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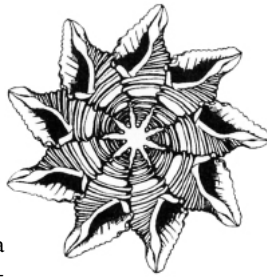
thomas@nerite.com www.conchologistsofamerica.org

American
CONCHIOLOGIST



Quarterly Journal of the Conchologists of America, Inc.

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.

OFFICERS

President: Harry G. Lee
4132 Ortega Forest Dr.
Jacksonville, FL 32210
shells@hglee.com

Vice President: Wayne Humbird
54 Tamarind Ct.
Lake Jackson, TX 77566-3127
whumbird@earthlink.net

Treasurer: Steven Coker
202 Canyon Oak Dr.
Lake Jackson, TX 77566
(979) 297-0852
shellman7000@sbcglobal.net

Secretary: Phyllis Gray
1212 S. Eola Drive
Orlando, FL 32806-2218
(407) 422-0253
phyllis.gray@amecfw.com

Membership: Karlynn Morgan
PO Box 11703
Winston Salem, NC 27116-1703
karlynnmorgan@earthlink.net

Trustee: Everett Long
422 Shoreline Drive
Swansboro, NC 28584-7204
nlong3@earthlink.net

Editor: Thomas E. Eichhorst
4528 Quartz Dr. N.E.
Rio Rancho, NM 87124-4908
(505) 896-0904
thomas@nerite.com

Website Administrator:
Marcus Coltro
1688 West Avenue apt 805
Miami Beach, FL 33139
marcus@femorale.com

Convention Coordinator:
Anne Joffe
1163 Kittiwake Circle
Sanibel, FL 33957-3605
sanibelchiton@aol.com

Immediate Past President: José Leal
3075 Sanibel-Captiva Road
Sanibel, FL 33957-1580
(239) 395-2233
jleal@shellmuseum.org

Awards & Endowments Director:
Donald Dan
6704 Overlook Drive
Ft. Myers, FL 33919
(239) 481-6704
donaldan@aol.com

Historian: **VACANT**
volunteers please contact
Harry G. Lee: shells@hglee.com

Academic Grants Chairwoman:
Jann Vendetti
Twila Bratcher Endowed Chair in
Malacological Research
Nat. Hist. Museum of L.A. County
900 Exposition Blvd.
Los Angeles, CA 90007
jannvendetti@yahoo.com

Member at Large:
Jim Brunner
2511 Parkwood Drive
Panama City, FL 32405-4444
jili@knology.net

Member at Large:
Doug Wolfe
109 Shore Dr., Shell Landing
Beaufort, NC 28516-7861
(252) 728-3501
dawolfe@ec.rr.com

Member at Large: Ed Shuller
409 S. Carroll Street
Apex, NC 27539-5360
eshuller@mindspring.com

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Editor:

Tom Eichhorst
4528 Quartz Dr. N.E.
Rio Rancho, NM 87124-4908
(505) 896-0904
thomas@nerite.com

Advertising Director:

Betty Lipe
11771 96th Place
Seminole, FL 33772-2235
blipe@tampabay.rr.com

Staff: Lynn & Richard Scheu

COA Webmasters:
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2017 COA CONVENTION
Key West, FL
August 15 - 19, 2017

Welcome to
The Conch Republic

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COA Convention
2017

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In memoriam:

Bruce Crystal (see p. 38)
Anne Marrou
Phil Poland (see p. 33)
Thomas C. (Van) Vanlandingham

Front cover: *Ovatipsa chinensis* (Gmelin, 1791) (the Chinese cowry, 27mm), photographed at night in Ambon Bay, by Charles Rawlings. For details of his trip to Ambon, and more great mollusk photographs by Charles, see his article starting on p. 4.

Back cover: *Diminovula culmen* (Cate, 1973), is a small ovulid (10-13mm) and like most of this family is much more colorful in life with its mantle fully extended than when viewed as the dried shell. This is also a photograph by Charles Rawlings from his Ambon trip.

A trip to Ambon or the quest for a living Bednall's volute

Charles E. Rawlings, M.D., J.D.

It was a dark and stormy night; the seas were a washing machine of mixed waves and currents – no, wait a minute, that's actually another story. Here the bay was a plate of still 82° water, reflecting the night sky in all its brilliance. Four divers, Lynn Murphy, Carl Ehrlich, Denise Lute, and myself, did slow back-rolls into the warm inky dark water. The slow, almost hypnotic, purring of our regulators was the only sound. The clear water was illuminated by shafts of light from our torches. We gently hovered over the top of a dark sand slope at 30 feet and then slowly began to descend following the slope, which was scattered with coral bommies, soft coral trees, and coral rubble. Then, of course, there were the shells – literally dozens of them – cones, harps, cowries, murex, bat volutes – to mention but a few. We did multiple night dives in Ambon and each night we enjoyed a similar experience. Even our day dives were filled with wonders, ranging from murex on shipwrecks to small ovulids in soft corals whipped by current. That was diving in Ambon. Of course traveling there is a bit of an effort.

Indonesia is the largest island country in the world, consisting of more than 13,000 islands, and is the most populous Muslim-majority country with a population of more than 255 million, of which over half live on the island of Java. Indonesia stretches from Sumatra in the west to Irian Jaya in the east and includes Borneo, Java, Bali, Sulawesi, and Ambon, along with the Malukus (Fig. 1). As can be imagined, being a tropical island nation, the molluscan fauna should be diverse and expansive. Moreover, during the past several years, *Volutoconus bednalli* (Brazier, 1878), Bednall's volute, has supposedly been collected in that region, or at least labeled as Indonesian. Because photographing a living Bednall's is almost my holy grail, I decided to search it out. Thus the trip to Ambon in the heart of the Malukus. In addition, both the Wallace and Weber lines indicate that Bednall's and other semi-Australian fauna could be found in that area (see sidebar p. 7 & Figure 2).

The Maluku Islands, also known as the Moluccas, are the original Spice Islands in the Eastern Seas and were seized by the Dutch East India Company in the 1620s. From then on they were exploited for not only their spices but also their exotic objects including shells. Accompanying this collecting zeal arose the art of describing the objects of curiosity, especially the natural history objects including shells. Among these noted descriptors was one of the first conchologists/malacologists, Georgius Rumphius (1627-1702). For almost 50 years, from 1653 until his death, Rumphius



lived on Ambon, and provided detailed descriptions and illustrations of its natural history objects of curiosity, including mollusks. Rumphius authored two books with those descriptions: *Herberium Amboinese* (1741) and *D'Amboinsche Rariteitkamer* [*The Amboinese Curiosity Cabinet*] (1705). In 1868 the naturalist A.S. Bickmore travelled to the Malukus with *The Amboinese Curiosity Cabinet* in hand and confirmed the accuracy of Rumphius' original descriptions and illustrations (Bickmore, 1868). Most recently, H.L. Strack described similar results in the *Rumphius Biohistorical Expedition to Ambon* (1990), again confirming the accuracy of Rumphius and his conchological observations. These expeditions corroborate the accuracy of Rumphius and his observations, but do they verify the biogeographical diversity of Indonesian mollusks? According to both the Wallace and the Weber lines (and keeping in mind that both men based their faunal division largely on land vertebrates rather than mollusks), the Malukus should possess a molluscan fauna unlike that of Bali, Sulawesi, or even the Philippines.

Lynn Murphy and I arrived in Ambon after 30 hours of flying and an overnight in Jakarta with its pouring rain. As an aside, Jakarta had, once again, suffered a terrorist assault only weeks before – see the bombing of Starbucks. I, however, never encountered or experienced any animosity in this predominantly Muslim portion of the nation. People were apologetic if anything. The people of Ambon are delightful

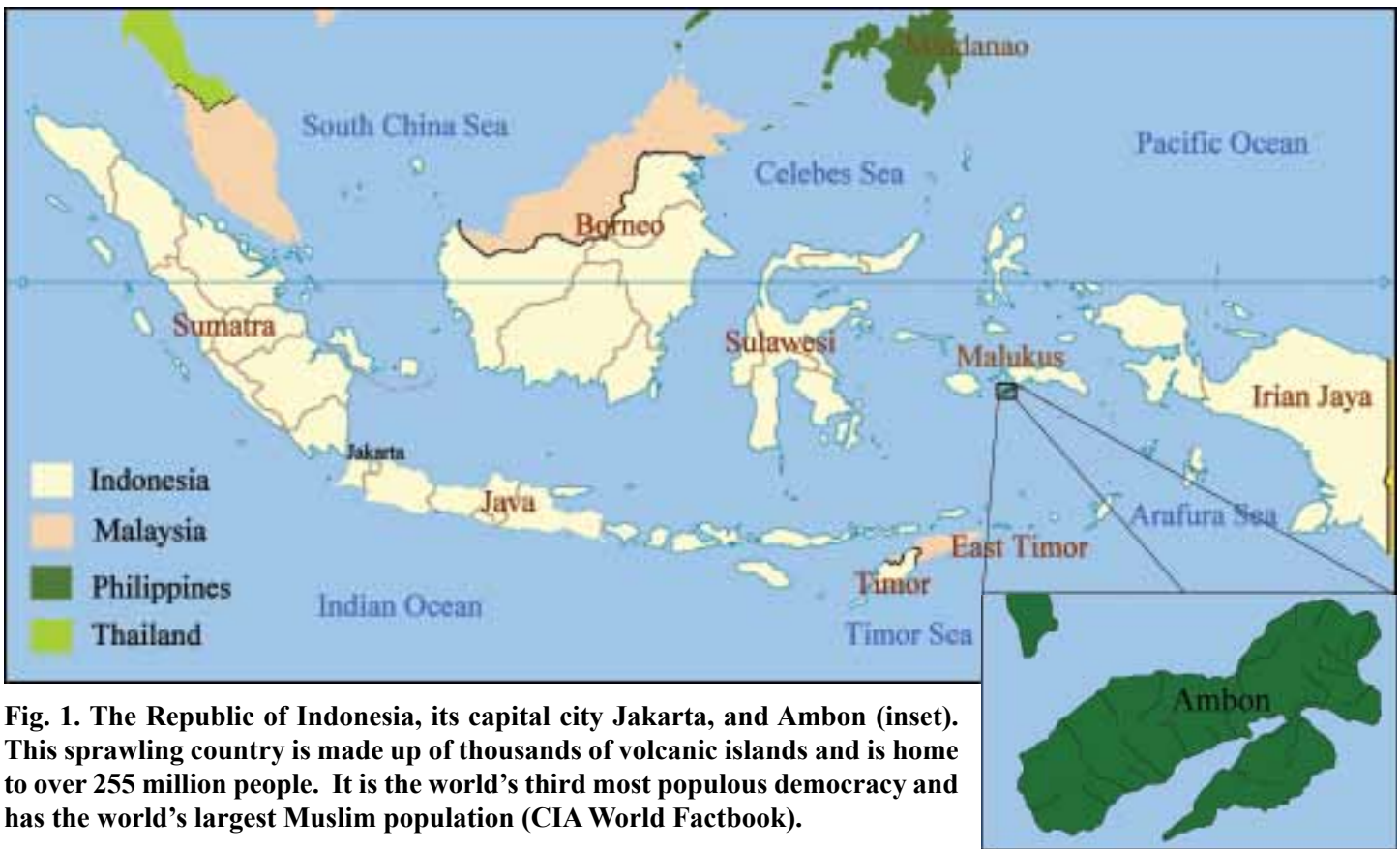


Fig. 1. The Republic of Indonesia, its capital city Jakarta, and Ambon (inset). This sprawling country is made up of thousands of volcanic islands and is home to over 255 million people. It is the world’s third most populous democracy and has the world’s largest Muslim population (CIA World Factbook).

as were the staff of Maluku Divers who were to help us in our collecting. I also had several friends along, Lynn Murphy and the Ehrlichs, to assist in finding and documenting as many molluscan species as possible. That we did, finding over 130 species of mollusks during our eight days of diving. Alas, these were not species unique to Ambon, but the murex, cones, cowries, and ovulids were both plentiful and diverse – a known characteristic of the Maluku (species lists 1-4).

Leaving the torrential rain in Jakarta, I arrived in Ambon, to warmth, sunny skies, and an eagerness to dive. Over the next eight days we averaged between three and four dives a day, and almost always added in a night dive. Between the four of us, we totaled over 150 hours underwater, about 30 of which were done at night. The dives were primarily done in the large bay that almost splits the island of Ambon in half (Fig. 1). We also managed

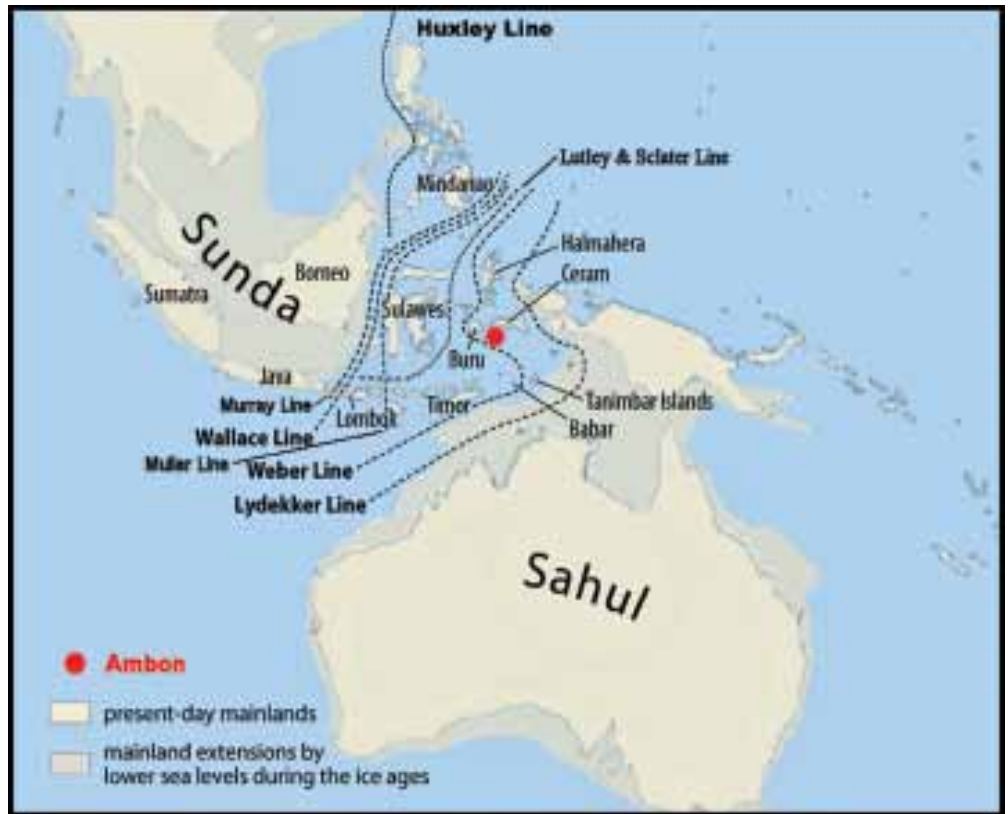


Fig. 2. The Wallace Line (and everyone else’s as well). The important thing to note is that all but Lydekker place Ambon in the Australian biogeographical region. For further explanation see sidebar p. 7.

dives along the outside of the island. Such dives are almost never available due to poor weather, prevailing winds, large waves, and unpredictable currents. Nonetheless, we were fortunate enough to have several days that allowed us to dive on the outside reefs of Ambon.

