



# THE **Festivus**

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**New Cones from Australia and Aruba**

**What are Species?**

**A New Land Snail from Vietnam**

**Cape Verde Abalone**

***Jaspidiconus* -Expert Opinions**

Quarterly Publication of the San Diego Shell Club



# THE FESTIVUS

A publication of the San Diego Shell Club

Volume: 47

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ISSUE 4

Editor Emerita Carole Hertz (1979–2014)

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Address all correspondence to:  
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## REGULAR CLUB MEETINGS

Club meetings are held every month on the third Thursday of the month, except April, September and December, at either 7:30 p.m. in Room 104, Casa del Prado, Balboa Park, San Diego, or at 12:00 noon at Holiday Inn Express, 751 Raintree Drive, Carlsbad, conference room as noticed.

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## FRONT COVER:

Live specimen of *Fasciolaria tulipa* (Linnaeus, 1758) on vermiform reef on Demijohn Key, Florida. Red form. Photo by David Berschauer. (Cover artistic credit: Martin Schuler)

## MISSION STATEMENT

The San Diego Shell Club was founded in 1961 as a non-profit organization for educational and scientific purposes. More particularly to enjoy, promote the study and promote the conservation of Mollusca, and associated marine life through lectures, club meetings and field trips. Our membership is diverse and includes beginning collectors, amateurs and scientists, divers, underwater photographers and dealers.

*THE FESTIVUS* is the official quarterly publication of the San Diego Shell Club, Inc. and is issued as part of membership dues in February, May, August and November. *The Festivus* publishes articles that are peer reviewed by our volunteer Scientific Review Board (which are of a scientific nature, including new taxa articles), as well as articles of general interest to malacologists, conchologists, and shell collectors of every level. Members of the Peer Review Board are selected to review individual articles based upon their chosen field and preference. Available by request or on our website are:

- Guidelines for Authors
- Guidelines for the Description of New Taxa

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All correspondence pertaining to articles, including all submissions and artwork should be addressed to the Editorial Board.

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## UPCOMING CLUB EVENTS:

November Auction: 11/14/2015  
 Holiday Party: 12/12/2015

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### New Taxa published in *The Festivus* in 2015: Volumes 47(1) through 47(4)

#### Species and subspecies:

*Carinapex albarnesi* Wiedrick, 2015, *C. alisonkayae* Wiedrick, 2015, *C. amirowlandae* Wiedrick, 2015, *C. cernohorskyi* Wiedrick, 2015, *C. chaneyi* Wiedrick, 2015, *C. johnwiedricki* Wiedrick, 2015, *C. lindseygrovesi* Wiedrick, 2015, *C. mooreorum* Wiedrick, 2015, *C. philippiensis* Wiedrick, 2015, *C. solomonensis* Wiedrick, 2015; *Chicoreus (Triplex) cnissodus ceylonensis* Houart, 2015; *Dalliconus edpetuchi* Monnier, Limpalaër, Roux & Berschauer, 2015; *Vepricardium eichhorsti* Thach, 2015; *Erosaria acicularis marcuscoltroi* Petuch & Myers, 2015, *Morum berschaueri* Petuch & Myers, 2015; *Amphidromus taluensis* Gra-tes, 2015, *A. luangensis* Gra-tes, 2015, *A. taluensis borealis* Gra-tes, 2015; *Tenorioconus monicae* Petuch & Berschauer, 2015, *T. rosi* Petuch & Berschauer, 2015; *Tesselliconus devorsinei* Petuch, Berschauer & Poremski, 2015, *Jaspidiconus vantwoudti* Petuch, Berschauer & Poremski, 2015; and *Bertia setzeri* Thach, 2015.

## President's Corner

Come on. Literally come. We're getting more shells out there – carrots to lure you in and sometimes pizza. May I suggest attending one of our two auctions held in April and November. If you come, I suggest scrutinizing our silent auction material and our one and five dollar tables whichever we set out. Stuff can get miscategorized as in OMG! Would you look at this?!!



This year the Club will be placing more emphasis on Field Trips. So please plan on participating in one of these fun adventures.

And finally, passing the gavel to David Berschauer; there will be more time for me for other things, like field trips, *etc.* A special thanks to all of you for your kind words of support over the last two years. – Woosh! It's gone by that fast. Now onwards and forwards for 2016 – cheers.

Larry Buck

## Changing of the Guard

by David B. Waller

I'm going to miss that smiling face in the President's Corner.

The time has come for a changing of the guard. David Berschauer, Co-Editor of *The Festivus*, will be taking the position of President for 2016 and with the current slate of Officers it promises to be another fantastic year for our club.

But before we move Larry into the Past President's position, I would like to give a brief overview of the accomplishments of the San Diego Shell Club over the past two years under the competent leadership of Mr. Buck. In Larry's first address to the membership in *The Festivus* he set out a very aggressive plan to revitalize our Club whose membership was dwindling so much that we, as the Board, were uncertain of our Club's future. Larry's primary goal was to increase membership. With this in mind he envisioned an entirely new *Festivus* that would appeal to the broad spectrum of individuals that comprise our membership. He proposed a stronger presence on social media, particularly Facebook, that would appeal to a broader age group. He suggested a new Club website to provide more information to our viewers, proposed special Club publications, increased public interaction through increased Club activities and even took steps to strengthen our club. Sounds like a lot of blah-blah, but let's take a look at the results.

1. **The New *Festivus*:** Our worldwide membership has grown significantly primarily because our members want our new journal. We have seen a steady increase in membership over the past two years more than doubling the membership from when Larry took office. We are now selling the *Festivus* through two dealers in Europe which is generating an additional revenue stream for our Club.

2. **Facebook:** Our social media presence started when Larry took office and our viewing membership now exceeds 500. This has proven to be a valuable vehicle for introducing new members to our Club. To date we have received over 35 new members from Facebook alone and those memberships have come from all over the United States.

3. **New Website:** Our new website has become a site where members can ask questions about shells, order copies of the *Festivus*, purchase supplements and renew membership or become members. The website is generating about 20 to 25 e-mails a month. With our new PayPal option for paying on-line our accounting has become significantly easier.

4. **New Publications:** Our Club has now produced two publications one on Australian abalone and one on living and fossil whelks. The Australian abalone publication recovered its publication costs in just a few months and has begun to generate income for the club. The second publication is expected to issue in mid-November and has almost paid for its publications cost before reaching the newsstands. This second publication is expected to be a great success.

5. **Increased Public Interaction:** Our Club now holds two auctions per year generating a significant income for the Club. The Club has instituted the Shell Show and Sale in Balboa Park, reestablished our relationship with the Del Mar Fair, who at the end of the 2015 fair formally asked us back to exhibit in 2016, conducted two art contests on shells, reinstated the Shell Bazaar and is conducting the Most Beautiful Shell Contest on our Facebook page. All of these activities have contributed to public awareness of our Club.

6. **Strengthened our Club:** Our Club now has insurance to protect its assets. In addition, we now have an annual budget and have instituted a formal accounting of the Club's income for tax purposes. In 2015, the Club officially operated in the black and it does not appear that this will change in the near future.

7. **Other stuff:** Well how about hosting the 2018 Conchologists of America Conference in San Diego an event that will bring about 200 shell collectors to sunny San Diego. How about establishing alternating meeting sites so that members living south of San Diego and those living north of San Diego (including Orange and Los Angeles Counties) can both enjoy our meetings.

**So did Larry do his job?** Absolutely! All of these things have increased our membership over 70% in two years. A number that is amazing considering most clubs, big and small, are on the decline. It is also important to note that the Club's bank account currently has the same balance as it did when Larry took office.

Congratulations Larry you deserve a standing ovation.

## Additions to the Cone Shell Faunas of Australia and Aruba (Conidae, Conilithidae)

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**ABSTRACT** Two new cone shells, one in the family Conidae and one in the family Conilithidae, are described from eastern Australia and Aruba. The new conid, *Tesselliconus devorsinei* n. sp., was dredged from 30 m depth off southern Queensland, Australia, and represents the newest member of a poorly-known deeper Neritic Zone *Tesselliconus* species complex that includes *T. sandwichensis* and *T. athenae* from Hawaii, *T. kashiwajimensis* from southern Japan, and *T. edaphus* from the Panamic Province. The new conilithid, *Jaspidiconus vantwoudti* n. sp., was found to be endemic to the Dutch Antilles island of Aruba, where it occurs in shallow subtidal rocky areas in the surf and surge zone.

### KEY WORDS

Cone shells, Conidae, Conilithidae, *Tesselliconus*, *Jaspidiconus*, Queensland, Australia, Aruba, *Tesselliconus devorsinei*, *Jaspidiconus vantwoudti*.

