increased health risks to the scallop will be evident in biomarkers of exposure and effect, particularly in view of the high As levels found in San José Gulf.

The results of this study provide useful information not only for scientific community, but also for organisms responsible for artisanal fisheries management and seafood quality control.

Acknowledgements

The authors wish to thank the National Parks Administration and Undersecretary of Conservation and Protected Areas (Chubut Province) for their permission to carry out the present study in the Natural Reserve of Valdes Peninsula in Chubut, Argentina. This research was partially supported by COA grant and it has been performed in the framework of the PhD research of Julieta Sturla Lompré, which is focused on the evaluation of the effect of natural contaminants in bivalves with commercial value. The authors thank Dr. Enrique Rodríguez for his help with the probit analysis.

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Marvel from the Deep

From Simon Aiken in the U.K. comes this intriquing image of *Alviniconcha hessleri* Okutani & Ohta, 1988 (approx. 26mm) from the Mariana Back-Arc Basin (about 3,200 meters in depth). At present there are five recognized species within the genus *Alviniconcha*, distinguishable only by DNA sequencing; morphologically they appear identical. This is not, however, a major concern for collectors as these cryptic mollusks come from deep-sea hydrothermal vents, a rather difficult collecting environment.

2017 Gulf Coast Shell Club Shell Show

Jim Brunner

The Gulf Coast Shell Club is proud to announce that this year's winner of the COA Trophy goes to the that non-native, invasive species known as the *Carolinian collectorum*, a.k.a. Ed Shuller & Jeannette Tysor for their 31 foot display, "Malacologists Important in Naming North Carolina Marine Mollusks." The duPont Trophy was won by Doug Thompson for "North Florida Pride," a 40 foot display of panhandle shells. The second winner of the new Vokes Trophy was Gene Everson, with a 26 foot display of striped shells - a very pretty and interesting display (the Vokes Trophy was first presented last year). Another 'major' award is the Helen Norton Trophy, awarded for a winning display of self-collected shells won by Linda and myself with a display called, "Three Bay Sampler," (31 feet of display cases on Northwest Florida Panhandle shells). And the Founder's Award was won by our Irish member Elizabeth Gibb with her display, "Shape Up," on different shell shapes. The scientific judges were Dr. Harry Lee and Dr. Richard Batt. The artistic judges were Dr. Robin Harris and professional artist Carol Mitchell.

Judging takes place at 5:15 pm. Exhibitors set up from 12:30 until 5. Around 3:15 we became concerned that one exhibitor who had 38 feet of displays had not yet appeared. A call indicated that they were in the process of loading their cars. At 4:57 they arrived. Then something magical occurred. Not a word was spoken but everyone in the room stopped what they were doing and headed out the door to the parking lot. In came the cases where knowledgeable people took over the task of making sure backboards were behind the proper cases. And, at 5:13 it was done! Judging began at its scheduled time of 5:15. We have been doing shows since 1976 and have never witnessed anything like this. Gulf Coast Shell Club – you rock!

Once again we were jam-packed in our venue with close to 400 feet of scientific displays and 40 feet of artistic displays. We also had a record attendance and the dealers made out quite well. All in all a very successful 20th Show.

Our Irish member Elizabeth Gibb with her Founder's Award winning display on shell shapes.

Ed Shuller & Jeannette Tysor won the COA Award for their 31 foot display, "Malacologists Important in Naming North Carolina Marine Mollusks."

Before the show we offer a field trip. We took some members and guests out in St Andrews Bay on a snorkeling trip. We visited several beaches and had an unexpected visitor - Buddy, the shelling dog. At one of the beaches on Shell Island he joined us and when we waded so did Buddy. When we got into the boat to change places so did Buddy. We knew his name because of his collar and tags. The island has only one house on it and no roads. We called the number on Buddy's tag and reached his owner. Buddy was returned home safe and sound after a day of profitable shelling.

Marco Island Shell Club 37th Annual Shell Show

The Marco Island Shell Club 37th Annual Shell Show and Sale was a great success, thanks to the people who supported the show by attending, viewing the exhibits, and making purchases in the gift shop. Proceeds benefit the Club's scholarships and grants program. THANK YOU TO ALL! This year's judges for the Scientific category were Alan Gettleman from Merritt Island, Florida, and John Chesler from Plantation, Florida; judges for the Artistic category were Sue Hobbs and Phil Dietz, both from Cape May, New Jersey.

Amy Tripp with her COA Award from the 2016 show (current image not provided).

2017 Marco Island Shell Show Scientific Award Winners:

The Conchologists of America (COA) Award - Amy and Bill Tripp for "Metro Tsunami Beach Shells/Marco Island."

The Du Pont Trophy - Doug Thompson for "Lion Paws."

The Dr. William O. Reid Plaque - Bob and Alice Pace for a fossil display.

The Top Novice Scientific Trophy - Gail Jacobson for "Oyster Shell."

Best Miniature Shells Trophy - Nancy Graev for *Melampus coffea* (Linnaeus, 1758)

Outstanding Self-Collected Marco Island Shell Collection Trophy - Paulette Carabelli

Florida Gulf Coast University presents the Most Outstanding Self-Collected Marco Island Shell - Mary Ann Coke for *Laevicardium pristis* (Bory de Saint-Vincent, 1827)

Florida Gulf Coast University presents the Best Photographic Mollusk Display - Amy and Bill Tripp.

The Friends of Rookery Bay present the Best Florida/Caribbean Self-Collected Single Shell Trophy - Amy and Bill Tripp for a lettered olive (*Oliva sayana* Ravenel, 1834).

Judges Special Merit Ribbons - Amy and Bill Tripp for "Metro Tsunami," and Mary Ann Coke for "Worm Shells."

Top Junior Awards - Amelia Vasquez and Hatti Hughes.

Keppel Bay Shell Club 50th Annual Shell Show

Sian Houghton and John Boyle with their COA Award for "50 Shells from Keppel Bay."

Second Annual West Coast Shell Show

Roger Clark won the COA Award for his *Neptunea heros* (Gray, 1850) exhibit. He also won Shell of Show for a self-collected specimen from Alaska.