While diving in Ambon and the Malukus is generally described as “muck” diving, the fact is that almost all tropical underwater habitats can be found in Ambon. Our dive locations varied from almost pure sand and mud with trash, to exquisite virgin coral reefs. The habitats inside the bay ranged from true “muck” diving (looking for mollusks over a featureless sand and mud slope while dodging garbage) to carpets of *Halimeda* hard algae, hydroids, and fields of lush, soft coral open in the raging current. We also dove several wrecks ranging from WWII to recent, piers, and even pillars of coral. On the outside of the island we dove several giant pinnacles and sheer walls of virgin coral reef, all bathed in a two knot current. In addition, due to the large tidal exchange, Ambon Bay is subject to serious currents, and some dive sites must be timed based on the current. Of course the best soft coral and their associated ovulids are located in the sites with the most ferocious currents. As a result some of my photographs were obtained in a stiff current, balancing a large camera, attempting to focus on a creature not much larger than a grain of sand. Regardless, we were able to investigate almost every habitat within divable range. No habitat went uninvestigated and our diving depths averaged around 60 feet, ranging from about 20 feet in the shallows while I once hit 130 feet in the depths of a WWII wreck.

As noted above, we were able to document over 130 species of mollusks. These ranged from the common species encountered across the Indonesian/Filipino (Indo-Malayan) biogeographical area, to the obscure ovulids. In fact, I was able to photograph several species of ovulids and *Simnias* which are unidentified. In addition, the cephalopods were also well represented during our dives. Almost every cephalopod encountered in the Indonesia and Filipino area can be found in Ambon and the Malukus. These ranged from common reef squid to many of the octopus species, including: *Octopus cyanea* Gray, 1849 (the day octopus), *Amphioctopus marginatus* (Taki, 1964) (the coconut octopus), *Thaumoctopus mimicus* Norman & Hochberg, 2005 (the mimic octopus), and *Wunderpus photogenicus* Hochberg, Norman & Finn 2006 (yes, that is its actual scientific name, commonly called the wonder octopus). I was able to identify three cuttlefish species: the common *Sepia latimanus* Quoy & Gaimard, 1832 (the broadclub cuttlefish), *Sepia bandensis* Adam, 1939 (the uncommon dwarf cuttlefish), plus my favorite *Metasepia pfefferi* (Hoyle, 1885) (the flamboyant cuttlefish). Surprisingly, a species of *Nautilus* is also found along the outside reef of Ambon, *Nautilus pompilius* Linnaeus, 1758 (the chambered nautilus). While we set several

traps over several nights, we did not trap any of these elusive creatures. We did, however, find their shells washed up on the beaches facing the outer reefs.

Let's turn to the issue of Bednall's volute, a mollusk that should be found in Ambon and the Malukus based upon biogeography and reports. In short from what I observed, this mollusk is not found in the area and seems to be restricted to the Australian biogeography. Bednall's volute is a rather rare shell that is found, by report, between 20 and 100 feet on a sandy silt with mud bottom. Most specimens are brought up by commercial fishermen and shrimpers, and its early biogeography was primarily the Arafura Sea just north of Darwin. More modern reports have it also occurring in Indonesia in the Maluku Islands. The animal appears never to have been photographed alive (thus my quest). Bednall's is apparently not located in Ambon or any of the nearby islands. After speaking with local collectors, fishermen, and shrimpers, they have never encountered one in the area. In addition, having placed several fish traps at varying depths in Ambon Bay, Bednall's were never found in the catch. The point of all this information is that, from a biogeographical standpoint, while both Wallace's and Weber's lines may define a general area of faunal occurrence and maybe even a limit, they do not define an actual range for Bednall's Volute. Moreover, they do not seem to apply to most of the molluscan species in and around Ambon. Bednall's volute should be found in the area around Ambon especially Ambon Bay. The bottom is appropriate (sandy silt with mud), the current is adequate, food is plentiful (harps, another carnivorous mollusk, were encountered on almost every night dive), and the depth range is suitable. In short, while Bednall's volute should occur in the waters around Ambon, it does not.

Clearly neither Wallace's nor Weber's lines apply to most of the Ambon molluscan fauna with regard to biogeography. Ambon is on the Australian side of the lines, but the fauna is more Asian. Bednall's, if it is indeed located in Indonesia, must be found further south, in those islands almost adjacent to and within the Arafura Sea. Bednall's must truly be located in the Australian biogeography locale, southeast of both Weber's and Wallace's line. As a result, Bednall's must be found around Darwin or the very southern Malukus.

So we didn't find, collect, or photograph Bednall's volute. We still were able to collect hundreds of shells and I was able to obtain multiple photographs of truly unique mollusks. One day we would be diving shipwrecks finding map cowries and plucking large specimens of murex from the crumpled remains of once ocean-going ships. On one such dive I was able to essentially pick and choose the best specimens of *Chicoreus brunneus*, *C. palmarosae*, *C. saulii*, and *C. torrefactus* on two dives. Another day we would be diving the outer reefs and bays being entranced by the beauty of pristine coral reefs and the associated shells including cones, *Lambis*, *Strombus*, and cowries. Other days would be spent

Wallace Line

The Wallace Line or Wallace's Line is a notional biogeographical boundary proposed by Alfred Russel Wallace (1823-1913) that separates the faunal ecozones of Asia and Australia. Wallace's Line runs from off the northwest coast of Australia, through the Indonesian Islands (an area called Wallacea), to the southeast of the Philippine Islands. It divides the Indonesian Islands southeast of Borneo and northwest of Sulawesi. During extensive travels in the area Wallace noticed that animals (mostly mammals, insects, and especially birds) differed between these two areas and it seemed the boundary was along the line he proposed. His theory was published as a paper he read to the Royal Geographical Society on 8 June 1863 (and published in volume 33 of their *Journal of the Royal Geographical Society* later the same year).

Wallace attributed this division to the breakup of a large continent into the Indonesian Islands of Sulawesi (his Celebes) eastwards (including Australia), and the expansion of Asia eastwards (largely through volcanic activity), including the Indonesian Island of Borneo. Wallace noted the deeper sea between these two groups and the shallower seas within each group. Plate tectonics and continental drift have since provided a more precise mechanism for the split (Oosterzee, 1997). Huxley proposed an extension of the Wallace line through the Philippines. Wallace was not the only (or even the first) to draw a line dividing the Indonesian Islands. Other lines were proposed by Salomon Muller in 1846, Murray in 1866, Thomas Huxley in 1868, Richard Lydekker in 1896, Lutley & Sclater in 1899, and finally Max Carl Wilhelm Weber (1852-1937) in 1902 (Oosterzee, 1997). Even Ernst Mayr got involved by redefining Weber's Line in 1944 (Oosterzee, 1997). In 1919, Weber (along with G.A.F. Molengraaff) named the two land masses connecting many of the islands in the area exposed by lower sea levels during the ice ages (Ballard, 1993). The land mass connecting Asia to Sumatra and Borneo was called Sunda and the land mass connecting Australia with Papua New Guinea and smaller islands was named Sahul. Both names had been used earlier and separately by other authors.

The term Wallace Line was actually coined by Thomas Huxley in 1868. Both Wallace and Huxley were contemporaries of Charles Darwin and much has been written about their various interactions, including their activities concerning the Theory of Evolution.

Wallace is considered a co-discoverer of natural selection. He corresponded with Darwin about his findings, resulting in a joint presentation of scientific papers to the Linnean Society in London (*On the Tendency of Species to form Varieties* [Wallace]; and *On the Perpetuation of Varieties and Species by Natural Means of Selection* [Darwin]) in 1858. Darwin followed this up with the 1859 publication of *On The Origin of Species*. Although some authors have attempted to portray Darwin's publication as a usurpation of Wallace's ideas, both men had worked for decades developing their ideas of natural selection (a term not used by Wallace until Darwin's tome was published. Wallace felt privileged to be included in the presentation of his paper to the Linnean Society and considered Darwin a mentor and friend. In Wallace's *The Malay Archipelago* (1869) he wrote the following: "To Charles Darwin author of "The Origin of Species" I dedicate this book not only as a token of personal esteem and friendship but also to express my deep admiration for his genius and his works." This book is still in print.



in the large Ambon Bay where I would spend time photographing an assortment of ovulids, *Simnias*, and other assorted esoteric mollusks. Finally, every night, once the sun set and the water darkened, we would back-roll into a shell collector's paradise of nocturnal mollusks on the prowl, including cones, cowries, harps, tuns, and the list could go on. Again, for a more comprehensive species indexing, see the lists at the end of this article detailing the cones, cowries, ovulids and murex that we collected. There is no question that the trip was worth the 30 hours of flight time, the list of specimens and photographs speak for themselves. Finally, thanks must go to Maluku Divers where we stayed and with whom we dived. Coincidentally, two of the very best creature spotters, Nus and Ali, now work and run the resort. We have dived with them for several years, starting a decade ago when they were at Kungkungan Bay Resort in Sulawesi. It felt like old times with the best in the world. If you have an opportunity visit Ambon and collect to your heart's content.

Table 1*
Cowrie Species from Ambon

Cribrarula cribraria (Linnaeus, 1758)
Cypraea tigris Linnaeus, 1758
Eclogavena quadrimaculata (J.E. Gray, 1824)
Erosaria erosa (Linnaeus, 1758)
Erosaria gangranosa (Dillwyn, 1817)
Erosaria helvola (Linnaeus, 1758)
Erosaria labrolineata (Gaskoin, 1849)
Erosaria miliaris (Gmelin, 1791)
Erronea caurica (Linnaeus, 1758)
Erronea cylindrica (Born, 1778)
Erronea erronea (Linnaeus, 1758)
Leporicypraea mappa (Linnaeus, 1758)
Luria isabella (Linnaeus, 1758)
Lyncina carneola (Linnaeus, 1758)
Lyncina leviathan (M. Schilder & F.A. Schilder 1937)
Lyncina lynx (Linnaeus, 1758)
Lyncina vitellus (Linnaeus, 1758)
Mauritia arabica (Linnaeus, 1758)
Ovatipisa chinensis (Gmelin, 1791)
Palmadusta lutea (Gmelin, 1791)
Palmadusta ziczac (Linnaeus, 1758)
Staphylaea staphylaea (Linnaeus, 1758)
Talostolida teres (Gmelin, 1791)

*Taxa listed according to the World Register of Marine Species (WoRMS) available online at www.marinespecies.org. Thus *Erosaria* (Troschel, 1863) is used even though some consider it a junior synonym of *Naria* Broderip, 1837. The editors of WoRMS limit the use of *Naria* to *N. irrorata* (Gray, 1828) and *N. ostergaardi* (Dall, 1921) until such time as more extensive research further defines the phylogenetic position of the two genera.

Table 2*
Cone Species from Ambon

Conus (Gastridium) geographus Linnaeus, 1758
Conus (Lividoconus) lividus Hwass in Bruguière, 1792
Conus (Pionoconus) consors G.B. Sowerby I, 1833
Conus (Pionoconus) monachus Linnaeus, 1758
Conus (Pionoconus) striatus Linnaeus, 1758
Conus (Puncticulis) arenatus Hwass in Bruguière, 1792
Conus (Rhizoconus) capitaneus Linnaeus, 1758
Conus (Rhizoconus) hyaena Hwass in Bruguière, 1792
Conus (Rhizoconus) miles Linnaeus, 1758
Conus (Rhizoconus) vexillum Gmelin, 1791
Conus (Splinoconus) capitaneus Fulton, 1938
Conus (Fraterconus) distans Hwass in Bruguière, 1792
Conus (Strategoconus) generalis Linnaeus, 1767
Conus (Elisaconus) litteratus Linnaeus, 1758
Conus (Pionoconus) magus Linnaeus, 1758
Conus (Conus) marmoreus Linnaeus, 1758
Conus (Gastridium) obscurus G.B. Sowerby I, 1833
Conus (Phasmoconus) parius Reeve, 1844
Conus (Strategoconus) striatellus Link, 1807
Conus (Cylinder) textile Linnaeus, 1758
Conus (Rolaniconus) varius Linnaeus, 1758
Conus (Virgiconus) virgo Linnaeus, 1758

*Taxa listed according to the World Register of Marine Species (WoRMS) and Tucker & Tenorio (2009) to determine the use of the numerous genera and subgenera of Conidae.

Table 3*
Ovulids from Ambon

Calpurnus verrucosus (Linnaeus, 1758)
Cuspivolva tigris (Yamamoto, 1971)
Dentiovula aff. *eizoi* Cate & Azuma in Cate, 1973
Diminovula culmen (Cate, 1973)
Diminovula stigma (Cate, 1978)
Hiatovula rugosa (Cate, 1973)
Margovula marginata (G.B. Sowerby I, 1828) (syn. *Pseudosimnia sinensis* (G.B. Sowerby III, 1874)
Ovula ovum (Linnaeus, 1758)
Phenacovolva rosea (A. Adams, 1854)
Phenacovula subreflexa (G.B. Sowerby II, 1848) (syn. *P. gracilis* (G.B. Sowerby II in A. Adams & Reeve, 1848))
Primovula rosewateri (Cate, 1973)
Serratovolvula minabeensis Cate, 1975

*Taxa listed according to the World Register of Marine Species (WoRMS). The editors of WoRMS use Cate (1973) and Lorenz & Fehse (2009) to determine the use of the numerous genera and subgenera of Ovulidae.

Table 4***Murex Species from Ambon**

Chicoreus brunneus (Link, 1807)
Chicoreus paini Houart, 1983
Chicoreus palmarosae (Lamarck, 1822)
Chicoreus ramosus (Linnaeus, 1758)
Chicoreus saulii (G. B. Sowerby II, 1841)
Chicoreus torrefactus (G.B. Sowerby II, 1841)
Haustellum haustellum (Linnaeus, 1758)

*Taxa listed according to the World Register of Marine Species (WoRMS). The editors of WoRMS use various sources for the Muricidae.