### INTRODUCTION

The peripheral edges of marine molluscan provinces and subprovinces have long been known to be areas where speciation has accelerated due to genetic isolation and exposure to marginal environmental conditions (Briggs, 1974, 1995; Petuch, 1982; Petuch, 2013; Valentine, 1973; Vermeij, 1978). Due to restricted gene flow and differences in ecological conditions, these peripheral areas typically produce large numbers of endemic species, often unique to single islands or small geographical areas. Two classic examples of the peripheral areas of provinces and subprovinces include the extreme southernmost coast of Queensland, Australia and the island of Aruba in the southern Caribbean Sea. The deeper water

areas offshore of Cape Moreton and Moreton Island, Queensland are known to house a large number of endemic marine gastropods, particularly in the families Volutidae and Conidae. Due to cooler water conditions produced by upwellings, this geographically-small area represents the extreme southernmost edge of the Solanderian Province of the Australian Region and contains oceanographic conditions that are barely marginal for most of its tropical faunal components. Similarly, Aruba represents the westernmost edge of the Grenadian Subprovince of the Caribbean Province and is subject to upwelling-driven cooler water conditions. Like the Cape Moreton area, the coastline of Aruba is known to contain numerous examples of large endemic gastropods.

Intensive field work, incorporating both diving and dredging, has recently been undertaken by several inspired amateur naturalists in the peripheral areas of both southern Queensland and Aruba. These efforts have led to the discovery of two new endemic cone shells, both of which represent peripheral isolate sibling species that belong to wide-ranging species complexes. These cone shells, including a new Australian species in the genus *Tesselliconus* (family Conidae) and a new Aruban species in the genus *Jaspidiconus* (family Conilithidae), are described in the following sections. Their discovery demonstrates the importance of biogeographical peripheral areas as centers of speciation and evolution in the world's oceans.

## SYSTEMATICS

### Class Gastropoda

### Subclass Orthogastropoda

### Superorder Caenogastropoda

### Order Sorbeoconcha

### Infraorder Neogastropoda

### Superfamily Conoidea

### Family Conidae

### Subfamily Punctulinae

### Genus *Tesselliconus* da Motta, 1991

#### *Tesselliconus devorsinei* Petuch, Berschauer, and Poremski, new species (Figure 1A-C)

**Description:** Shell of average size for genus, stocky, subturbinate, broad across shoulder; shell with distinctly concave sides, with widest area just below shoulder angle; shoulder angled but slightly rounded; spire elevated, with early whorls raised above plane of spire; early whorls broadly pyramidal in shape, distinctly truncated, heavily ornamented with strong spiral cords and small low rounded beads; spire whorls ornamented with 3 large spiral cords, with cord

along suture being twice as thick as other two cords; body whorl shiny, ornamented with 22-24 incised spiral grooves which become stronger and better developed toward anterior end; spiral grooves vary in development, with some specimens having heavily-sculptured shells and others being smoother and more polished; anterior third of body whorl heavily sculptured with numerous deeply-incised spiral sulci, often arranged in pairs; largest and most deeply-incised sulci contain fine, closely-packed tiny pits; shell color white or pale violet-white, overlaid with 3 wide bands of pale orange-tan, one around shoulder, one posterior of mid-body line, and one anterior of mid-body line; wide color bands with variable number of rows of large, rectangular orange-tan spots; mid-body area with wide white band containing two rows of widely-spaced, large, rectangular orange spots; anterior tip bright violet-purple; spire white, marked with large, evenly-spaced, elongated dark orange-tan flammules; spire flammules extend onto edge of shoulder, producing checkered pattern; spire flammules of body whorl and previous whorls fuse to form distinct radiating pattern; aperture proportionally narrow, arcuate, following curvature of body whorl outline; interior of aperture colored pale yellow-cream; protoconch white, proportionally large, mammilate, composed of two rounded whorls; periostracum thin, smooth, translucent.

**Type Material:** HOLOTYPE - length 29 mm, width 17 mm (Figure 1A, B), QM M080845, molluscan collection of the Biodiversity Section, Queensland Museum, Brisbane, Queensland, Australia. Other material includes a 30 mm specimen (David Berschauer collection, Figure 1C, D), a 34 mm specimen (E.J. Petuch collection), and a 37 mm specimen (Remy Devorsine collection), all from the same locality and depth as the holotype.

**Type Locality:** Dredged from 15 fathoms (27.5 m) depth, due east of Mooloolaba, Queensland State, Australia.

**Range:** At present, known only from the southern coast of Queensland, off Mooloolaba, but may range to Cape Moreton and Moreton Bay and possibly extreme northernmost New South Wales.

**Ecology:** The new species occurs within the Neritic Zone, on coral rubble and carbonate sand substrates, in depths of around 30 m.

**Etymology:** Named for Remy Devorsine of Avoca Beach, New South Wales, Australia, who dredged the new species from off Mooloolaba.

**Discussion:** Of the seven known species in the genus *Tesselliconus*, *T. devorsinei* is most similar to the eastern Indian Ocean - southwestern Pacific *T. suturatus* (Reeve, 1844) (Figure 2A, B), particularly in having a stocky, barrel-shaped shell profile. The new Australian species differs from its widespread congener, however, in being a much more sculptured shell, with numerous deeply-incised spiral cords and threads, in being a much more colorful shell, having rows of orange-tan checkers and rectangular dots on a pale violet base color, and in having a completely different sculpture pattern on the spire whorls, with three large spiral cords and numerous strong coronations and rounded beads and in having a distinctive raised, truncated pyramid shape to the early whorls (Figures 1B, D). The early whorls of *T. suturatus*, on the other hand, are much smoother, having only two large raised spiral cords and are only slightly exerted, forming a small acutely-angled pyramidal structure that is devoid of coronations.

With its checkered color pattern, *T. devorsinei* is also similar to *T. tessulatus* (Born, 1778) (type of the genus; Figure 2C), but differs in being a stockier, less elongated, and more inflated shell, and in being a more heavily sculptured shell, with incised spiral sulci on the body whorl and in having a truncated pyramidal spire that is ornamented with large spiral cords and rounded coronations. The highly ornate spire whorls of the new species are also reminiscent of another deep water *Tesselliconus* species, *T. athenae* (Filmer, 2011) from 105 fathoms (192 m) depth off Keehi Lagoon, Oahu, Hawaii (Figure 2D). *Tesselliconus devorsinei* differs from this deep water Hawaiian endemic in having a lower, less elevated spire, and in having a distinct truncated pyramid shape to the early spire whorls. The new species is also similar in appearance to another Hawaiian endemic *Tesselliconus*, *T. sandwichensis* (Walls, 1978) (Figures 2E, F), but differs in having a stockier, less elongated shell, in having deeply-incised spiral cords on the body whorl, and in having a different spire whorl configuration, with a truncated pyramid shape and heavy sculpture composed of large spiral cords and low knobs and coronations.

With the exception of the widespread, shallow water *Tesselliconus suturatus* and *T. tessulatus*, all the other known congeneric species are found in deeper, offshore areas along the outer edges of the biogeographical limits of the genus. These peripheral endemic species may represent disparate populations of *Tesselliconus* which became isolated on the fringes of the Indo - Pacific Region during the Pleistocene. Since that time, these peripheral isolates have evolved into a complex of sibling species, with each being restricted to a limited geographical area. This peripheral isolate sibling species complex includes:



- *Tesselliconus athenae* (Filmer, 2011) - endemic to deep water areas off Oahu, Hawaii
- *Tesselliconus devorsinei* Petuch, Berschauer, and Poremski, n. sp. - endemic to deeper water off southernmost Queensland, Australia
- *Tesselliconus edaphus* (Dall, 1910) - restricted to the Panamic Province, from the Gulf of California to Panama and Cocos Island
- *Tesselliconus kashiwajimensis* (Shikama, 1971) - restricted to southern Japan, the Ryukyu Islands
- *Tesselliconus sandwichensis* (Walls, 1978) - endemic to the Hawaiian Islands

Future research into the deep water and deep Neritic Zone cone faunas of other fringe areas of the Indo-Pacific, such as northwestern Australia and the Marquesas and Tuamotu Islands of eastern Polynesia, may yield other, previously-unknown, members of this species complex.

### Family Conilithidae

#### Subfamily Conilithinae

#### Genus *Jaspidiconus* Petuch, 2004

#### *Jaspidiconus vantwoudti* Petuch, Berschauer, and Poremski, new species (Figure 3A-F; Figure 4 C, D)

**Description:** Shell small for genus, averaging only around 14 mm, stocky and inflated, broad across shoulder, with high, broadly pyramidal spire and rounded, convex sides; spire with distinctly sloping whorls; shoulder angled, bordered by small, rounded carina; body whorl shiny, ornamented with 20-24 faint, slightly-incised, evenly-spaced spiral sulci; sulci become stronger and better-developed toward anterior end; spire whorls smooth, ornamented with very numerous, closely-packed, radiating curved threads, which correspond to growth increments (Figure 3C, D); aperture proportionally wide and flaring, becoming wider toward anterior end;

base shell color bright pink, overlaid with variable amounts of darker pink or purplish-pink amorphous flammules; spire whorls marked with prominent large, widely-spaced, dark pink or pinkish-purple amorphous flammules; interior of aperture pink, becoming darker farther within interior; protoconch proportionally very large and prominent, shiny, composed of 2 rounded, domed whorls; protoconch color deep purple-pink; periostracum very thin, smooth, transparent.