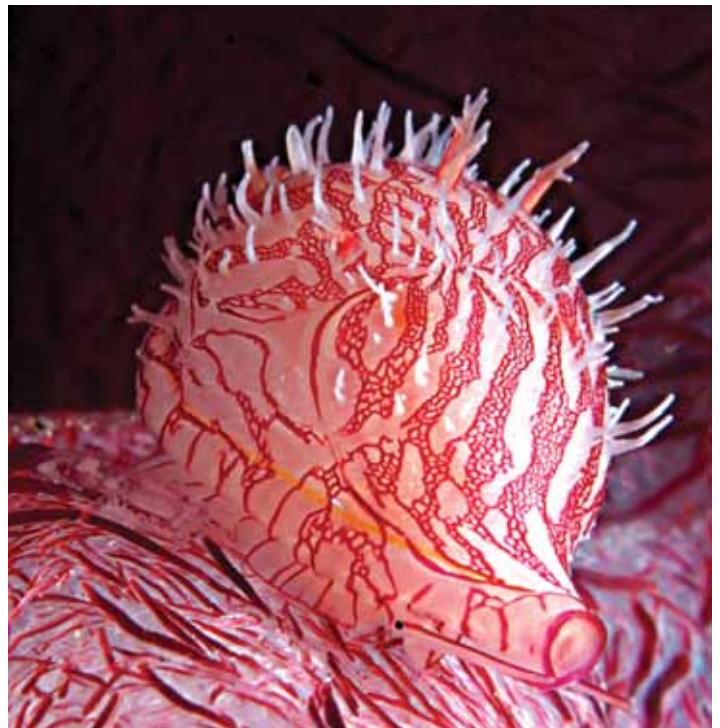
The elusive *Volutoconus bednalli*. This 112 mm specimen was trawled in the southern Maluku Islands, at 40-45 meters, off Tanimbar Island (about 300 miles south of Ambon). Image courtesy of Bill Frank, webmaster, www.jaxshells.org.



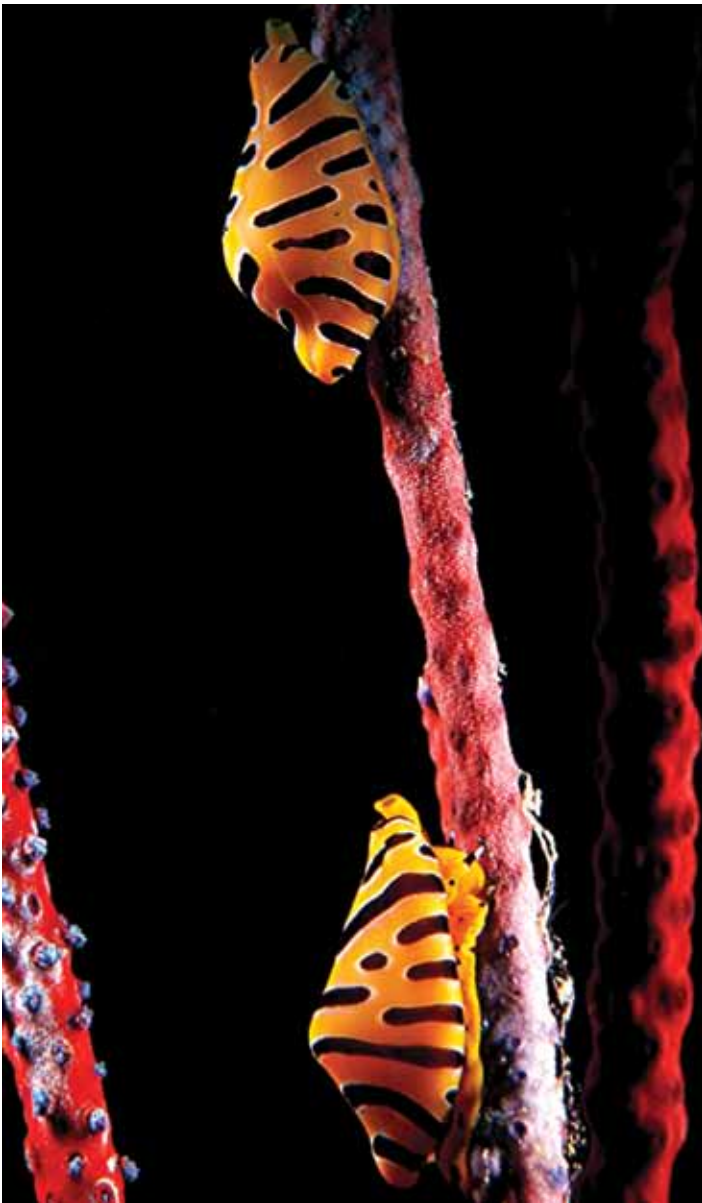
Metasepia pfefferi, the flamboyant cuttlefish, photo by the author, 60 feet on sand & rubble slope, Ambon.



Calpurnus verrucosus, the leather coral cowrie, photo by the author, 40 feet on leather coral host, Ambon.



Serratovolva minabeensis, photo by the author in 80 feet in a 2 knot current. The animal covers a shell which is approximately 8mm in length.



Cuspidovula tigris, 10mm, the tiger ovulid, photographed by the author in 40 feet in a 2 knot current, Ambon.



Dentiovula aff. *eizoi*, photographed by the author in 90 feet. This species is approximately 4mm in length.



Cymbiola vesperilio, the bat volute, approx 75mm, photographed by the author at night in moderate depth, Ambon. This animal has obviously had a rather serious misadventure, but has obviously made a nice recovery.



Umbraculum umbraculum, approx. 70mm, photographed by the author at night in the same area as the *C. vesperilio* above.



Primovula sp., less than 5mm, photographed by the author at night, Ambon.

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Phenacovolva subreflexa is the currently accepted name with *P. gracilis* (G.B. Sowerby II in A. Adams & Reeve) now considered a junior synonym. Photographed by the author at night in moderate depth, Ambon.

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CHARLES E. RAWLINGS, M.D., J.D.
426 Old Salem Road
Winston-Salem, NC 27101
336-725-6444
rawlings@rawlingslawfirm.com
www.livingmollusks.com

Identifying Florida Glycymerids

Marlo F. Krisberg

Abbott (*American Seashells* 1974), Mikkelsen & Bieler (*Seashells of Southern Florida - Bivalves* 2008), and Hartmann (*Bivalve Seashells of Florida* 2006) each identified four glycymerids occurring in Florida waters.

Glycymeris americana (DeFrance, 1826)

Glycymeris decussata (Linnaeus, 1758)

Glycymeris spectralis Nicol, 1952

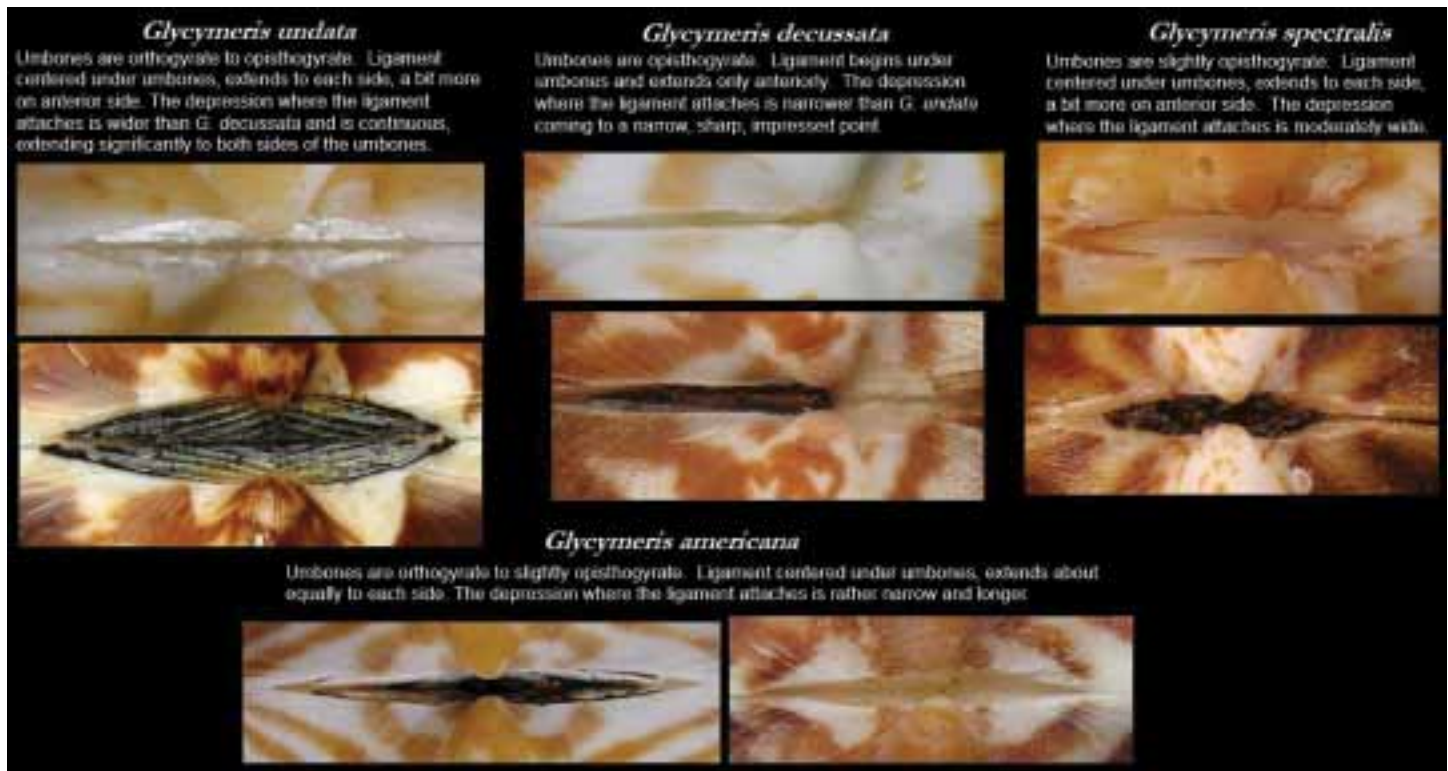
Glycymeris undata (Linnaeus, 1758)

In reviewing their work, that of others, and my examination of a limited sample for each taxon as to those characters that distinguish among these four, I found that only three characters taken together can be relied upon. All other features were too variable and occurred across all four of these taxa. The one character I relied upon as the first and non-variable feature for separating them was the ligament/ligament depression. The second character was the direction of the curling of the umbones (orthogyrate [curling directly toward each other] or opisthogyrate [curling posteriorly]). Workers have described each of these taxa as having umbones that are orthogyrate or opisthogyrate, however, I found that for the two taxa described as opisthogyrate (*G. decussata* and *G. spectralis*), this was consistently so, but that for

the two taxa described as orthogyrate (*G. americana* and *G. undata*), this was not consistently so. Some *G. americana* were slightly opisthogyrate and *G. undata* displayed much variability, sometimes being quite opisthogyrate. The third character was the sculpture of the exterior radial ribbing. While this character was useful, it was also quite variable within a taxon, and often might be indistinguishable from variations within other taxa of this group. This character was greatly influenced by maturity, wear, and also differed on different portions of the shell. It became useful in final confirmation of an identification once the possibilities were narrowed after considering the ligament/ligament depression and curling of the umbones.

A note about the comments by Abbott and Hartmann that the exterior radial ribs of *G. undata* are “separated by lines of white.” This condition is frequently present on both *G. undata* and *G. decussata* (and also sometimes *G. americana*) resulting from the darker mottling colors not being present or being very much lighter in the interspaces. This circumstance is well illustrated by Hartmann’s photo of *G. undata* and her photo (on the right) of *G. decussata*.

The following comparative guides illustrate the three key characters I’ve noted.



A comparison of the umbone and ligament features of the four species.



A comparison of the sculpture of the exterior radial ribbing of each species.



This plate and the table on the following page provide some visual comparisons and general comments concerning these four glycymerids that can be considered after an identification is made using the three key characters described above. These features, however, are all quite variable and may be present for any single specimen across all four taxa.

Comparison of Florida *Glycymeris*

character	<i>americana</i>	<i>decussata</i>	<i>spectralis</i>	<i>undata</i>
ligament/ ligament depression	Centered under umbones, extending well to each side; relatively narrow	Anterior of umbones; narrow	Centered under umbones, extending to each side, more extended on anterior side; moderately wide.	Centered under umbones, extending to each side; wide. Ligament with chevron-like sculpturing.
umbones	Orthogyrate (curling directly toward each other) to slightly opisthogyrate	Opisthogyrate (curling posteriorly)	Slightly to quite opisthogyrate	Orthogyrate to quite opisthogyrate
Ribs	Wide, rather flat, but distinct major ribs with several riblets on the major ribs; interspaces proportionally narrow compared to major ribs.	Wide, rather flat major ribs with several riblets on the major ribs; interspaces narrow, and may be indistinguishable from interspaces between riblets on major ribs.	Prominent and narrowish major ribs with riblets on major ribs; interspaces proportionally quite wide compared to major ribs.	Wide, flat, very weak major ribs with fine radial cuts on the major ribs; interspaces narrow to sometimes proportionally widish compared to major ribs.
Concentric lines	Faint crossing ribs and interspaces creating faint reticulated pattern	Faint crossing ribs and interspaces creating faint reticulated pattern	Faint crossing ribs and interspaces	Faint crossing ribs and interspaces creating faint reticulated pattern. Concentric ridges occur near the ventral margin.
size	largest - to 98 mm	to 40 mm	smallest - to 25 mm	to 50 mm
exterior color	Background white with lots mottling of orange/brown. Mottling color usually substantially dominates.	Background white with mottling of dark to reddish brown. Background color usually dominates.	Usually uniformly shades of light brown, but occurs almost all white.	Background white with mottling or bands of reddish to orange brown. Mottling colors sometimes dominate.
interior color	all white	white, may have some orange/brown	white with brown	white, may have some orange/brown

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Many thanks to José H. Leal, Director of The Bailey-Matthews Shell Museum, and G. Thomas Watters, Curator of Molluscs, The Ohio State University Museum of Biological Diversity, for loan of their collections of glycymerids, and to Dan Teven for providing specimens of the difficult to obtain *G. undata*. And, thanks to those others who reviewed their collections in an attempt to reply to my appeal on Conch-L and provide specimens of *G. undata*.

Marlo F. Krisberg
marlo@cfl.rr.com
[http://z14.invisionfree.com/Conchologist_Forum/
index.php?act=site](http://z14.invisionfree.com/Conchologist_Forum/index.php?act=site)

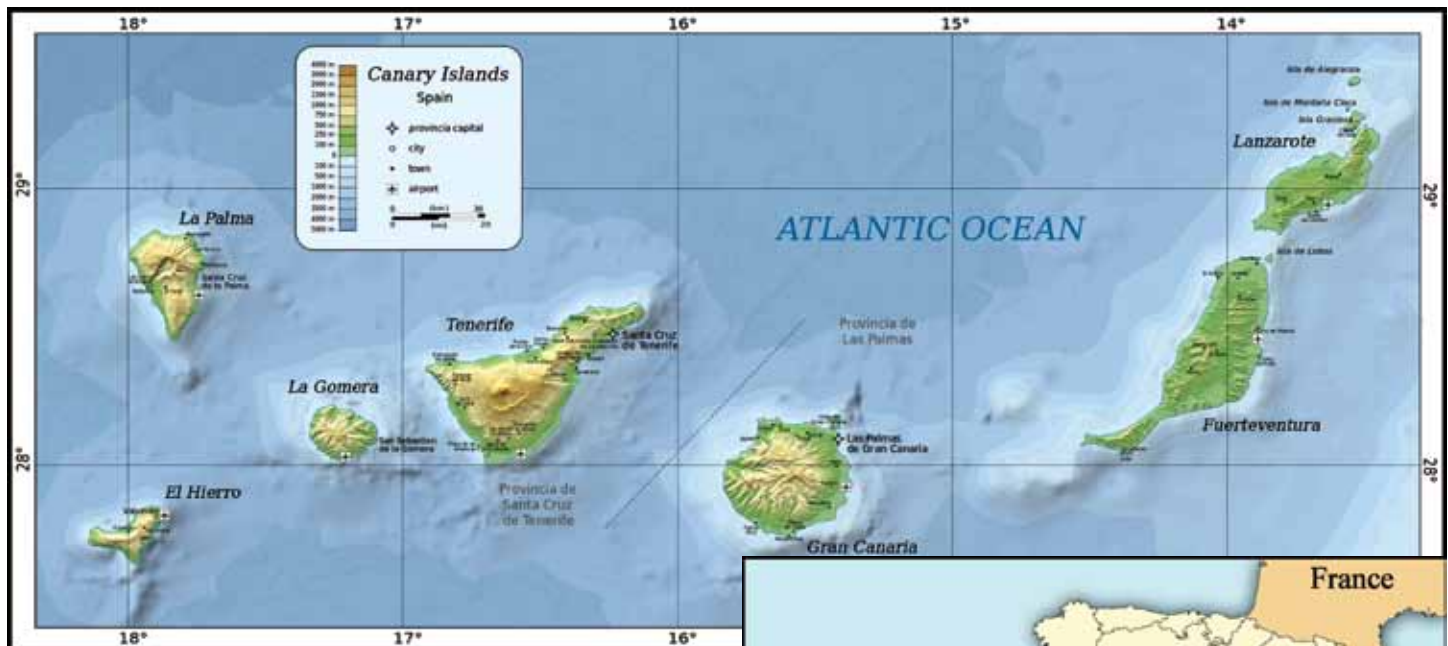
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COA grant project in the Canary Islands

Alexander F. Wall



The Canary Islands (Islas Canarias) are an autonomous community of Spain (think a state with more self-governing authority) with a population of over 2 million. The climate varies greatly by island and on each individual island. Images adapted from Wikipedia Commons.

Thanks to an academic grant from the Conchologists of America, I was able to travel to the Canary Islands (Islas Canarias) and conduct field research that is the main component of my master's thesis at the University of Cincinnati. I spent 4 weeks collecting 33,233 snail shells from 60 localities with several colleagues. Having been identified, counted, and curated, they are now housed in the University of Cincinnati's malacological collection, which includes the most (and increasingly) complete collection of Canarian land snails in the world.

I am currently preparing my thesis defense, which will occur in June, and writing an article I expect to be published in a peer-reviewed journal. My project focuses on the way snail community composition changes in response to anthropogenic variables. Samples came from a single biome, the coastal scrub, which roughly rings each island. It is characterized by sclerophyllous vegetation and is semi-arid, temperate, and low altitude. It is also exposed to a wide variety of anthropogenic factors originating with agriculture, industry, urbanization, and recreation, as well as having undisturbed areas.

By correlating changes in snail communities to anthropogenic factors, I've been able to detect and quantify apparent human impacts on the Canarian malacofauna in this



biome. A clear effect of landscape alteration is a decrease in diversity. Perhaps more importantly, the relationship appears not to be linear, but rather there is a threshold after which the number of species becomes limited. Information like this may be informative, for example, to help conserve the several endangered snail species found in the coastal scrub. I've also found, as others have reported, that human-introduced snails do not seem to be invasive - that is, they don't appear to be expanding their ranges much beyond the areas where they were introduced, but they do tend to be found with cosmopolitan natives, suggesting a homogenization of communities into which they are included.

My lab-mate used thousands of these specimens for her thesis. She is comparing a Pleistocene assemblage



1



2



3

An illustration of the climate variability in the Canaries: 1. is a view of Gran Canaria Island, not tropically lush, but certainly green, 2. is a view of the arid habitat of Fuerteventura Island, and 3. is a view of Mount Teide on Tenerife Island. Images from Wikipedia Commons.

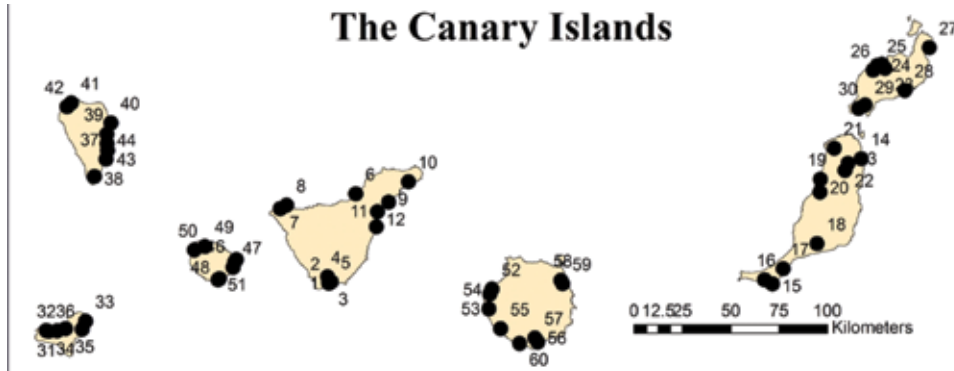


The author searching through a typical sandy arid habitat for shells. Photo by the author.



Shells in the sand. This is definitely not your typical land snail shelling habitat. Photo by the author.

The Canary Islands



The collecting sites on the various islands. Yes, it was a busy four weeks.



Specimens in hand.

of land snails found on Tenerife to the modern specimens collected on that island. She will also defend this summer and has a publication forthcoming. Hundreds of specimens from the collection have also been used in an undergraduate student project exploring body-size response to climatic variables across multiple islands.

All that is to say, the specimens collected using COA funding have resulted in three projects in less than a year. Data already produced constitutes enough information for at least two further projects and little body-size and no taphonomic data has yet been produced [ed. Taphonomy is the study of decaying organisms over time, including how they may become fossilized]. These specimens have borne significant fruit and I expect will continue to do so for a long time.

Alexander F. Wall
 Graduate Student
 University of Cincinnati
 Department of Geology
 500 Geology Physics Building
 Cincinnati, OH 45220
 wallaf@mail.uc.edu

A FUNNY THING HAPPENED ON THE WAY TO A DISPLAY

A couple of years ago, being overly ambitious and woefully under-informed, we decided to do a display of the family Muricidae. Every shell show includes the murexes in the category of “Major Family” and urges the fullest display of the species therein. With over 900 lots of muricidae in our collection how hard could it be?

Really hard! The 900 lots boiled down to about 700 species (OK, I’ll admit that 8 of them are unrecognized forms that I just can’t make myself give up on). Pretty good, huh? That is until you find reliable estimates of over 1,435 named species. Not so good, we are less than 50%.

Let’s do a little math here. Assume you’ve got all 1,435 and you want to do a display. Most of us have cases that are 24 inches wide and we can get an average of twenty shells to the case. That means you only need 72 cases to do the job, a mere 144 feet of table space (whoops, make that 146 feet to allow space for an award – if you don’t get a COA or DuPont for this there is no justice!).

What’s that you say? “Don’t be ridiculous, nobody would do the display and no show would accept it.” But that’s exactly the point I’m trying to make. The major families have grown so large over the years that they are undisplayable (I think I just coined a new word).

So my impassioned plea to shell show chairs, rules committees, judges, and other members of the shell show pantheon of gods is to rethink the category of “Major Family”. Some families currently included are actually small enough that a reasonable totality can be displayed. Others like Muricidae, Conidae, and Cypraeidae are simply too large. We wound up limiting our display to Muricinae. While I’ve seen some excellent treatments of minor families in recent shows I’ve not seen many displays of the major families. Perhaps a category of “A Subfamily of the Major Families” would lead to the reappearance of these long time favorites.

Jim Brunner
 jili@knology.net

The birth of a trophy

Jim Brunner

THE EASY PART

This started easy enough. “You have a great show but what you need is a special trophy to attract exhibitors.” That was all Emilio García had to say to get the wheels turning. Of course all kinds of questions immediately popped up. What will be the criteria for eligibility to win it? For whom or what are you going to name it? What are you going to call it? What is it going to look like?

These were easy questions. It didn’t take much of a brainstorming session to determine that we wanted a trophy that could be won by anyone – large collection or small. Very egalitarian of us. A name was a little harder. Names can be chosen based on a level of expertise shown in the display (Masters, Superstar, etc.), an institution (COA, DuPont, Smithsonian, etc.), or to honor those persons who have helped build our hobby (Abbott, Clench, etc.). As all the really cool titles in the first two categories were taken, we turned our attention to those who had done the most to support our club. No contest! Doctors Emily and Harold Vokes had done extensive work in the Florida Panhandle, especially in the area of fossils. After some correspondence with Emily Vokes, we had permission to use their name on our new trophy.

THE HARD PART

That last question: “What should it look like?” proved to be a real struggle. A wooden plaque with text? Too simple. How about a wooden plaque with a gastropod named by Emily and a bivalve named by Harold mounted on it? When you add the text that’s going to be a huge trophy. So how about just one shell that is named for the two of them. “Emilio, does such a creature exist?”

“Yes: *Siratus vokesorum* García, 1999.”

Emily: “Oh that would be wonderful”.

Well, that was easy. I should have known better. The next question to Emilio: “Do you know of any dealers who might have these in stock?” Answer: “Well, there are only **two** known specimens – one in a private collection in the Bahamas and the type at the Academy of Natural Sciences in Philadelphia.” My day is not going well – not well at all. Emilio: “But I did take pictures of the type. I can send you those.”

A tiny ray of sunshine. Pictures in hand (actually on a thumb drive), it was off to the local trophy shops to see if they could create a decal that could be mounted on an acrylic trophy. Five shops available and naturally it was only the last one that said they *might* be able to do it. Days pass. “No, the pictures are not of high enough resolution.” Rats! Where, oh where am I going to get better pictures? Wait, the type is in Philly at Drexel. I know people there, maybe they can take pictures.

Do you know how hard it is to grovel in an email? But my heartfelt (and increasingly desperate) plea fell upon the sympathetic ears of Paul Callomon, a scholar and gentle-

man of the highest order. Soon my thumb drive was much heavier with the addition of four more photos. Off to my decal guy – but gloom and despair yet again, the answer was the same. Still not enough resolution.

Sometimes, no matter how hard you plan, it is just sheer dumb luck that saves your bacon. Our frying pan this time was the annual Broward Shell Show and the bacon saver was the elegant acrylic trophies that they award. They have found a craftsman who is able to carve their club logo shell into the reverse side of the trophy, giving a three-dimensional quality to the image. Broward’s Bob Pace, another scholar and gentleman of the highest order, provided a name, number, and email.

THE CREATION: A TIME LINE

(Shell Show 17-19 June)

January: Photos sent. “Looks pretty tricky but I’ll give it a try”.

February: Nothing. But then he’s just getting started.

March: Nothing. But there’s still plenty of time.

April: Nothing. Maybe I should call him?!? “I’m waiting on my etcher.” E t c h e r , what’s an etcher?

May: Nothing. Linda: “You seem to be getting a lot more gray hair. Call him.” “Oh, yes. They’re finished, have been for a couple of weeks.”

June: 10 June. Trophies arrive (yes, trophies). We ordered five. We don’t know how old the carver is.

June: June 18. And the winner is..... Vicky Wall of North Carolina. She receives Trophy Number 2. Trophy Number 1, fittingly, was presented to Dr. Emily Vokes.

Would you like to win this trophy? Our next Gulf Coast Shell Show will be on 9-11 June 2017 in Panama City Beach. The exhibit criteria for eligibility to win the trophy are:

The Vokes Trophy: Awarded to the best display, in the opinion of the judges, presenting a fairly balanced presentation of various families of gastropods and bivalves. Other classes may be included but should play a minor role. The display may be worldwide, regional, or from a local area and may include recent shells, fossil shells, or a combination of both. This trophy honors the work of Drs. Emily and Harold Vokes.

After the first show it was concluded that “fairly balanced” would mean that approximately ten percent or more of the shells in the display should be bivalves.

New trophy? Piece of cake!

Jim Brunner
jili@knology.net





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Quarterly Journal of the Conchologists of America, Inc.

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Crown conch royal buffet

Lisa Fitzgerald

What a sight! One fine winter day last January, my sisters, Sunnye Dinger and Suzanne Bobo, and I had just hopped out of Captain Brian Holaway's boat into 3-foot water on the Pine Island Sound side of Cayo Costa Island, Florida, headed for some serious shelling. The tide was too high to get all the way to shore in the boat so we were walking the last bit in the water. Seeing something dark on the bottom up ahead, we edged closer. It was a deceased horseshoe crab, *Limulus polyphemus* (Linnaeus, 1758), being consumed as if it was a grand buffet! Dozens and dozens of crown conch, *Melongena corona* (Gmelin, 1791), of all sizes were fighting for a spot at the table. A look around found them migrating toward the crab in droves.

Once back home, a little research on these hungry conchs was in order. The Smithsonian Marine Station at Fort Pierce online site relates that, "*Melongena corona* is a tropical to subtropical species occurring on both coasts of the Florida peninsula, eastern Alabama, and throughout much of the West Indies south to South America." It later states, "*Melongena corona* is an opportunistic predator/scavenger capable of feeding on a variety of live prey items as well as carrion and detrital material." That explains the frenzy surrounding the dead crab!