**Type Material:** HOLOTYPE - length 12.4 mm, width 6.5 mm (Figure 3A, C), LACM 3432, type collection of the Department of Malacology, Los Angeles County Museum of Natural History, Los Angeles, California. Other material includes a 14 mm specimen in the research collection of E.J. Petuch (Figure 3B, D), a 12.4 mm specimen in the Berschauer collection, and a 13.4 mm specimen in the Poremski collection, all from the same locality and depth as the holotype.

**Type Locality:** Collected in 2 m depth, on exposed hard, rocky surface in high current and surge, near Arashi Beach, Noord District, Aruba.

**Range:** Known only from Aruba, to which the new species appears to be endemic.

**Ecology:** The new species prefers shallow water exposed rocky platforms, in areas with strong currents and wave surge.

**Etymology:** The taxon honors Alain Van't Woudt of Den Hoorn, The Netherlands, who collected the type lot on Aruba.

**Discussion:** The Grenadian Subprovince of the Caribbean Molluscan Province, which extends from Aruba to Anguilla, and encompasses all the island chains off the Venezuelan coast and the Lesser Antilles, is now known to house

three pink or pinkish-orange, similar-appearing endemic *Jaspidiconus* species: *J. berschaueri* from the northern Lesser Antilles (Windward Islands), particularly Sint Maarten; *J. arawak* from the southern Lesser Antilles (Leeward Islands), especially the Grenadines; and *J. vantwoudti* from Aruba (Netherlands Antilles). The new Aruban endemic described here is most similar to *J. arawak* (Figure 4A), but differs in being a smaller and stubbier shell with a smoother and shinier body whorl that lacks any pustules or beads, in having a more rounded and less developed shoulder carina, in having large, prominent dark pink or pinkish-purple patches on the spire whorls, in lacking the rows of tiny tan dots around the shoulder carina and sutures of the spire whorls, and in having a proportionally much larger and more domed protoconch. The new Aruban species differs from the Windward Islands *J. berschaueri* (Figure 4B) in being a smaller, stockier, and much less elongated shell with a proportionally lower and less elevated spire, in being a much smoother and less sculptured shell that is devoid of any prominent beads or pustules, in lacking large tan dots along the edge of the shoulder carina, and in having a proportionally much larger protoconch.

These three pink cones form a distinctive species complex that is restricted to the Grenadian Subprovince. Throughout the area extending from Tobago to Los Roques Atoll, members of this species complex often occur together with the much larger, variably-colored, and heavily-sculptured *J. jaspideus* (Gmelin, 1791) (see Petuch, 2013: 133). Unlike the restricted ranges of the three Grenadian Subprovince endemics, the type of the genus *Jaspidiconus*, is a widespread species which ranges from Tobago all the way to Panama and may co-occur with the three pink species in certain localities. Of these four southern Caribbean *Jaspidiconus* species, the new

Aruban endemic also has one of the most unusual habitat preferences of any of the known species of *Jaspidiconus*. Most of the members of this group of small cones prefer sandy environments, preferably clean carbonate sand or muddy quartz sand, along the entire western Atlantic, from Cape Hatteras, North Carolina to Santa Catarina State, Brazil. *Jaspidiconus vantwoudti* is the only species of its genus known to prefer open, exposed rocky platforms in shallow, high surge and strong current areas. The closely-related and similar-appearing *J. arawak* and *J. berschaueri* both prefer quiet water, clean carbonate sand areas near living coral reefs and coral rubble, as does the sympatric and widespread *J. jaspideus*. Because of its bright pink shell color, *Jaspidiconus vantwoudti* has often been referred to the taxon “*Jaspidiconus fluviamaris* Petuch and Sargent, 2011” by other workers and collectors. That species, however, is restricted to the Floridian Subprovince of the Carolinian Molluscan Province and ranges only from the Dry Tortugas island chain of the southeastern Gulf of Mexico, through the Florida Keys, and northward to Palm Beach County, Florida. Although having the same intense pink and pinkish-purple color of the new Aruban endemic, *J. fluviamaris* differs in being a larger and more elongated shell with a distinctly cylindrical shape and much straighter sides, and in having distinctly stepped, scalariform spire whorls that differ greatly from the sloping spire whorls of *J. vantwoudti*.

The new *Jaspidiconus* is the sixth-known endemic cone shell to be found on Aruba and its discovery underscores the uniqueness of the Aruban molluscan fauna. This Aruban endemic cone fauna is now known to include the conids *Arubaconus hieroglyphus* (Duclos, 1833), *Tenorioconus curassaviensis* (Hwass, 1792), *Tenorioconus monicae* Petuch and Berschauer, 2015, and *Tenorioconus rosi* Petuch and

Berschauer, 2015, and the conilithids *Perplexiconus wendrosi* (Tenorio and Afonso, 2013) and *Jaspidiconus vantwoudti* (see Petuch, 2013: 134-137 and Petuch and Berschauer, 2015: 195-205 for a review of the endemic marine gastropods of Aruba).

#### ACKNOWLEDGMENTS

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José and Marcus Coltro

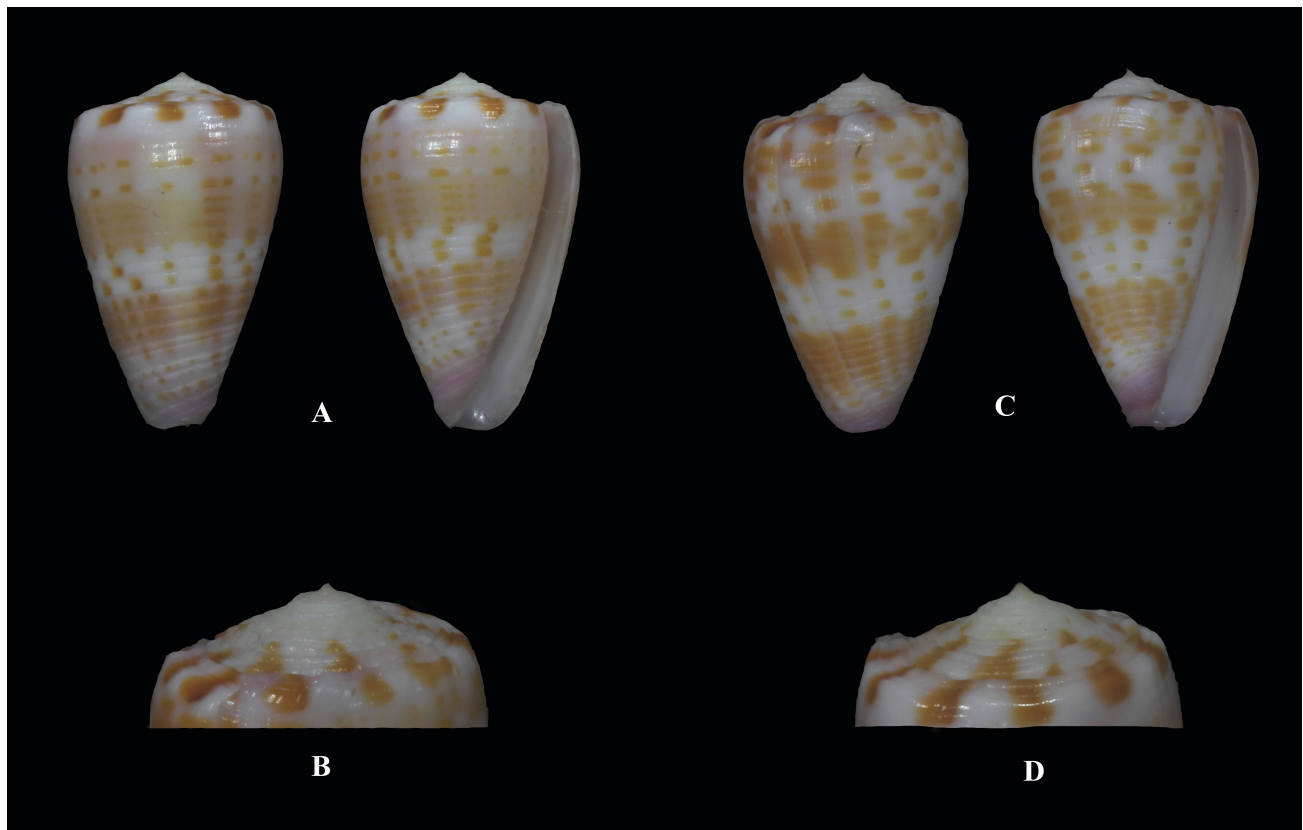
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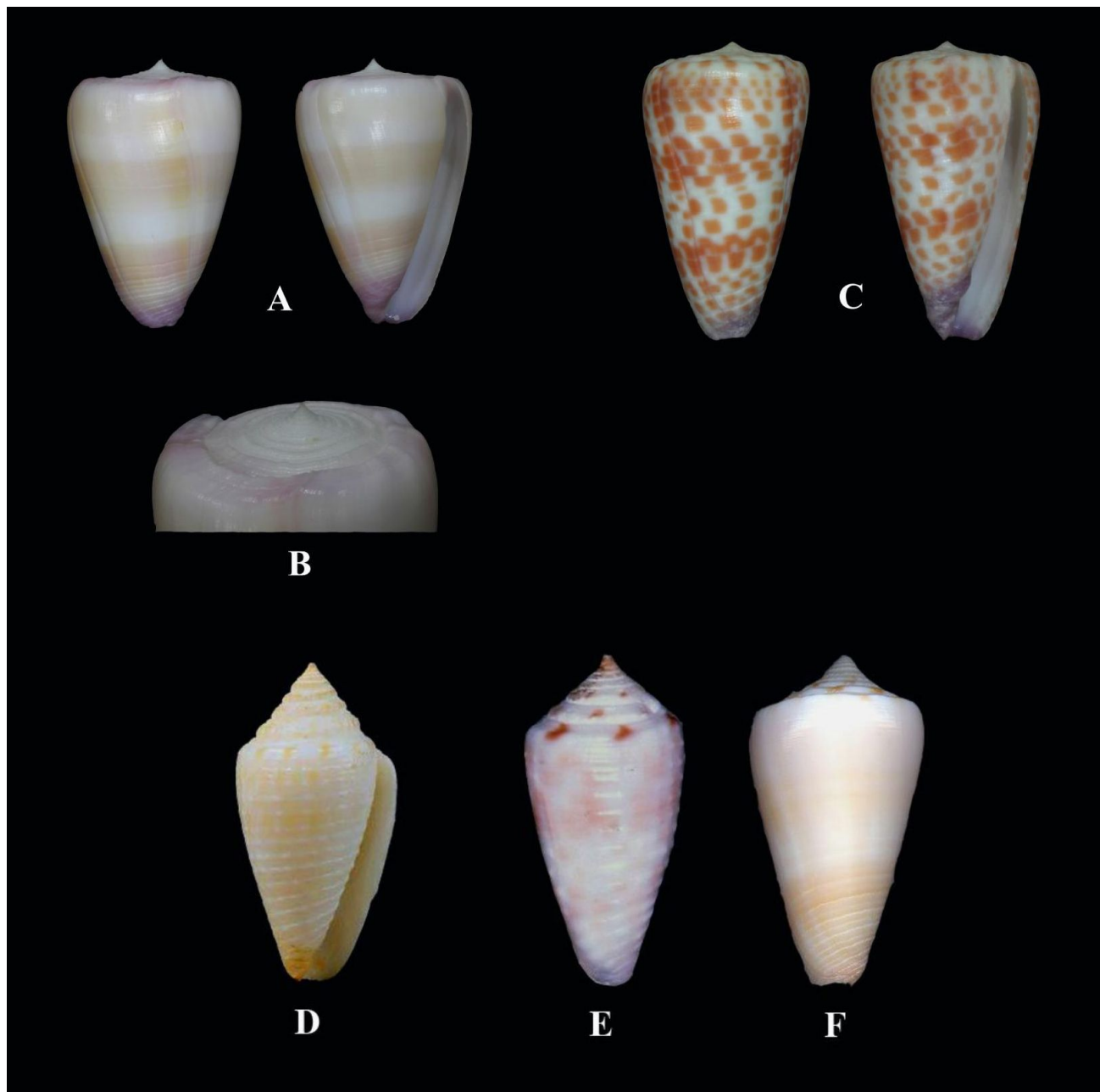
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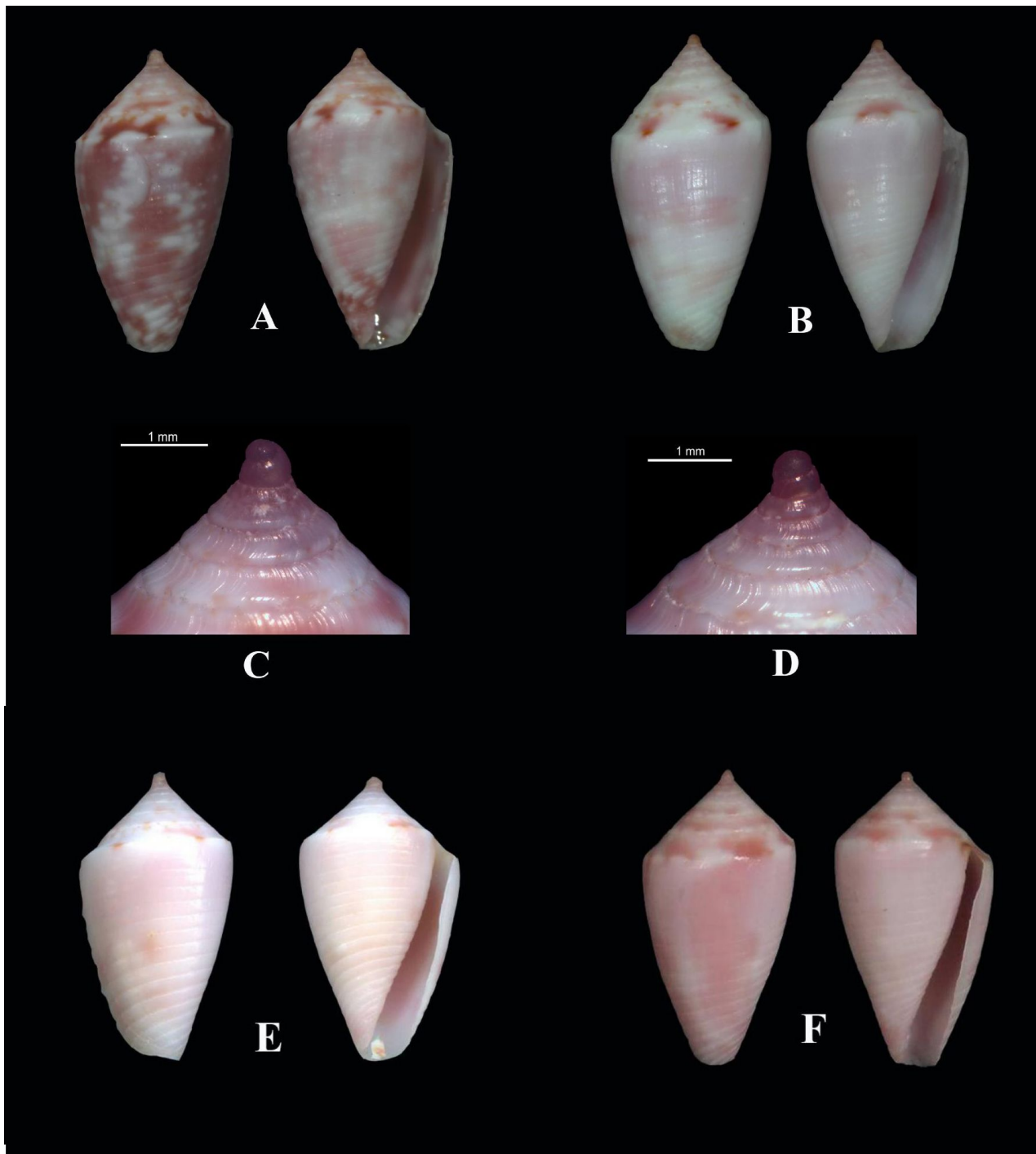