About the many named forms, the site states, "Highly variable coloration, size, and shell architecture, and the physical discontinuity of habitat in which *Melongena* is found have led to considerable taxonomic debate as to the designation of distinct species and subspecies. Historically, a number of putative *Melongena* species and *M. corona* subspecies have been collectively been referred to as the "corona complex." Recent DNA sequence analysis conducted by Hayes & Karl (2004), however, provided no support for historic taxonomic subdesignations and indicated that the corona complex consists of the single polymorphic species *M. corona*."

With interest I read that, "Kaplan (1988) indicates that *Melongena corona* can attain lengths of greater than 200 mm, but most individuals are considerably smaller." Further on it states, "Cannibalism has also been suggested as a strategy for achieving large size."



Cannibalism? Gordon Gunter in his 1956 journal article stated: "The crown conch is certainly one of the most active and aggressive of the predaceous snails, and the smaller specimens of its own species are not spared when no other food is available." Who knew?!

The horseshoe crab feast was definitely a treat to observe. No doubt, however, it will be difficult to ever look at a Crown Conch in quite the same way.

Lisa Fitzgerald
1002 County Road 145
Sweetwater, Texas 79556
mwljherring@me.com

Smithsonian Marine Station at Fort Pierce. 2016. http://www.sms.si.edu/IRLSpec/Melongena_corona.htm

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“Got the fever” in the Dominican Republic

Dora Zimmerman (photos by the author)

In May 2015, I found myself in a pool in Southern Maryland with the lifeguards staring at my unusual appearance, probably chuckling to themselves. I was in full snorkel gear swimming back and forth down the lap lanes, learning to snorkel. I was going on a trip! I showed up at this pool four times a week for two hours doing the same routine for the entire month of May. Never having snorkeled before, but being a good swimmer, it was still important to be prepared for my first collecting/snorkeling trip.

Fifteen members of the North Carolina Shell Club went to the Dominican Republic, June 11-19, 2015, on a shelling excursion. This trip was announced a year before to club members. Many of our members had been on trips before with our guide, Glenn Duffy, and everyone knew this would be another quality trip. I had never been on any out-of-country trips and there was so much to do! Thankfully Glenn sent out a recommended packing list of what to prepare for this trip. Once 2015 hit there were trips to the dive shop, visits to my optometrist, prescription goggles ordered, deposits sent in, traveler's insurance obtained, equipment purchased and ordered, luggage purchased, currency exchanged, and practice snorkeling. “I'm ready!”

All 15 club members arrived, Wednesday, June 10, 2015, in Fort Lauderdale, Florida, and after meeting for dinner, were given instructions by our trip organizer, Everett Long, about our departure schedule the next day. No need for real alarm clocks, Everett would call everyone at 3:30 am to be up and ready for our shuttle by 4:15 to the airport, awaiting our 6:30 am flight. Coffee, fruit and Danish were all waiting at the airport for our tired but eager group. Navigating through any airport, for me, is foreign, as I am not a traveler. It was with gritted teeth and wringing hands that I made it all by myself to Fort Lauderdale from BWI Airport in Maryland. I was so happy to give it over to my fellow travelers. I felt like a baby elephant following the herd. Just lead, I will follow. NOW I could relax. Or so I thought...

CULTURE SHOCK!

We landed in the Dominican Republic by 12:00 noon in Santo Domingo and were promptly met by our guides for the trip, Glenn Duffy and his partner, Randy Hooks. Our destination was Las Salinas, located in the province of Peravia, the southwest region of the Dominican Republic. We endured a nail-biting, “take your life in your hands” drive, according to David Bunn, through the downtown streets of Santo Domingo as we headed out of the city. I don't know how many times I gasped in surprise each time I saw someone's life flash before their eyes zipping through this traffic.



Preparing for my first snorkeling shell-collecting trip. Next stop, the waters of the Dominican Republic.



Turns out the next stop was a traffic jam. What is missing from this photo is the cacophony of horns from vehicles going nowhere and raucous exhaust sounds of motorcycles as they zipped in between larger vehicles.

The cacophony of horns from the crowded vehicles jammed on the streets and the buzz of just as many motorcycles darting in and out between vehicles were “music to the ears,” depending on how one looks at it. I live in a rural town in Southern Maryland where I see Amish horse and buggies on the road all the time and the only noise I get from them is the clip clop of horse hooves. Street vendors walked right up to our shuttle vehicle, in between the rushing vehicles around us, selling wares such as birds in their cages, loofa, mangos



The Junta Central Electoral (Central Election Board) was established in 1923 to oversee elections and other facets of civil life in the Dominican Republic. It is also issues birth certificates and identity cards.



Our 12 passenger van that was able to accommodate 17 passengers plus snorkel gear. A bit of a tight fit, but it was certainly worth it to have reliable transportation for the entire group.

and other fruits and nuts, windshield wipers, and seat cushions.

Some of the sights we enjoyed during our drive consisted of the Plaza de la Bandera, the Dominican Republic's version of our country's Tomb of the Unknown Soldier, in Washington DC. We saw small crowded homes built into steep hillsides and along the roadways there were single-level ramblers right next door to even larger, more expensive homes. The larger homes had tall walls made of metal gates, or cement surrounding them due to the fact that squatters will take over once a house is being built. Homeowners put these walls up to keep squatters



My first day in the water and a magical world unfolds: waving sea fans, a male blue-headed wrasse (*Thalassoma bifasciatum* (Bloch, 1791), the females and immature males are yellow and white), and a flamingo tongue (*Cyphoma gibbosum*).

out because once they take over the property, it is difficult to get them off. Glimpses of trees, the royal poinciana (*Delonix regia*), in bright orange bloom and wandering goats were seen throughout our drive. With a quick stop at a local roadside shop, we stocked up on locally grown cashews, mangos, drinks and other treats as we continued to our hotel, the Hotel Salinas, located the bay, Bahia de Las Calderas, arriving around 3:00 pm.

Our hotel hosts, Jorge and Bernice Domenech, checked us in. Before evening set in, members took off to find the local Colmados store to get supplies, such as buckets and bleach. "Colmados" means "full to the brim" in Spanish and equates to the US's version of 7-11 stores. We were

told that we would enjoy delicious meals with fresh seafood and fruits daily while sitting in the dining area that was wide open to the breezes of the bay. Strawberry jam from Knott's Berry Farm in California, was an unexpected sight sitting on our tables during breakfast each morning. The instructions given at dinner by Glenn and our club president, Everett Long, left everybody excited to begin our adventure.

FRIDAY, our first day, we will snorkel off the beaches of Playa de Salinas. Breakfast finished and everybody packed up for the morning trip by 7:30 ready to go. Glenn commandeered the hotel van for us to use during the week. This van, originally intended to fit 12 people, squeezed 17 people in PLUS snorkel gear every day.

THIS IS NEW TO ME!

I watched everybody get out of the van like the seasoned snorkelers they were. While I'm in the process of getting my gear on I noticed, very quickly, that I was all alone! "Where did everyone go?" "Geez, they're all in the water already!" I stood there looking at what's lying in front of me waiting for me to maneuver across to deeper water, endless beds of black sea urchins on shallow exposed flat reefs! "I'm supposed to get over *THAT!*?"

Everybody had their own version of shuffle and scoot and I realized that there was no graceful way to make your way over this "bed of horrors" to get to deeper water. I suppose I looked like I was walking on hot coals during my crossing but I made it.

Once past that shallow obstacle, I put on my mask and found a world of soft, flowing, clear beauty. Masses of bright purple sea fans, gently swaying in the current made it feel like another world! I had never seen this world before! Sometimes I found myself not worrying about searching for shells, I just floated and watched this underwater world and took in all its wonder and beauty.

Collecting environments along the Playa de Salinas area consisted of beach, shallow water, coral reefs, rubble, smooth sandy bottoms, and turtle grass beds. Earlier, Glenn suggested that as we explore the base of reefs and sandy rubble, we "fan" with our hands to uncover mollusks and shells hidden in the rubble. Our search was on for the Atlantic carrier shell, *Xenophora conchyliophora*, known in this part of Dominican Republic to carry black pebbles. "Look for sandy mounds about the size of your hand." Glenn said. I was fortunate to find two my first day, doing exactly as Glenn instructed. Other species gathered our first day were amber pen shells (*Pinna carnea*), Barbados keyhole limpets (*Fissurella barbadensis*), deltoid rock shells (*Vasula deltoidea*), Caribbean spiny limas (*Lima lima*), apple murexes (*Phyllonotus pomum*), speckled tellins (*Tellinella listeria*), carrot cones (*Conus daucus*), milk conchs (*Lobatus costatus*), hawk-wing conchs (*Lobatus raninus*), zig zag scallops (*Euvola ziczac*), and eastern turret shells (*Turritella exoleta*).

Ed Shuller showed us the live, rare-for-this-area, pink or spectral murex (*Chicoreus spectrum*) that he found in 5-6 feet of water on a flat rock shelf at the bottom of the sandy trench. "I almost threw it back because it was totally covered with a white crust and I didn't think it would clean up very well." Looking at this beauty, I'm certain Ed is glad he didn't toss it.

SATURDAY saw us on a path through the local salt flats to get to a different stretch of beach. The sun bakes all the moisture right out of the dirt and leaves a salty crust behind over which we crunched with every step we took on the path. We stopped and watched the salt operations as Haitians, who are trucked in every morning, do endless hours of tiring, hot, backbreaking work to rake up the salt from the



A beautiful example of *Chicoreus spectrum* collected by Ed Shuller. When collected it was heavily encrusted, but it cleaned up nicely.



Workers harvesting salt from the salt flats.

wet salt ponds, scoop it into wheel barrows, dump it into piles, shovel it into bags, and load it on trucks. The pinker the salt, the closer it is to being ready for harvesting. After additional processing elsewhere in the country, it is then used for table salt and ingredients in packaged foods. Susan Rotman went over to a pile and grabbed a handful of it as a souvenir. She decided not to consume it once she got back in the states, but her family enjoyed seeing the freshly harvested salt that came directly from the flats of Las Salinas.

On this particular part of Las Salinas beach we viewed the mountains across Bahia de Las Calderas as they rose in the distance across blue waters. This area was farther south along the Las Salinas beaches and some of our group reported numerous colonies of the purple sea fan (*Georgia ventalina* (Linnaeus, 1758)) swaying with many flamingo tongues (*Cyphoma gibbosum*) attached. Everett Long showed everyone the two reticulated cowry helmets (*Cypraecassis testiculus*) he was fortunate enough to find by chance after he came out of the water. "I was taking my time walking back to the group along the water's edge when I saw the large one almost out of the sand. Upon closer inspection



Two near perfect specimens of *Cypraecassis testiculus* collected by Everett Long. Although considered a shallow-water species, they have been taken at over 100 meters.



The two pistol or snapping shrimp that were in a shell collected by Glenn Duffy. Although quite small, they were able to express a bit of “attitude” against his finger.



Two West Indian *Simnias* on their sea fan home. Their cryptic coloring makes them quite difficult to spot.

I saw the top of the smaller one beginning to appear.” Right time, right place!

Hazel Andress and I were lured by the beach while everyone else snorkeled. Strolling along, we found lamellose wentletraps (*Gyroscala lamellosa*) and Atlantic gray cowries (*Luria cinerea*) tangled in the high tide lines and six West Indian simnias (*Cymbovula acicularis*), attached to a broken piece of purple sea fan washed up in the shallows.

We rested and spent a few moments lying down on our backs on the wet sand, with the water lapping at our toes while we gazed at the blue skies and beautiful scenery. We laid there and giggled like school girls at the fun of it – like we were getting away with something! What a special day.

Some of us would gather on the beach after coming out of the water to see what we found. Glenn and Randy usually dumped their bags out for all to see. Surprising visitors to our shell world were two pistol or snapping shrimp (family Alpheidae) that had their home inside of one of the shells Glenn collected. They were disturbed, to say the least, and one took a little bite out of Glenn’s finger hard enough to draw blood. Small but mighty!

We had a long, hot walk back over the crunchy salt pond trail, which lead Glenn to get the brilliant idea to stop at the Colmados on the ride back for a cold beer for anyone who wanted one. The local store owner must know Glenn from previous tours, so he started pulling plastic chairs out and setting them up on the sidewalk for all to sit on as we bought our cold drinks. Our skin suits and boots were crusted with dry salt and sand, we were dirty and probably smelly, but there was nothing like it. That cold beer, Presidente, was the best beer we ever had! An exceptional way to end a good day!

SUNDAY was a day of change in location. Dominicans from the metropolitan area of Santo Domingo are known to come to the Playa de Salinas beaches as a weekend getaway. Glenn arranged for two local boaters to take us across the Bahia de Las Calderas bay to an area named Palmar de Ocoa, for some un-interrupted snorkeling opportunities. We had to wade through the sticky mud bottom to get to shore when we landed. This area had quite a variety of collecting environments compared to the beaches at Playa de Salinas. Rocky shorelines, sandy and muddy beachlines, shallow sand and turtle grass floors, mangroves, rocky and coral reefs, were all there waiting for us. I was looking along the shore and didn’t realize what I was walking on until Vicky Wall pointed out the many West Indian false ceriths, *Lamparella minimas*, clustered along the muddy water’s edge. An Atlantic morum, *Morum oniscus*, and an Atlantic partridge tun, *Tonna pennata*, were found washed up among the rocks on shore. Bleeding tooth, *Nerita peloronta*, and four-toothed nerites, *Nerita versicolor*, were attached to the base of large boulders and rocks along the water line. Our group had great finds for us to keep, but the mud had a BEST “find” of its own to keep....Susan O’Connor’s flip flop got sucked down in the muddy bottom – never to be found again. She was down to one!

ARMADILLOS? AT THE BEACH?

Chitons are fascinating to me because of how unusual they are with their plates and girdles. Imagine my excitement when I turned over a rock in the shallows of Palmar de Ocoa and found my first ever chiton in its natural environment! There were a lot of rocks and rubble in the area where I was snorkeling so this seemed to be the perfect place for me to find them. The common West Indian chiton (*Chiton tuberculatus*), the largest one I'd collected measuring about 1 ½", was actually kind of scary looking. It reminded me of one of those tropical beetles that are so big! "Alright, now I've found some. Now what do I do?" I found Vicky Wall, a renowned expert at flicking off chitons and preserving them and asked her for her advice.

"You have to get under them quickly with the blade of your knife and flick them off fast or else they will latch on and you won't get another chance to get them off." She showed me with the large one and guided me on how to get them off of the surface. "Put them quickly into a container with salt water and they will eventually relax after curling up into a tight ball." I've seen that happen before and they always reminded me of armadillos curled up in defense. I took her advice and brought back four beautifully preserved specimens.