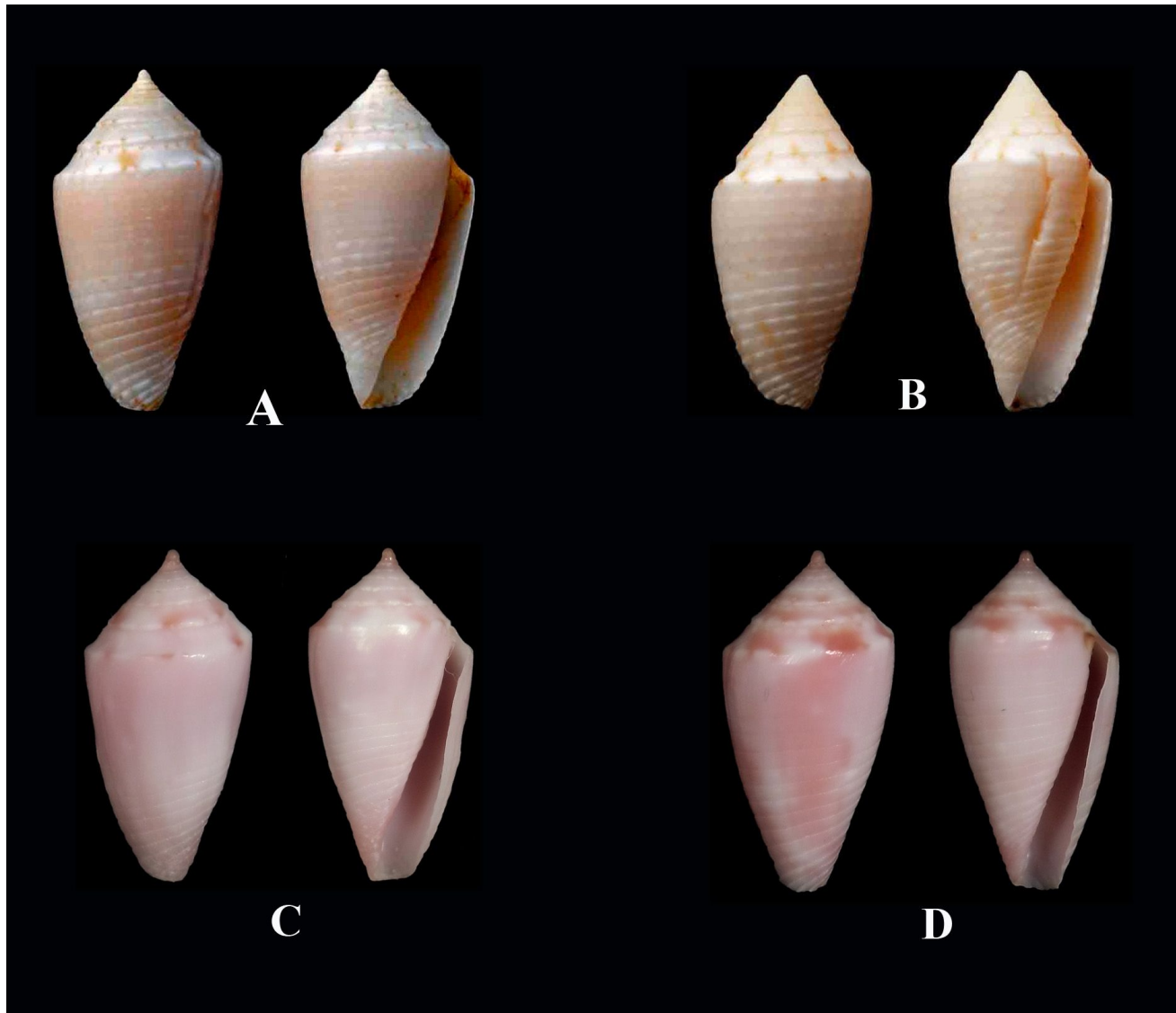
**Figure 1.** *Tesselliconus devorsinei* new species. **A**= Holotype (QM M080845, molluscan collection of the Biodiversity Section, Queensland Museum, Brisbane, Queensland, Australia), length 29 mm; **B**= close-up view of the spire of the holotype, showing the distinctive truncated pyramid shape and beaded sculpture of the early whorls; **C**= specimen with wide bands of orange-tan rectangular spots, length 30 mm, Berschauer Collection; **D**= close-up view of the spire of the 30 mm specimen, showing the distinctive truncated pyramid spire. Both specimens were dredged from 15 fathoms (27.5 m) depth east of Mooloolaba, Queensland, Australia.



**Figure 2.** *Tesselliconus* species, for comparison with *T. devorsinei*. **A**= *Tesselliconus suturatus* (Reeve, 1844), length 43 mm, 3 m depth in clean coral sand, off Fitzroy Reef, Great Barrier Reef, Queensland, Australia; **B**= close-up view of the spire of *T. suturatus*, showing the narrow, acutely-angled early whorls which lack the beaded sculpture seen on *T. devorsinei*; **C**= *Tesselliconus tessulatus* (Born, 1778), length 49 mm, 2 m depth in clean coral sand, Sykes Reef, Swain Group, Great Barrier Reef, Queensland, Australia; **D**= *Tesselliconus athenae* (Filmer, 2011), holotype, length 22.6 mm, dredged from 105 fathoms (192 m) depth off Keehi Lagoon, Oahu, Hawaii; **E**= *Tesselliconus sandwichensis* (Walls, 1978), holotype, length 14.4 mm, in sand on reef off Pokai Bay, Oahu, Hawaii; **F**= *Tesselliconus sandwichensis* (Walls, 1978), length 35 mm, on deep reefs off Oahu, Hawaii; photo courtesy of Paul Kersten.



**Figure 3.** *Jaspidiconus vantwoudti* new species. **A**= Holotype (LACM 3422, type collection of the Department of Malacology, Los Angeles County Museum of Natural History, Los Angeles, California), length 12.5 mm; **B**= length 14 mm. Petuch Collection; **C**= close-up of the spire of the holotype, showing details of the proportionally-large, bulbous protoconch; **D**= close-up of the spire of the 14 mm specimen in the Petuch Collection, showing details of the proportionally-large protoconch; **E**= specimen length 12.6 mm; **F**= specimen length 11.8 mm. All specimens collected on exposed rocky platforms in 1-2 m depths, in areas of strong currents and wave surge, near Arashi Beach, Aruba.



**Figure 4.** *Jaspidiconus* species from the Grenadian Subprovince of the Caribbean Molluscan Province. **A=** *Jaspidiconus arawak* Petuch and Myers, 2014, holotype, length 15 mm, from 3 m depth, in carbonate sand near coral reef, off Petit Martinique, Grenadines; **B=** *Jaspidiconus berschaueri* Petuch and Myers, 2014, length, holotype, length 18 mm, found in coral rubble in beach drift, Sint Maarten Island, Lesser Antilles; **C=** *Jaspidiconus vantwoudti* Petuch, Berschauer, and Poremski, new species, length 12.8 mm, near Arashi Beach, Aruba, for comparison with *J. arawak* and *J. berschaueri*; **D=** *Jaspidiconus vantwoudti* Petuch, Berschauer, and Poremski, new species, length 13.4 mm, near Arashi Beach, Aruba, for comparison with *J. arawak* and *J. berschaueri*.

**Note:** Club members, mark your calendars! The November Auction is scheduled for Saturday, November 14, 2015, beginning at 1:00 p.m. in the conference room at the Holiday Inn Express located at 751 Raintree Drive, Carlsbad. Food and beverages will be made available by the Club. An auction list will be e-mailed to all members prior to the event.



## What are Species? Or, on Asking the Wrong Question

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**ABSTRACT** The question, ‘What are species?’, has had a long history in biological systematics with no success at achieving a scientifically viable consensus. This failure is due in large part to the obsession with this one taxon to the exclusion of asking the epistemically more relevant question, ‘What are taxa?’ The problem has been exacerbated by the fact that systematics rarely operates in accordance with the overarching goal of scientific inquiry. This essay offers solutions by defining ‘taxon’ and ‘species’ such that they are consistent with that goal. Some notable consequences are then discussed.

### INTRODUCTION

Biologists have maintained an obsession with the biological status of species for several hundred years (Mayden, 1997; Stamos, 2003; Wilkins, 2009a, 2009b; Richards, 2010). The outcome thus far is that over 25 species concepts have been put forward. Ironically, from the voluminous literature on the subject, especially after the advent of Darwinian and neo-Darwinian thinking, consensus on the subject remains elusive. Biologists gravitate to one school of thought or another, often consistent with the organisms that are one’s specialty or one’s general perspective on the nature of biological systematics, or both.

The time is long overdue to cut through all the indecision, which means approaching that interminable question, ‘What are species?’, from an entirely different point of view; one that is not derived from within the limits of biological thinking. Rather, the search for a solution should begin outside biology. We must look to the generally acknowledged reason we engage in scientific inquiry as well as understand the basic principles of reasoning we apply in response to observations of organisms. When we consider the nature of the relations

that exist between an observer and the organisms they perceive, coupled with the goal of inquiry, we find that asking ‘What are species?’ is not the appropriate question. In this essay, I will show that the question we should have been asking all along is ‘What are taxa, and how do they serve the goal of scientific inquiry?’ It is only after answering that question that the subsidiary ‘What are species?’ can be answered. But answering that question will expose the notable deficiencies of the one term species for accurately representing the products of our interactions with organisms in the name of inquiry.

Pursuing the task outlined above first requires acknowledging the goal of scientific inquiry. Next we will need to take a short foray into the nature of reasoning to be able to link our reactions to the observations of organisms with the goal of inquiry. This provides the basis for stating the goal of biological systematics, which should be consistent with the goal of science, as well as showing that the term taxonomy is synonymous with systematics rather than being a sub-operation within or distinct from systematics. And since the field of science is systematics, as the act of systematization, our concern is not with classification since the latter



does not serve the intended purpose. We will then have a clearer conception of how to proceed from observations of organisms to the conclusions we call species, as well as all other taxa. And from there it is straightforward to give basic definitions of taxon and species that are consistent with scientific inquiry. The implications of those definitions for DNA ‘barcoding’ will be discussed, as well as pointing out that a single definition of species is both too biased and limited to effectively encompass all of the endeavors in systematics and biology.

### THE GOAL OF SCIENTIFIC INQUIRY

To what end do people involve themselves in a field of science? Certainly if you ask a physicist working with the Large Hadron Collider you will receive an answer very different from a malacologist examining the radulae from a group of gastropods. But while answers from different fields of science might appear dissimilar, it is the overarching objective of all scientists that is distinctly uniform. Simply put, the goal of inquiry in the sciences is to pursue causal understanding (Hempel, 1965; Hanson, 1958; Salmon, 1984a; Mahner & Bunge, 1997; Thagard, 2004; de Regt *et al.*, 2009; Hoyningen-Huene, 2013). We want to know why things are as they are, as well as anticipate what we might encounter in the future. The philosopher of science, Carl G. Hempel, offered a good characterization of the goal of scientific inquiry:

“Broadly speaking, the vocabulary of science has two basic functions: first, to permit an adequate *description* of the things and events that are the objects of scientific investigation; second, to permit the establishment of general laws or theories by means of which particular events may be *explained*

and *predicted* and thus *scientifically understood*; for to understand a phenomenon scientifically is to show that it occurs in accordance with general laws or theoretical principles.” (Hempel, 1965: 139, emphasis original)

Note that while descriptions of the objects and events we encounter are of utmost importance, they are the impetus to pursue causally understanding what is observed. Such pursuit is in the form of explanations of the present by way of what occurred in the past. And the better that causal understanding, the more effectively we can anticipate what might occur into the future.

As we will see later, the interplay between the descriptive and causal understanding form the basis of systematics, and is critical to correctly referring to all taxa, including species. But first we must understand the relations between observations, descriptions, and the pursuit of understanding, which derive from the basic principles of reasoning.

### THE NATURE OF REASONING, FROM PERCEPTIONS TO HYPOTHESES

In its simplest form, reasoning is the act of proceeding from evidence to conclusion(s). It is the act of making an inference (Salmon, 1984b). If presented as a set of statements, called an argument, the evidence comprises the premises that support a statement that is the conclusion. The ancient Greeks recognized that the content of and relations between premises and conclusion allows for a classification of reasoning. The ideal form of reasoning is deduction, and it is on the basis of the rules of valid deduction that all other forms of reasoning are compared. Of these rules for deduction, the most basic is that if the premises are true, then

the conclusion must be true. Consider this example,

- [1] All humans are mortal  
 Kirk is a human  
 \_\_\_\_\_  
 Kirk is mortal.

The line separates the premises above from the conclusion below. Given that the premises are true, the conclusion must be true. In fact, the conclusion is already implied by the premises since I am a subset of the group 'humans.' Valid deductions are indicated by a single line, whereas non-deductive reasoning is denoted by a double line separating premises and conclusion. For instance, changing the relations of premises and conclusion in [1] will give a non-deductive argument,

- [2] All humans are mortal  
 Kirk is mortal  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Kirk is a human.

While the premises are true, they cannot guarantee the truth of the conclusion. At best, the conclusion has some probability of being true, contingent on the content of the premises. The fact that I am mortal does not necessarily mean I am human, as mortality applies to all organisms. In standard logic, any argument that is not deductive is said to be inductive, as indicated by the double line. The conclusion contains or implies information not stated in the premises. In other words, the content of the conclusion goes beyond what is offered by the premises.

While the rules of deduction have the benefit of providing the foundation from which all reasoning is compared, deduction is of limited use for scientific inquiry. We saw earlier that a deductive conclusion only reiterates what

already is in the premises; it does not allow for introducing or considering new ideas. The act of explaining phenomena for the purpose of understanding requires that we go beyond mere descriptions; we have to consider unobserved and sometimes unobservable objects and events. Thus, growth of scientific knowledge is not by way of deduction. But to label all non-deductive reasoning as inductive is not an effective approach to characterize the actions in scientific inquiry. Subtleties have to be acknowledged.

At a minimum, inquiry in everyday life as well as the sciences proceeds from surprising or unexpected observations to inferences of hypotheses that offer explanatory accounts of those observations. This involves a form of non-deductive reasoning known as abduction or abductive reasoning (Thagard, 1988; Josephson & Josephson, 1994; Aliseda, 2006; see Fitzhugh 2006a, 2008, 2010, 2012, 2014 for considerations of abduction in relation to biological systematics and evolutionary biology). Abduction has the form,

- [3] Background knowledge  
 Theory  $X$ : if cause  $x$  occurs, effect  $y$  will  
 ensue  
 Surprising effect  $e_y$  is observed  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Hypothesis  $h_x$ : cause  $x$  occurred.

Abductive reasoning is the source of both hypotheses and theories, and also represents the everyday cognitive process proceeding from our sense data to observation statements. An observation statement is a hypothesis accounting for sense data by way of the existence of some object. And as we will see in the next section, references to taxa, species, or phylogenetic hypotheses are all products of abduction, which will be the key to properly defining terms like taxa and species.

Though this essay will not pursue these issues, brief mention should be made of the relations of abduction to the broader context of scientific inquiry. Abduction is the productive component of inquiry; it is the stage in which new ideas are put forward. As with any non-deductive inference, hypotheses are probable, not certain. Empirically evaluating the credibility of a hypothesis then requires that it be tested, which involves two steps. First, if the hypothesis is true, then specific consequences should be anticipated, such that those consequences, as potential test evidence can offer support for the hypothesis. The prediction of potential test evidence is deductive,

- [4] Background knowledge  
 Theory  $X$ : if cause  $x$  occurs, effect  $y$  will ensue  
 Given hypothesis  $h_x$ : cause  $x$  occurred  
 Proposed conditions to carry out test
- 
- Effect  $e_y$  originally prompting  $h_x$   
*Predicted test evidence*, i.e. independent effects associated as narrowly as possible with causal conditions outlined in  $h_x$  should be observed.

Subsequent to the prediction of test evidence, the hypothesis is subjected to testing by determining if the test evidence does occur. Hypothesis testing is an instance of induction,

- [5] Background knowledge  
 Theory(ies) relevant to original effects  
 Test conditions  $a, b, c$ , etc., established  
*Predicted test evidence* is observed/not observed pursuant to test conditions
- 
- Hypothesis  $h_x$  is confirmed/disconfirmed.

Since hypothesis testing is non-deductive, finding evidence that confirms a hypothesis offers support for the hypothesis but the truth of

the hypothesis remains probabilistic. Future test evidence could reduce confidence in lieu of an alternative explanation.

### THE GOAL OF BIOLOGICAL SYSTEMATICS AND HOW IT IS ATTAINED

Having presented an overview of the goal of scientific inquiry and the basic steps taken in the pursuit of that inquiry, we can identify the goal of systematics. Consistent with all the sciences, systematics pursues causal understanding of the differentially shared features of organisms. Unlike the nebulous view that systematics seeks to find the ‘tree of life’ or ‘reconstruct phylogeny,’ the more precise characterization is that systematics deals with hypotheses across a spectrum of causal contexts, ranging from the descriptions of organisms to ontogenetic, reproductive, intraspecific, specific, and phylogenetic hypotheses, among others (Hennig, 1966: fig. 6). The goal of systematics is therefore consistent with the intent of systematization (Hoyningen-Huene, 2013). This means use of the term taxonomy is unnecessary. While systematics and taxonomy are often considered synonymous, current usage tends to equate taxonomy with species ‘descriptions’ and systematics with phylogenetic hypotheses. Since species are not described, as shown in the next section, all actions within systematics serve the purpose of systematization, which makes it straightforward to show that all taxa are inferential products directed at our desire to acquire causal understanding of organisms. Similarly, classification cannot be equated with systematization. A process of grouping objects according to shared properties lacks the theoretical and causal depth desired in systematics.

## FORMAL DEFINITIONS OF ‘TAXON’ AND ‘SPECIES’

Reiterating what has been developed in the previous two sections, we encounter surprising or unexpected objects and events every day and in most instances spontaneously infer by way of abduction at least tentative answers to implied or explicit questions. For instance,

“Why is traffic so slow on this street (as opposed to moving the speed limit)?”

– “Perhaps there’s a wreck down the street.”

Or,

“Why is broken glass on the sidewalk (as opposed to being clean)?”

– “Maybe someone dropped a bottle.”

Notice that both questions refer to what is observed in contrast to what is expected. It is that contrast that prompts inquiry in the form of proceeding from observations to abductive inferences to possible causes as answers to questions.