The much talked-about flock of pink flamingos were located after some searching by Everett Long. We were able to get close enough in our boats to watch them as they stood in the shallow water before they took off over our heads.

From there we boated back across the bay and southward past the Playa de Salinas beaches to an area named Derrumbao, where the local fishermen bring in their boats and fishing nets. After searching around the boats and nets, we realized there was nothing to be found so we geared up and headed into the water. It was here that Jeannette Tysor found a very nice king helmet, *Cassis tuberosa*. The current was very strong and I and a few others decided that instead of fighting it we'd beach-comb. David Bunn was called by the shade of a nearby bush with a beached boat underneath and settled down for a nap, all the while being watched by some friendly goats munching nearby.

MONDAY morning we snorkeled back at the spot where we went Friday till lunch. Afterward we all cleaned up and squeezed into our van and headed to the closest town of Bani, about an hour northeast of Las Salinas, for a little local shopping. Many of us were interested in finding jewelry made with Larimar, a rare blue form of pectolite, which is only mined in the southwest portion of the Dominican Republic. We all quickly learned from store owners, with Glenn and Randy interpreting, that the shops in Bani didn't have Larimar. Bani is not known as a tourist destination for shopping, which explained why Larimar was nowhere to be found. Putting a halt to our search we made the best of our day when Glenn and Randy mentioned the ice cream shop



A small collection of chitons. They look prehistoric and indeed have a fossil record that goes back at least 400 million years. They have been called "coat-of-mail" shells.

they knew about. Ice cream is a wonderful treat anywhere!

We visited a department store that had everything under the sun, but the thing that impressed us the most were the aisles filled with shelves and shelves of deodorant. Also in town was the Cathedral Nuestra Señora de Regla, originally built November 6, 1689. This is a beautiful place to stop and enjoy the architecture of the church. Natural disasters took their toll on the building and many renovations took place over the years. Impressive stained glass windows were put in place in 1993.

I mentioned "culture shock" before. It seemed that the ratio of motorcycles to other road vehicles was almost equal. Motorcycles were just about everywhere you could imagine. There had been motorcycles on the beach at Derrumbao and also the salt flats we traveled on Saturday. I found this pizza delivery motorcycle on the street. I'm used to seeing the stick-on signs on top of cars from local pizza shops. It was just another quirky difference I enjoyed.

Motorcycles were also used as taxis. It wasn't uncommon to see them zipping by with at least four people clutching onto each other, half-way hanging off the sides and back of the motorcycle.

As we drove back to Las Salinas, we stopped at a roadside stand with handmade wooden wares, getting drinks, snacks, and fresh bananas off of stalks. Our shopper, Susan O'Connor was satisfied and happy.

TUESDAY was spent at Punta Salinas (*Punta* means tip or point,) the point of the Playa de Salinas beach area, but on the inner part towards the bay. Glenn said that the inner side of Punta Salinas (the bay side) would have a good low tide very early in the morning. "How early?" we asked. "How do you feel about getting into the water at 6:30 am?" Since we hadn't been on the inside of the bay yet, we said "OK. We're all in!" This area had wide expanses of grass and sand to explore, allowing us to go farther out than we

were able to go in other areas. It was here, across the bay from Palmar de Ocoa and the Pink Flamingos, that I found a long pink feather beached on the sand.

SUCH A ROOKIE!

I'd snorkel for a while then stop and come up to see where others were. Sometimes flippers would pop out of the water as people dove or I'd see a snorkel floating along. Occasionally someone would stand up way out from shore and examine something they found and it was then I realized just how far out I could have gone. That's where the turtle grass beds were and it turns out, those beds proved to be treasure troves as Jeanette Tysor came out with a queen helmet *Cassidulus madagascariensis* and a dog-head Triton *Ranularia cynocephala*. I watched others come out with helmet shells, murexes, rooster conchs, and milk conchs. Glenn found several carrot cones, *Comus daucus*, along with a juvenile Atlantic Triton, *Charonia variegata*, all of which were live. He took a carrot cone and the juvenile Triton back to his container filled with salt water allowing them to relax and come out of their shells. Susan Rotman photographed both in action.

David Bunn had lost one of his flippers earlier but that didn't slow him down. From the turtle grass he brought out a mature Atlantic Triton, *Charonia variegata*, that had been in the process of eating a starfish. A group of us watched the spectacle and after realizing that it wasn't in the water anymore, the Triton promptly spat, bubbled, and squirted the rest of the starfish out. We all jumped back in surprise as the Triton gave us no advance notice. It was a very noisy and splashy process!

This area was full of bivalves. I found zig zag scallops, Pennsylvania lucines, turkey wing arks, king Venuses, and calico clams from the sandy bottom, and I was very satisfied but once I saw people with helmet shells, conchs, murexes, etc., I realized just how much I had missed. Many thoughts ran through my head, such as, "David had only one flipper and look at what he found!" "Why was I not seeing these shells myself?" "Just how many did I overlook?" "I knew I didn't go out far enough." I quickly realized that I needed to gain more confidence snorkeling to feel more comfortable being a little farther from shore. And I definitely did NOT have the practiced eye needed to see these mollusks in their natural habitat. I'm such a snorkeling rookie. My "fever" just rose – I needed to do more of these trips now, so I could get that eye.

WEDNESDAY came, the day before our departure. Half of our group went one more time to snorkel that morning after Glenn offered, while the other half stayed behind and began packing. Even though we all cleaned our shells immediately after arriving back at our hotel each day, I was still a little nervous about getting behind. I opted to stay back and finish cleaning and packing my shells with the expert help of my roommate, Hazel Andress. After having lunch with everyone at the dining area, I finally got the chance to



The "faceless" dolls, carved to represent any of the many ethnicities of the Dominican Republic.

enjoy the salt water pool at the hotel with Hannah Rotman for the rest of the afternoon till dinner. The pool was just below the balcony of the dining area and all week long had always looked so inviting. It was a very nice way to finish the week.

Our hosts, Jorge and Bernice Domenech provided a special dinner buffet for our group as part of our last night's celebration. They outdid themselves with a delicious spread of fresh lobster and seafood, potatoes, and fresh local fruits and vegetables with champagne.

Once dinner was finished, the last minute details began, including finally buying something we walked past every day in our hotel. The "faceless dolls." These beautiful dolls filled the cabinet in the lobby. They were painted with bright colors and details but curiously, there were no facial features. A tag tied to the bottom of them told of their history and why they were called "faceless".

The artists do this intentionally, not showing one specific facial feature due to the fact that people of the Dominican culture are of Spanish, African, French, and Arawak descent. Arawak is an Indian culture that originated in South America. The dolls are usually made of wood or clay. Many of our group purchased some as gifts. We saw more of these dolls in the airport in Santo Domingo.

THURSDAY morning, June 18, we departed Las Salinas at 7:45 am for the two hour ride back to the airport on a shuttle van similar to the one in which we arrived. We arrived at the airport in Santo Domingo at 10:00 am, thanked



The Dominican Republic shellers.

Back row L-R: Vicky Wall, Karlynn Morgan, Dora Zimmerman, Bill Bennight, Ed Shuller, Dana Bunn, Hannah Rotman, Jeanette Tysor.

Front row L-R: Susan Rotman, Susan O'Connor, Gayle Hughes, Charlotte Thorpe, Hazel Andress, Everett Long, David Bunn. (Glenn Duffy behind the camera).

Glenn and Randy for their wonderful trip and all of their hard work, then made our way through check-in, waiting for our flight to Fort Lauderdale, Florida at 2:50 pm.

It was here, at the airport, that we finally found Larimar jewelry!

ONE LAST SHOCK!

I had never experienced Customs before, but I had received advice from many about the process. Now back in Ft. Lauderdale airport, I was still in awe of all the dogs and large guards covered in vests and uniforms. So many people filled the area and lines. It was a very imposing sight and I couldn't help but be nervous. Thankfully, all went well. No sirens, bells or whistles went off and no guards or dogs came to pull me out of line.

After we checked into our hotel, one of the first things most of us did was head out for a good old American meal with a follow-up ice cream from McDonald's! It's funny the things we miss. Everyone had different departure schedules for the next day, so our group said our "goodbyes" the night before we left.

Friday the hand-wringing began as I made my way through the Ft. Lauderdale airport to BWI airport in Maryland. Success! Wheels up to Maryland at 10:41 am. My husband was waiting for me with a bouquet of flowers as a congratulations on the success of my travel.

I had so many people looking after me and helping me all along the way. Their guidance and support made my first experience delightful. Since that trip, I have developed a "fever" for more shelling excursions. With the help of some very experienced club members who took me under their wing, I had the best first time shelling trip! I can't wait for the next one!

SPECIES LIST

June 11-18, 2016 North Carolina Shell Club
Las Salinas, Dominican Republic

Dora Zimmerman, Everett Long, Ed Shuller, Jeanette Tysor, Vicky Wall, Karlynn Morgan, Hazel Andress, Glenn Duffy

GASTROPODS

Eoacmaeidae

Eoacmaea pustulata (Helbling, 1779) spotted limpet

Fissurellidae

Fissurella barbadosis (Gmelin, 1791) Barbados keyhole limpet

Fissurella rosea (Gmelin, 1791) rosy keyhole limpet

Diodora listeri (d'Orbigny, 1847) Lister's keyhole limpet

Tegulidae

Tegula fasciata (Born, 1778) smooth Tegula

Cittarium pica (Linnaeus, 1758) West Indian top shell

Turbinidae

Lithopoma caelatum (Gmelin, 1791) carved star shell

Lithopoma phoebium (Röding, 1798) long-spined star shell

Lithopoma tuber (Linnaeus, 1758) green star shell

Turbo castanea Gmelin, 1791 chestnut turban

Neritidae

Nerita peloronta Linnaeus, 1758 bleeding tooth nerite

Nerita tessellata Gmelin, 1791 checkered nerite

Nerita versicolor Gmelin, 1791 four-tooth nerite

Smaragdia viridis (Linnaeus, 1758) emerald nerite

Vitta virginea (Linnaeus, 1758) virgin nerite

Batillariidae

Lampanella minima (Gmelin, 1791) West Indian false cerith

Cerithiidae

Cerithium lutosum Menke, 1828 dwarf cerith

Cerithium litteratum (Born, 1778) stocky cerith

Modulidae

Modulus modulus (Linnaeus, 1758) button snail

Potamididae

Cerithiopsis scalariformis (Say, 1825) ladder horn shell

Turritellidae

Turritella exoleta (Linnaeus, 1758) eastern turret-shell

Littorinidae

Echinolittorina ziczac (Gmelin, 1791) zebra periwinkle

Cenchritis muricatus (Linnaeus, 1758) beaded periwinkle

Littoraria angulifera (Lamarck, 1822) mangrove periwinkle

Strombidae

Lobatus costatus (Gmelin, 1791) milk conch

Lobatus raninus (Gmelin, 1791) hawk-wing conch

Strombus pugilis Linnaeus, 1758 West Indian fighting conch

Xenophoridae

Xenophora conchyliophora (Born, 1780) Atlantic carrier-shell

Calyptraeidae

Crucibulum auricula (Gmelin, 1791) West Indian cup and saucer

Hipponicidae

Cheilea equestris (Linnaeus, 1758) false cup and saucer

Cypraeidae

Luria cinerea (Gmelin, 1791) Atlantic gray cowrie

Erosaria acicularis (Gmelin, 1791) Atlantic yellow cowrie

Ovulidae

Cyphoma gibbosum (Linnaeus, 1758) flamingo tongue

Cymbovula acicularis (Lamarck, 1811) West Indian simnia

Triviidae

Pusula pediculus (Linnaeus, 1758) coffee bean trivia

Naticidae

Naticarius canrena (Linnaeus, 1758) colorful Atlantic Natica

Polinices lacteus (Guilding, 1834) milk moon-shell

Cassidae

Cassia flammea (Linnaeus, 1758) flame helmet

Cassia madagascariensis Lamarck, 1822 queen helmet

Cassia tuberosa (Linnaeus, 1758) king helmet

Cypraecassis testiculus (Linnaeus, 1758) reticulated cowrie-helmet

Bursidae

Bursa granularis (Röding, 1798) granular frog-shell

Ranellidae

Cymatium femorale (Linnaeus, 1758) angular Triton
Gutturium muricinum (Röding, 1798) knobbed Triton
Monoplex nicobaricus (Röding, 1798) gold-mouthed Triton
Monoplex pilearis (Linnaeus, 1758) Atlantic hairy Triton
Ranularia cynocephala (Lamarck, 1816) dog-head Triton
Charonia variegata (Lamarck, 1816) Atlantic Triton

Tonnidae

Tonna pennata (Mörch, 1853) Atlantic partridge tun

Epitoniidae

Epitonium multistriatum (Say, 1826) many-ribbed wentletrap
Gyroscaia lamellosa (Lamarck, 1822) lamellose wentletrap

Muricidae

Chicoreus spectrum (Reeve 1846) pink murex
Coralliophila erosa (Röding, 1798) short coral-shell
Dermomurex pauperculus (C. B. Adams, 1850) little aspella
Morula nodulosa (C. B. Adams, 1845) blackberry drupe
Phyllonotus pomum (Gmelin, 1791) apple murex
Vasula deltoidea (Lamarck, 1822) deltoid rock-shell

Buccinidae

Gemophos tinctus (Conrad, 1846) tinted cantharus
Pisania pusio (Linnaeus, 1758) miniature trumpet Triton

Nassariidae

Phrontis alba (Say, 1826) variable dog whelk

Columbellidae

Rhombinella laevigata (Linnaeus, 1758) smooth dove-shell
Columbella mercatoria (Linnaeus, 1758) common dove-shell
Nitidella nitida (Lamarck, 1822) glossy dove-shell

Marginellidae

Volvarina avena (Kiener, 1834) orange-banded marginella

Cystiscidae

Persicula pulcherrima (Gaskoin, 1849) decorated marginella

Mitridae

Mitra barbadensis (Gmelin, 1791) Barbados miter
Mitra nodulosa (Gmelin, 1791) beaded miter

Olividae

Americoliva reticularis (Lamarck, 1811) netted olive
Oliva jamaicensis Marrat, 1867

Olivellidae

Olivella nivea (Gmelin, 1791) West Indian dwarf olive

Turbinellidae

Vasum muricatum (Born, 1778) Caribbean vase

Harpidae

Morum oniscus (Linnaeus, 1767) Atlantic morum

Conidae

Conus daucus Hwass in Bruguière, 1792 carrot cone
Conus anabathrum Crosse, 1865 Florida cone
Conus mus Hwass in Bruguière, 1792 mouse cone

Drilliidae

Drillia albomaculata (C. B. Adams, 1845) white-banded drillia

Architectonicidae

Architectonica nobilis Röding, 1798 common sundial

Bullidae

Bulla striata Bruguière, 1792 common Atlantic bubble

Ellobiidae

Melampus monile (Bruguière, 1789) Caribbean melampus

BIVALVIA**Mytilidae**

Modiolus americanus (Leach, 1815) tulip mussel

Arcidae

Anadara notabilis (Röding, 1798) eared ark
Arca zebra (Swainson, 1833) turkey wing
Barbatia candida (Helbling, 1779) white-bearded ark
Barbatia domingensis (Lamarck, 1819) red-brown ark

Noetiidae

Arcopsis adamsi (Dall, 1886) cancellate ark

Glycymerididae

Glycymeris decussata (Linnaeus, 1758) decussate bittersweet
Tucetona pectinata (Gmelin, 1791) comb bittersweet

Pteriidae

Isognomon radiatus (Anton, 1838) Lister's tree oyster
Pinctada imbricata (Röding, 1798) Atlantic pearl oyster

Pinnidae

Atrina rigida (Lightfoot, 1786) American stiff pen shell
Pinna carnea Gmelin, 1791 amber pen shell

Limidae

Ctenoides scaber (Born, 1778) rough Lima
Lima lima (Linnaeus, 1758) Caribbean spiny Lima

Ostreidae

Dendostrea frons (Linnaeus, 1758) frond oyster

Plicatulidae

Plicatula gibbosa Lamarck, 1801 kitten's paw

Pectinidae

Caribachlamys ornata (Lamarck, 1819) ornate scallop
Caribachlamys sentis (Reeve, 1853) sentis scallop
Euvola ziczac (Linnaeus, 1758) zig zag scallop

Lucinidae

Anodontia alba Link, 1807 buttercup lucine
Clathrolucina costata (d'Orbigny, 1846) costate lucine
Codakia orbicularis (Linnaeus, 1758) tiger lucine
Lucina pensylvanica (Linnaeus, 1758) Pennsylvania lucine
Phacoides pectinatus (Gmelin, 1791) thick lucine

Chamidae

Chama macerophylla Gmelin, 1791 leafy jewel box
Chama sarda Reeve, 1847 cherry jewel box
Pseudochama cristella (Lamarck, 1819) left-handed jewel box

Cardiidae

Acrosterigma magnum (Linnaeus, 1758) magnum cockle
Americardia media (Linnaeus, 1758) Atlantic strawberry cockle
Dallocardia muricata (Linnaeus, 1758) yellow cockle
Fulvia laevigata (Linnaeus, 1758) common egg cockle
Papyridea lata (Born, 1778) spiny papercockle
Papyridea soleniformis (Bruguière, 1789) spiny papercockle

Mactridae

Mactrotoma fragilis (Gmelin, 1791) fragile surfclam

Tellinidae

Arcopagia fausta (Pulteney, 1799) faust tellin
Laciolina laevigata (Linnaeus, 1758) smooth tellin
Laciolina magna (Spengler, 1798) great tellin
Tellinella listeri (Röding, 1798) speckled tellin

Psammobiidae

Asaphis deflorata (Linnaeus, 1758) gaudy asaphis
Heterodonax bimaculatus (Linnaeus, 1758) small false donax

Veneridae

Lirophora paphia (Linnaeus, 1767) king Venus
Chioneryx pygmaea (Lamarck, 1818) white pygmy Venus
Megapitaria maculata (Linnaeus, 1758) calico clam
Periglypta listeri (Gray, 1838) princess Venus

Dentaliidae

Coccolentalium carduus (Dall, 1889) yellow tusk shell

Acanthochitonidae

Acanthochitona hemphilli (Pilsbry, 1893) Hemphill's chiton

Chitonidae

Chaetopleura apiculata (Say in Conrad, 1834) eastern beaded chiton
Chiton tuberculatus Linnaeus, 1758 common West Indian chiton

Ischnochitonidae

Stenoplax floridana (Pilsbry, 1892) Florida slender chiton

Dora Zimmerman
daddybird59@comcast.net

Working out the mussels of Peninsular Malaysia

Pei-Yin Ng, John-James Wilson & Alexandra Zieritz

Mussels are known as “ku-pang” in the Malay language and marine mussels are prized by locals in Peninsular Malaysia as something good to eat. Freshwater mussels (order Unionida) are much less well-known by locals and are particularly poorly-known by scientists. Until recently, the most current scientific report of mussels in Peninsular Malaysia dated back almost 50 years. There has been fresh interest in freshwater mussels among scientists in Peninsular Malaysia with the establishment of a commercial freshwater pearl culture at Kenyir Lake, in the northeastern state of Terengganu. Worryingly, the commercial venture has focused on an invasive species – the Chinese pond mussel (*Sinanodonta woodiana*) – overlooking native species.

The native mussels of Peninsular Malaysia, however, are finally getting the attention they deserve. An international team of researchers led by the University of Nottingham Malaysia Campus have surveyed over 150 sites across the peninsula to record any mussels present. A report of part of this work can be found in *Ellipsaria* (Bogan et al. 2015). Due to the lack of reports and spotty taxonomic treatment of the freshwater mussels of Peninsular Malaysia, our team is using DNA barcoding to help identify and record species. DNA barcoding is a method of species identification and discovery using a short section of DNA (a DNA barcode) from a standardized region of the genome. For animals, the DNA barcode region is a fragment of the *cytochrome c oxidase I* gene from the mitochondrial genome. The project was supported by a COA grant and completed as part of a final-year undergraduate project at the Museum of Zoology, University of Malaya, Kuala Lumpur. Preliminary findings were presented at the 6th International Barcode of Life conference in Guelph, Ontario, Canada (Ng et al. 2015).

Our team revealed the presence of six genera of mussels in Peninsular Malaysia, which, after DNA barcoding of a total of 67 populations, were assigned to 12 BINs (Barcode Index Numbers). The Barcode Index Number System is an online framework that automatically clusters DNA barcode sequences into putative species showing close



Peninsular Malaysia

concordance with species limits recognized by traditional taxonomists. DNA barcoding successfully rectified several misidentifications of mussels based solely on the shell characters. Besides DNA barcoding, we have also sequenced a gene from the nuclear genome and conducted a simple phylogenetic analysis of the freshwater mussel species. The analysis flagged several issues with the current taxonomy at the subfamily and genus levels, providing a starting point for further efforts to resolve the position of the freshwater mussels of Peninsular Malaysia on the “unionid tree of life.” A comprehensive study of the distribution of freshwater mussels in Peninsular Malaysia is in preparation by our group, so stay tuned.

Acknowledgments:

We thank Manuel Lopes-Lima (University of Porto), Arthur Bogan (North Carolina Museum of Natural Sciences), and Ronaldo Sousa (University of Minho) for their participation in part of the field surveys. University of Nottingham Malaysia Campus students F.N.B. Mahadzir, H.W.



Sampling unionid mussels in a small stream in Negeri Sembilan.



Sampling tissue snips for DNA barcoding.

Lun, H.M. Lye, M.M. Chu, M.M. Norizam, M.S.A.b. Embong, N.b. Mahmood, T.J. Min, W.Q. Loke and V.L.P. Wen provided invaluable help as interpreters and field assistants.

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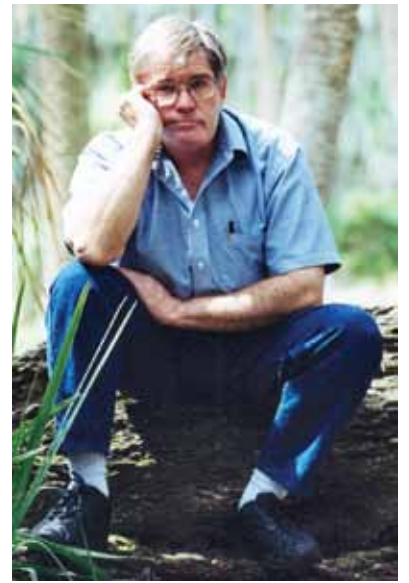
Pei-Yin Ng¹, John-James Wilson² & Alexandra Zieritz³
Museum of Zoology, University of Malaya, Kuala Lumpur, Malaysia

School of Geography, University of Nottingham Malaysia Campus, Semenyih, Selangor, Malaysia

¹peiyin@siswa.um.edu.my, ²johnwilson@um.edu.my, ³alexandra.zieritz@nottingham.edu.my

Phil Poland

There were two giants here in the Florida sheller's world. I met the first, Harry Lee, in the early 1990s, and Harry quickly connected me with Phil Poland. Phil was an avid and skilled field worker. We soon roamed Florida together, collecting and observing. Phil was indefatigable, both in his enthusi-



asm for field work and especially in utilizing and sharing the products of his labors to assist and further the efforts of researchers around the world. Over 30 years of dedicated effort in Florida, Phil amassed multiple collections of well-preserved and documented marine shells, all of which, without hesitation, were provided to all researchers, world-wide, simply for the asking. He repeatedly donated collections and documentation to museums. His final collection of marine micros accumulated during the '90s was donated to Let's Talk Seashells and has served as the backbone for many of the presentations on LTS. Phil's generosity and enthusiasm for using his love of shells for the benefit of research, conservation, and enhanced knowledge was admirable and inspired me to emulate his philosophy. Phil was a complex personality, as generous as they come, modest to a fault, a brilliant observer, with strong political and philosophical opinions (oh, the conversations we had), and a wonderful sense of humor. In the past decade Phil's efforts turned to *Liguus*, while mine remained with marine micros. He donated his entire Florida marine collection to the Smithsonian in 1999. We lived on opposite sides of Florida. He still went into the field for me when I was in need of samples of west coast species, but we did not manage to get together as in the "old days." We always planned to get together "next year" during the south Florida collecting season, but it didn't happen. I'll miss you, Mensch.

Marlo F. Krisburg

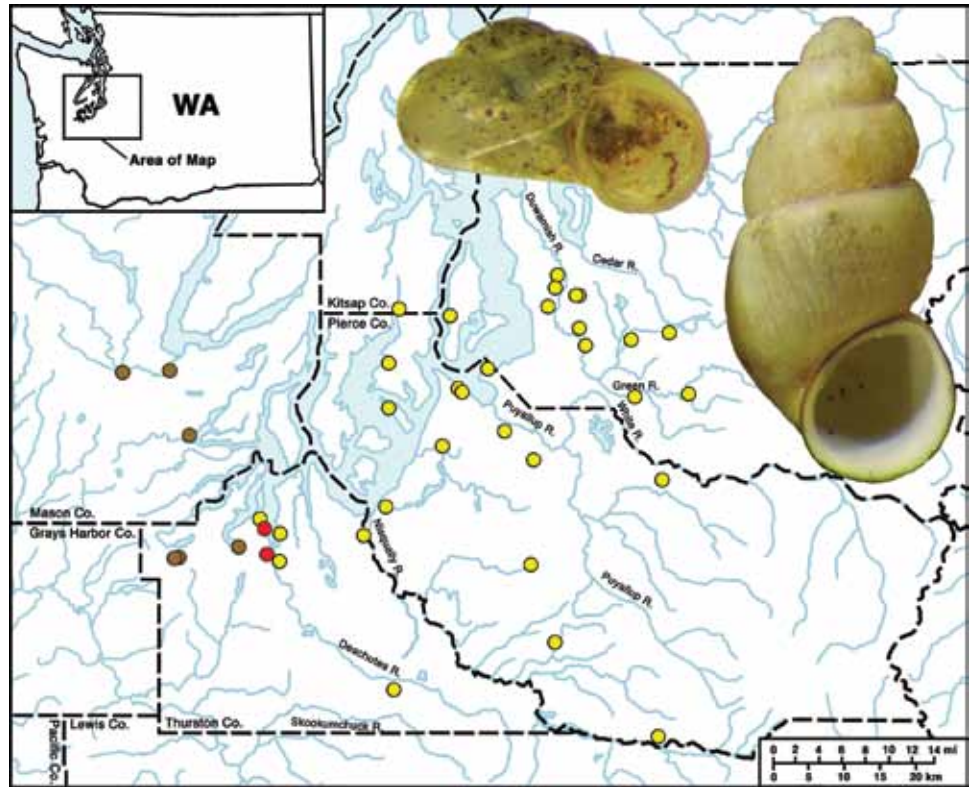


Liguus fasciatus graphicus from Pilsbry (1912)

Springs and the minute snails that inhabit them in the Puget Sound region: Searching for the concealed

Edward J. Johannes

As part of a phylogenetic study with Dr. David Campbell, Gardner-Webb University, North Carolina, on *Juga* and *Pristinicola*, I have been surveying springs for the latter snail in the Puget Sound basin. Permanent springs (by springs I also include seeps) are ones running year round for thousands if not a million years or so, and may occur singly or in groups and are not only an important habitat for freshwater mollusks, in particular snails, but for many other animals and plants, especially in arid areas. Springs have a disproportionate occurrence of rare or endemic species, some found at one or a few springs and as a result are of major conservation concern (Sada *et al.* 2001, Hershler *et al.* 2014). Springs also serve as a thermal refugia for many species including springsnails, especially those that were unable to migrate rapidly enough as the climate warmed during the end of the last ice age (Late Pleistocene). I have found cold springs in the Puget Sound basin ranging from 11 to 13 °C, approximately the current mean annual ambient air temperature in the region, indicating they are coming from a relatively shallow groundwater sources. Hopefully human caused climate change will not increase water temperatures of these springs above the tolerance threshold of springsnails or other taxa. In the opposite temperature spectrum, hot springs (actually warm springs, above 46 °C is too hot) support freshwater snails and other animals that cannot exist at cooler temperatures, and have deep-seated groundwater sources (Sada *et al.* 2001, Clarke 2014). I have found no thermophile snail species occurring in the Puget Sound region; only two cold-water taxa, *Pristinicola hemphilli* (Pilsbry, 1890) (pristine pyrg) and *Colligyrus* n. sp. (coastal duskysnail) have been found during my surveys of springs here and elsewhere (Johannes 2015). Recent DNA analysis suggest placement of the coastal duskysnail under a new genus (Liu *et al.* 2015).



Map showing distribution of *Pristinicola hemphilli* (yellow dots) and *Colligyrus* n. sp. (brown dots) in the Puget Sound basin. Red dots are sites where they co-occur. Insets of *Colligyrus* n. sp. (coastal duskysnail; no other western U.S. hydrobioid has a near planispiral shell like this minute species; height 1.2 mm) on the left and *Pristinicola hemphilli* (pristine pyrg; height 2.8 mm) on the right. Both snails at same scale. Photos by the author.