Let’s extend such considerations to systematics. The objects of concern in biology are organisms. We observe individuals at particular moments during their life history, what Hennig (1966) referred to as *semaphoronts*, and we perceive these individuals by way of their properties or characters. It is our differential observations of characters among semaphoronts that prompt causal questions, leading to abductive inferences of hypotheses that explain these differences. Those explanations address a host of different observations, thus the inferences to

explanations require different sets of theories depending on what are being explained. The discussion so far has centered on our reactions to conditions of observed objects; reactions in the form of abductive inferences to explanatory hypotheses. Those hypotheses are what are often called *taxa*, whether species, genera, families, classes, etc. Since taxa are explanatory hypotheses, the consequence is that we *do not* observe or describe taxa. As noted already, taxa are nothing more than inferential reactions, in the form of explanatory hypotheses, to observations among semaphoronts. This means formal definitions of *taxon*, *species (partim)*<sup>1</sup>, and *supraspecific taxon* (= phylogenetic hypothesis) would be as follows (cf. Fitzhugh, 2005, 2009, 2013):

*Taxon*: Any of a number of classes of explanatory hypotheses in biological systematics that causally account for differentially shared characters among observed organisms.

*Species (partim)*: An explanatory account of the occurrences of the same character(s) among gonochoristic or cross-fertilizing hermaphroditic individuals by way of character origin and subsequent fixation within reproductively isolated populations. This is but one of at least five possible classes of explanatory hypotheses commonly called species. The other definitions will be given later.

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<sup>1</sup> As will be noted later, the term species entails at least five different classes of causal conditions, such that it is not possible to give a definition that is appropriate to all of them.

*Supraspecific taxon*: A class of explanatory hypotheses accounting for particular characters by way of character origin/fixation among members of an ancestral population, and subsequent population splitting events. Collectively known as phylogenetic hypotheses.

Per the structure of abduction in [3], formal representations of inferences to specific and supraspecific/phylogenetic hypotheses take the respective forms:

[6] **Species (*partim*) Theory**: If character *Y* originates among gonochoristic or cross-fertilizing hermaphroditic individuals of a reproductively isolated population with character *X*, and *Y* subsequently becomes fixed throughout the population, then individuals observed in the present will exhibit character *Y*.

**Observations (effects)**: Individuals have a dorsal margin with antennae in contrast to a smooth dorsal margin as seen among individuals to which other specific hypotheses (*a-us*, *b-us*, etc.) refer.

---

**Causal Conditions (specific hypothesis *y-us*<sup>2</sup>)**: The antennate dorsal margin condition originated within a reproductively isolated population with smooth dorsal margins and eventually became fixed throughout the population.

[7] **Phylogenetic Theory**: If character *X* exists among individuals of a reproductively isolated, gonochoristic or cross-fertilizing hermaphroditic population and character *Y* originates and becomes fixed within the population, followed by the population being divided into two or more reproductively isolated populations, then individuals to which descendant species hypotheses refer would exhibit *Y*.

**Observations (effects)**: Individuals to which specific hypotheses *x-us* and *y-us* refer have ventrolateral margins with appendages in contrast to smooth as seen among individuals to which other species hypotheses (*a-us*, *b-us*, etc.) refer.

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**Causal Conditions (phylogenetic hypothesis *X-us*)**: Ventrolateral margin appendages originated within a reproductively isolated population with smooth ventrolateral margins, and the appendage condition became fixed in the population (= ancestral species hypothesis), followed by a population splitting event that resulted in two or more reproductively isolated populations.

Notice that while specific and phylogenetic hypotheses are inferred by way of abduction, the respective theories used differ in that the former considers character origin/fixation within reproductively isolated populations, and the latter refers to character origin/fixation followed by population splitting events. The representations in [6] and [7] are highly schematic in that neither actually stipulates details regarding the various causal mechanisms necessary to offer useful explanatory accounts. Yet, this lack of causal specifics is typical in references to specific and phylogenetic hypotheses, *e.g.* cladograms. The intentional

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<sup>2</sup> The uninomial name used here and in [7] follows from Fitzhugh's (2008) argument that a species hypothesis is inferred separate from the phylogenetic hypothesis referred to by the rank of genus, and should be recognized as such. The binomen required by the International Codes of Nomenclature incurs the requirement that monotypic genera be recognized when in fact the genus name is empirically vacuous and cannot be defined.

limitation of the definition of species in [6] to intersexual organisms highlights the fact that the term species requires special consideration regarding several different classes of reproduction and genetic exchange, which will be discussed later (see **THE PROBLEM WITH SPECIES**).

Finally, let me reiterate that neither species nor any other taxa have the status of individuals; they are causal accounts intentionally inferred as part of the goal of inquiry. To speak of a 'species description' means describing the observed features of organisms, not the species. A formal species name refers to a hypothesis, e.g. specific hypothesis *y-us* in [6]. What is required is a definition of that formal name; that being an explanatory account of particular characters of organisms. The same conditions apply to supraspecific taxa, regardless of rank. And in the case of these latter taxa, all are phylogenetic hypotheses, e.g. [7].

### THE PROBLEM WITH SPECIES

The definition of species in the previous section (see also [6]) is intentionally limited in scope for the fact that the one term cannot accurately entail the variety of causal events typical across all organisms, especially those that do not display the uniformity of sexual reproduction. Fitzhugh (2013) identified at least five classes of causal events to which the term species have been applied:

*Species<sub>1</sub>* (cf. [6]): if character *Y* originates among gonochoristic or cross-fertilizing hermaphroditic individuals of a reproductively isolated population with character *X*, and *Y* subsequently becomes fixed throughout the population, then individuals observed in the present will exhibit character *Y*. This is essentially

equivalent to the 'biological species concept.'

*Species<sub>2</sub>*: if character *Y* simultaneously originates and is fixed by hybridization, e.g. polyploidy, among gonochoristic or cross-fertilizing hermaphroditic individuals to which respective 'species<sub>1</sub>' hypotheses refer, such that subsequent interbreeding events are limited to individuals with *Y*, then individuals observed in the present will exhibit *Y*. This is a common occurrence among plants that exhibit polyploidy, wherein polyploid individuals immediately result in reproductive isolation.

*Species<sub>3</sub>*: if character *X* exists among individuals with obligate reproduction that is asexual, apomictic/parthenogenetic, or self-fertilizing, and character *Y* originates, then individuals observed in the present exhibiting *X* and *Y* are respective reproductive products of individuals with those characters. This characterization addresses the most distinct limitation of the 'biological species concept.' Among organisms that are obligate asexual, parthenogenetic, or self-fertilizing, the introduction of novel characters result in divergent lineages of individuals with those characters explained by the species<sub>3</sub> hypothesis. A complicating factor that will not be pursued here is that phylogenetic hypotheses (cf. [7]) are not applicable to these kinds of organisms since the only type of 'lineage splitting' that occurs is by way of reproductive events, not population splitting events.

*Species*<sub>4</sub>: if character *Y* originates among individuals with *X* during one of the alternative phases of asexual or sexual reproductive events, and *Y* subsequently becomes fixed throughout the population during tokogeny, then individuals observed in the present will exhibit *Y*. This class of hypothesis considers organisms with metagenetic or ‘alternation of generation’ life histories, as observed for instance among some cnidarians [*e.g.* alternate polyp (asexual) and jellyfish (sexual) stages; sporocysts (asexual) and adult (sexual) digenetic trematodes].

*Species*<sub>5</sub>: if character *X* exists among individuals and character *Y* subsequently occurs due to horizontal genetic exchange with other individuals, then individuals observed in the present exhibiting *X* and *Y* are respective reproductive products of individuals with those characters. Horizontal gene transfer is a widespread phenomenon, especially among bacteria. The standard species hypothesis, *e.g.* *species*<sub>1</sub>, aimed at sexually reproducing organisms cannot accommodate hypotheses explaining characters obtained via horizontal genetic exchange.

What is most apparent is that the one term *species* is inadequate to represent the variety of non-phylogenetic hypotheses required to explain the presence of shared characters among organisms. The five classes of hypotheses outlined here are not immediate solutions to the problem, but rather illustrate that the problem exists and needs to be acknowledged.

As noted in the previous section that all taxa, including species, represent explanatory hypotheses. Taxa do not have the status of individuals or things, and when one points to an organism-as-semaphoront they are not referring to a species, genus, etc. Hypotheses are explanatory constructs. Their relations to organisms only stand as vehicles that provide causal understanding, per the goal of scientific inquiry.

### **DISPELLING THREE MYTHS: DNA BARCODING, ‘CRYPTIC’ SPECIES, AND THE PREEMINENCE OF SEQUENCE DATA**

The fact that species are multiple classes of explanatory hypotheses, and phylogenetic hypotheses also have explanatory standing, has significant implications for the growing methodological fad known as DNA barcoding. The reliance on snippets of DNA to ‘identify’ species suffers from the erroneous premise that species can be regarded as spatio-temporally localized individuals. As species do not have this quality, sequence data cannot serve as a surrogate for the actuality that species hypotheses can and do refer to explanations of characters other than nucleotides. Barcoding fails on both epistemic and scientific grounds (Fitzhugh, in prep.).