Both snails occur mostly in seeps to small-medium sized springs, though on rare instances *Pristinicola* is found in small spring influenced creeks and bigger springs. To me, how these snails migrate from one spring, whether hot or cold, to another is a very interesting biogeographic problem, especially in the recently deglaciated Puget Sound basin.

If you are inspired by finding new molluscan species, as I am, springsnails are by far the easiest way to go in the western United States. Many have been scientifically described (mostly in the genus *Pyrgulopsis*) from this region within the last decades, with an unknown number yet to be found or named, including the aforementioned coastal duskysnail. Of the freshwater mollusks that occur in the western U.S., the few listed under the Endangered Spe-



Springs (green strips) on the Washington side of the Columbia River Gorge west of Wishram. Bridge is the Celilo Bridge also known as the Oregon Trunk Rail Bridge. *Juga n. spp.* and *Pristincola* occur in springs in this region of the Columbia Gorge.



Spring on the Oregon side of the Columbia River Gorge west of Celilo Village. All-too-common livestock are allowed access to spring sources degrading them. Left photo and photo above taken at the same vantage point along side Wasco County Road 143 by the author.

cies Act (ESA) include a significant number that are either spring dwellers or found in habitats influenced by springs or groundwater. Neither springsnail that occurs in the Puget Sound region is listed under the ESA. Despite the relative small size of the habitat, I have found searching for springs in the open arid lands of the western U.S. relatively easy. From a distance the green strip of vegetation surrounding the source and run of springs can be readily seen on hillsides or valleys. Even U.S. Geological Survey (USGS) 7.5-minute topographic maps, also known as 7.5' quadrangles, often have springs indicated in such areas. These are easily seen in areal photos, the basis for these maps, or when using Google Earth satellite images. In areas with dense forest and vegetative cover, however, such as in the Puget Sound region, searching for spring habitats is extremely difficult. Often the USGS 7.5' quadrangles in this region do not show them. Even large ones with names, like Crystal Springs (N-most site for *Pristincola* in the Puget Sound region) occurring a half mile from my house, are missed. You can also forget about Google Earth helping as well. So what is one to do?

From experience I know that most springs emanate from the side or base of hillsides, or along drainages often in small stream ravines or gulches. These are good geographic features to narrow searches. Permanent springs in the Puget Sound basin depend on a big enough upland (catchment) area for rainfall, that are underlain mostly by permeable geologic units largely glacially deposited allowing infiltration to a sufficient depth before hitting impermeable layers to store enough underground water volume for year round flow even during the dry summer months. Searching (crashing through) all these well-vegetated slopes and ravines for springs would be slow going. If they exist, looking at geo-

logic maps may help whittle down the search area, but is dependent on prior knowledge of which units produce springs. Even then it does not tell you where the springs will occur in these units that could cover many square miles. Once again we are back to vegetation, obscuring the geology of this region further hindering searches. There seems to be a consistent theme here, vegetation. Instead of considering it a barrier, why not use it. That is exactly what I do. Instead of looking for springs, I look for specific kinds of vegetation on slopes and in ravines, ones that are wetland indicators (for a practical local guide see Cooke 1997, others likely available for your region). This is especially useful while tooling along roads both in the actual sense or virtually when using Google Earth street view (where available), as plants are easier to see than the springs they obscure. Another method I use is to watch for water in ditches during the dry summer months as a possible indicator of springs; but ditches are not always present along roads and during the rainy season are not as helpful indicator as is the presence of wetland plants.

I am not the first to use plants as indicators. Having a background in geology, I was aware that in addition to searching for a show of 'color', miners have known since medieval times that particular plants could be used as indicators to the presence of ore bearing deposits. Both *Lychnis alpina*, a small pink-flowering plant in Scandinavia, and *Haumaniastrum katangense*, a white-flowered shrub in central Africa, were known associates of copper mother lodes. Recently, a tree, possibly *Pandanus candelabrum*, in Liberia, was noticed to occur only in kimberlite soils, becoming the first indicator species for diamond-bearing kimberlite pipes (Haggerty 2015). Before this, diamonds in Liberia were mined only from placer deposits and their sources could not be found, hidden not only by the thick tropical vegetation, but



Well concealed spring run near county boundary sign with *Colligyrus* along Cloquallum Road, Chehalis River drainage, Grays Harbor County. Yellow flowers (pointer) of skunk cabbage revealed presence of spring. Photo by Terry Frest.



Concealed spring with *Pristinicola* along Chatwood Road SE, Deschutes River drainage, Thurston County. Note the presence of devils club, horsetails and water parsley. Drew Skinner for scale. Photo by the author.

also ironically by dense impenetrable thickets of *Pandanus* trees. Here in the western U.S., the nickel-chromium bearing serpentinite rocks in the Klamath and Siskiyou mountains of Oregon and California have endemic plants, such as the carnivorous *Darlingtonia californica* (California pitcher plant), that grow nowhere else. Terrence Frest (deceased, my former Deixis Consultants partner), while surveying the Midwest Driftless area during the 1980s for the ESA, listed endangered *Discus mcclintockii* (F. C. Baker, 1928) (Iowa Pleistocene snail), used both geology to define the extent of his search area and vegetation to zero in on a rather locally narrow habitat where this and several other glacial relict land snails occurred (Frest, 1984, 1991). He coined the name algific talus slopes for this unique habitat (Frest, 1981). He noticed that algific talus slopes consistently occurred in two separate Paleozoic limestone formations, both with thin shaley layers that allowed periglacial frost and ice wedging of limestone blocks on N.-facing slopes during the close of the Wisconsinan (Late Pleistocene). This created a mechanical karst where ice could accumulate during the winter months resulting in year round refrigerated talus slopes, the talus debris falling from the cliff faces. This created a rather stable microclimate that not only protected the glacial relict land snails from climate change at the end of the last ice age, but also allowed both relict and disjunct plants and trees to exist in the Midwest that would otherwise be extinct or found further north in Canada. Using geologic maps, he determined what hillsides the Paleozoic formations cropped out on and could quickly find these small habitats by searching for occurrences of specific trees such as Canada yew, balsam fir, birch, basswood and sugar maple or plants, especially the ESA listed threatened *Aconitum noveboracense*, northern wild monkshood. Using his method, he and later

others were able to discover over three hundred sites within a relatively short time. This when previously only a couple of sites had been found after extensive searches over many years. Most sites are now included in The Driftless Area National Wildlife Refuge, the first federal refuge created to protect a mollusk, the Iowa Pleistocene snail, and a plant, the northern wild monkshood.

Unlike the examples given above, most of the plants occurring in the Puget Sound region that are wetland indicators are not necessarily restricted to spring habitats. Occurrence of these plants on slopes, slope bases, or ravines improves the chances they actually indicate the presence of springs. There are only three plants I often find closely associated with springs – two of them painfully make me wonder why nasty plants are found at springs. These would be *Rorippa nasturtium-aquaticum* (watercress), a widely introduced European plant that prefers cool permanent water such as spring runs or ditches fed by springs; *Oplopanax horridus* (devil's club), with fine irritating spines on stems and leaves; and finally *Urtica dioica* (stinging nettle), with hollow stinging hairs on leaves and stems that can inject a irritating histamine into your skin. I have observed *Allogona townsendiana* (I. Lea, 1838) (Oregon forestsnail) often co-occurring with the last plant at springs, including the previously mentioned Crystal Springs. It has been suggested that this landsnail has a strong affinity for *Urtica*, but I think springs have been overlooked as an important factor also (Waldock, 2002). I believe *A. townsendiana* is a glacial relict (possibly the much rarer *Cryptomastix devia* (Gould, 1846) (Puget Oregonian) is as well), preferring a stable cool microhabitat offered by springs, somewhat like the algific talus slope landsnails inhabit in the Midwest. Other wetland plants I often look for include *Lysichiton americanum* (skunk



Allogona townsendiana found associated with a spring and *Urtica* on E. side of Waldrick Road SE near Silver Spring, Deschutes River drainage, Thurston County. Snails about 27 mm wide. Photo by Bert Bartleson.

cabbage), which has smelly yellow flowers; *Oenanthe sarmentosa* (water parsley), reported to be poisonous, can be found in spring runs or spring influenced small creeks; *Typha* spp. (cattails) often found in ditches with permanent water; *Cicuta douglasii* (western water-hemlock) is poisonous, do not eat; and *Mimulus guttatus* (common monkeyflower). Ones I don't trust as much to indicate springs include *Carex* spp. (sedges) and *Equisetum* spp. (horsetails), but they do indicate slopes that are wetter than typical and suggest the possibility of springs in the area. They also occur at springs. As you can see the list of wetland indicator plants I use is not very extensive and learning to recognize them in the field is not difficult. So, if surveying for springsnails in the Puget Sound basin or other heavily vegetated or forest covered areas, don't look for the spring, look for the wetland indicator plants.

Acknowledgements: I would like to acknowledge James Johannes and Bert Bartleson for comments. Both Bert and Drew Skinner accompanied me in the field and it was much appreciated. I would also like to recognize the financial support for the phylogenetic study on *Juga* and *Pristinicola* in the Puget Sound basin from the Conchologists of America, City of Tukwila, Vashon Nature Center, LLC, and the Pacific Northwest Shell Club.

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Edward J. Johannes

Deixis Consultants

16827 51st Ave S. SeaTac, WA 98188, USA

edjohannes@yahoo.com

June 18-19 Gulf Coast Shell Show in Panama City Beach, Florida



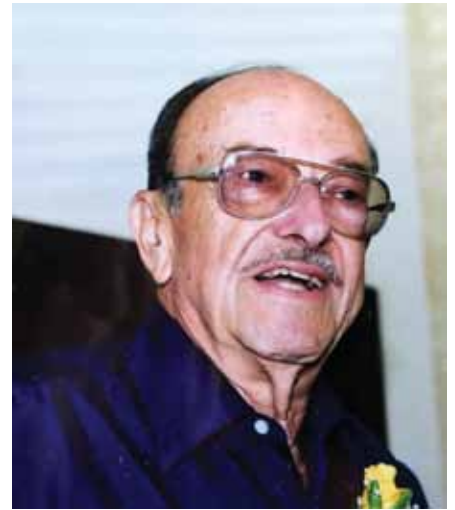
Jeannette Tysor and Ed Shuller with their COA Award, Shell of the Show Award, and blue ribbon. Their 25 foot display was a tribute to North Carolina collector Hugh Porter and was titled, "Mr. Seashell & North Carolina's Marine Mollusks."

The Gulf Coast Shell Show on 18-19 June 2016, was a huge success. Paid attendance was about 300 and over 50 were let in for free. The scientific exhibits totaled 365 feet of display. Shell Show Chairman was Jim Brunner and the Scientific Judges were Linda and Kevan Sunderland. Jeannette Tysor and Ed Shuller won the COA Award for their display in tribute to the well known North Carolina shell collector, Hugh Porter. The display was titled, "Mr. Seashell & North Carolina's Marine Mollusks." Their extensive display involved 10 cases and covered 25 feet. Also at this year's show was the award of the new Vokes Trophy to Vicky Wall (see p. 18). Founder

Other winners in the scientific division included: the DuPont Trophy to Linda & Jim Brunner for "Oh What Tangled Webs We Weave," the Helen Norton Award to Gene Everson for "World-wide Self-collected," Founder's Award to Carolyn and Ed Petrikin for "Colors of Worldwide Molluscs," the Student Award to Olivia Carney for "Shelling and Crafting With My Grandmother," and the Frozen Dip-net to Al Johnson for "Northwest Florida Shell, Self-collected." Shell of the Show Self-collected was the eponymous *Phyllonotus eversoni* (D'Attilio, Myers & Shasky, 1987) displayed by Gene Everson; Shell of the Show Collected by any Manner was *Echinophoria coronadoi* (Crosse, 1867) displayed by Jeannette Tysor and Ed Shuller.

Bruce William Crystal

Bruce Crystal was born on Oct. 26, 1929, in Brooklyn, N.Y., to the late Helen Haber Crystal and Reuben Robert Crystal. He grew up in Brooklyn, attending Erasmus High School, and after graduation,



signed up with the U.S. Air Force Reserves. The Air Force called him to active service during the Korean War, where he worked as an ambulance driver for a hospital unit in Japan. Upon his return to the United States, he used the G.I. Bill to attend the University of California, Berkeley, receiving a bachelor of science degree followed by a doctor of optometry degree.

In 1956, he and his wife moved to Longmont, Colorado. Dr. Crystal was an avid naturalist and lifelong outdoorsman. He began with collecting butterflies as a child in the Brooklyn Botanical Garden, and as an adult, enjoyed fishing and hunting, particularly, at Swede Lake, Colorado, and along many Colorado rivers. He retired from optometry at age 48 and, with his wife, launched a 41-foot Morgan sailboat, the *Aspen Leaf*, in 1970. Moored in the British Virgin Islands, the boat afforded the couple many happy years of travel. Dr. Crystal became an avid seashell collector, corresponding with fellow shell collectors from around the world and building a prized seashell collection. One of his proudest accomplishments was completing a month-long sail with a friend from San Diego, Calif., to Tahiti, in 1979.

In retirement, Dr. Crystal and his wife traveled extensively, participating in numerous Elderhostel trips, including several bike hikes in Europe. Dr. Crystal also enjoyed woodworking and built many fine pieces for his children and grandchildren.

COA *Neptunea* Award

Many of us are beginning plans for the 2017 COA Convention in Key West, FL. One of the many events on the agenda is the annual COA *Neptunea* Award(s), and it is once again my privilege to call for nominations.

The consensus of the COA Board is to reopen nominations with a “clean slate” annually. **Nominees not selected in previous years are certainly welcome for consideration if renominated - in fact their renomination is encouraged.** For the present cycle, nominations will close on June 1, 2017, so as to allow ample time for deliberation before the convention.

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

1. Service to the Conchologists of America.

AND/OR

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

AND/OR

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

Although notable exceptions have been made, the COA Board, which serves as the jury for the *Neptunea* Award, has traditionally weighed its consideration for award recipients toward (1) amateurs: those not currently pursuing a principal career involving collection, study, or commerce 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 [currently me]:

Harry. G. Lee

4132 Ortega Forest Drive

Jacksonville, FL 32210 / shells@hglee.com]

Previous *Neptunea* Award winners:

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

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

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

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

2004 (Tampa, FL): Bobbi Houchin

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

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

2007 (Portland, OR): none given

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

2009 (Clearwater, FL) none given

2010 (Boston, MA): none given

2011 (Port Canaveral, FL): Alan Gettleman

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

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

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

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