There is a common tendency among systematists to think that sequence data offer clues to ‘cryptic’ species, where ‘traditional’ (*i.e.* ‘morphological’) characters fail to discriminate between species. This is a specious perspective that derives not only from the failure to recognize species as explanatory hypotheses, but also not understanding the abductive inferences that lead to those hypotheses. No one class of characters, sequence data in this case, can be held up as the basis for inferring species hypotheses. Instead, the decision-making

process of what observed effects to include in the minor premises of an abductive inference to species hypotheses, *cf.* [6], will depend upon the investigator's choices of what observations are to be conjoined with the major premise that is a particular theory, *cf.* species<sub>1</sub> through species<sub>5</sub> in the previous section. Excluding all observations except sequence data is irrational if it is the case that there are non-sequence data that have to be explained via the same theory. And, since species are neither class constructs nor ontological individuals, there can be no 'cryptic' species; only explanatory hypotheses that fulfill the inferential requirements necessary to attain rational conclusions.

Finally, the view that sequence data offer some sort of superior avenue to inferring species suffers from not understanding that causal understanding is our goal (Fitzhugh, 2006b, 2012, 2014, in prep.). The tools of such understanding include the theories of natural selection and genetic drift. But as it is the case that selection cannot operate at the level of individual nucleotides, but rather at the higher organizational levels of phenotypes, we would have to restrict explanations of sequence data to drift, which is not entirely realistic. Explaining particular phenotypes by way of selection will determine distributions of lower-level structures, including associated sequences by the phenomenon of downward causation (Campbell, 1974; Ellis, 2012; Martínez & Esposito, 2014). The consequence is that the naïve inclusion of sequence data in inferences of specific and phylogenetic hypotheses, coupled with the exclusion of other relevant characters that are in need of being explained, will result in hypotheses that have little if any explanatory merit. There must be discrimination between sequences to be explained by drift as opposed to higher-level selection for particular phenotypes. In other words, not all sequence data can serve the purposes of inferring taxa at the exclusion of

other characters also in need of being explained. Like barcoding, the popular bias toward sequence data is founded on significant misunderstandings of the goal of biological systematics as a scientific endeavor.

## CONCLUSIONS

The title of this essay alludes to the view that asking 'What are species?' is not the right question. The relevant question is, 'What are taxa?' I have provided the answer to the latter question such that the former can be cogently answered. If you now feel confused about what is a species, then I have done my job. You should feel confused for the fact that the pursuit of causal understanding within biological systems is not always a clear-cut process and cannot be represented by simple classificatory procedures. Systematics is about systematization. There are no activities called taxonomy or classification *simpliciter* that usurp the intent of systematization. There are only our efforts to describe objects, *not* species, and pursue causal understanding of our observations through the inferences of various taxa-as-explanatory hypotheses. Recent tradition in systematics has focused too much effort on methodology at the expense of integrating the coherent philosophical foundations that pervade all sciences. And the victims of this neglect have been thoughtful treatments of the question, 'What are taxa?'

## ACKNOWLEDGEMENTS

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**Taxonomic Note - new species:** *Typhinellus jacolombi* Houart, 2015

This new species from the Caribbean sea, apparently endemic to Portobelo Bay, Panama, is relatively large for the genus ranging in size from 19 to 28 mm in length, and is substantially broader in length/width ratio than other species in the genus, with a spiral sculpture of low, rounded, broad smooth primary and secondary cords and narrow tertiary cords, a long tapering broad ventrally sealed anal tube, a small and rounded protoconch, with color ranging from completely white to light brown. The holotype figured above measures 19.2 mm in length. (Houart, R. 2015. Description of a new species of *Typhinellus* (Gastropoda: Muricidae: Typhinae) from the Western Atlantic. *Zootaxa* 4007(3) 427-432.) Photo credit: Roland Houart, with permission.

***Bertia setzeri*, a New Species of Land Snail from Vietnam  
(Gastropoda: Stylommatophora: Dyakiidae)**

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**ABSTRACT** A new species of genus *Bertia* Ancey, 1887 is described from Khánh Hòa, Central Vietnam and compared to three species of this genus: *Bertia cambojiensis* (Reeve, 1860), *Bertia pergrandis* (Smith, 1893) and *Bertia brookei* (Adams & Reeve, 1848).

**KEYWORDS** Mollusca, Gastropoda, Stylommatophora, Dyakiidae, *Bertia*, Nha Trang, Khánh Vĩnh, Khánh Hòa, Bình Định, Central Vietnam, land snail, new.

**INTRODUCTION:** *Bertia* is a genus of the family Dyakiidae. At the end of 2014, an unknown land snail was found that was not included in the works by Schileyko (2011). It belongs to the genus *Bertia* and is described herein.

**Abbreviations:**

ANSP = Academy of Natural Sciences, Philadelphia, USA

NHMUK = National Museum of Natural History, London, England

NNT = Collection N.N.Thach

**SYSTEMATICS:**

**Class Gastropoda Cuvier, 1797**

**Order Stylomatophora Schmidt, 1855**

**Family: Dyakiidae Gude & Woodward, 1921**

**Genus: *Bertia* Ancey, 1887**

**Type species: *Helix cambojiensis* Reeve, 1860**

***Bertia setzeri* n. sp.**

**Figure 1, Images 1-4 and 17-20**

**Diagnosis:** The new species is characterized by completely black base with the shell width much larger than its height.

**Description:** Shell large (70-75 mm in average adult size, reaching 78.6 mm in width) heliciform sinistral much wider than high with 5.5 whorls. Spire low and inflated, sutures deep. Body whorl swollen, periphery rounded with a moderately strong spiral rib. Sculpture consists of many broad radial ribs at body whorl (each rib is a series of 3-4 riblets) and numerous small granules formed by intersections of fine radial and spiral ribs at penultimate whorl. Aperture wide obliquely ovate and bluish at upper part with external pattern visible within and darker at lower part, outer lip wide thin and not angulated. Base inflated, strongly convex and sculptured with numerous radial ribs. Umbilicus broad open and deep, periostracum thin and straw-colored. Color red-brown at dorsal side and completely black at ventral side. Illustrated holotype was damaged at periphery.

**Type material:** Holotype 78.6 mm wide in ANSP (Fig.1, Images 1-4). Paratype 1: 75 mm wide in NNT (Fig. 1, Images 17-20). Paratype 2: 73.8 mm wide and Paratype 3: 76.2 mm wide in Ex-NNT (not illustrated).

**Type locality:** At the border of Khánh Vĩnh District and Nha Trang outskirts, Khánh Hòa Province, Central Vietnam.

**Range and habitat:** Known only from the type locality. The specimens were found among leaf litter.

**Etymology:** This new species was named in honor of Steve Setzer of the United States for his interest in the terrestrial snails of Vietnam.

#### DISCUSSION:

• *Bertia setzeri* n.sp. is close to *Bertia cambojiensis* (Reeve, 1860) (Fig. 1, Images 5-8) but differs in shell width much larger than shell height, completely black base, lack of dark brown spiral band along suture of each whorl

and other characters that are summarized in Table 1.

• *Bertia setzeri* is close to *Bertia pergrandis* (Smith, 1893) (Fig. 1, Images 9-12) but differing in completely black base, convex (not angulate) outer lip and other characters that are summarized in Table 1.

• *Bertia setzeri* is close to *Bertia brookei* (Adams & Reeve, 1848) (Fig.1, Images 13-16) but differs in completely black base, not concave outer lip at umbilical area, vivid yellow (not grayish brown) foot, black (not orange-colored) eyes of the live animal and other characters that are summarized in Table 1.

**Table 1:** Comparison of *Bertia setzeri* vs *B. cambojiensis*, *B. pergrandis* & *B. brookei*

	<i>Bertia setzeri</i>	<i>Bertia cambojiensis</i>	<i>Bertia pergrandis</i>	<i>Bertia brookei</i>
<b>Umbilicus</b>	Broad, open and deep	Moderately broad, open and shallow	Broad, widely open and deep	Mostly covered by columella, shallow
<b>Umbilical area</b>	Black	Black or red-brown	White	Red-brown
<b>Base color</b>	Completely black	Black or red-brown encircled by white band	White, encircled by red-brown band	Completely red-brown
<b>Peripheral rib</b>	Moderately strong	Obsolete	Very strong	Sharp, very strong
<b>Locality</b>	Vietnam (Khánh Hòa Province)	Cambodia	Vietnam (Binh Định Province)	Indonesia, Malaysia

#### ACKNOWLEDGEMENTS:

I want to thank the members of my team who worked diligently at the end of 2014 to collect land snails of Central Vietnam for scientific study. I am also grateful to Prof. Fred Naggs and Dr. Jonathan Ablett of London National Museum of Natural History for the photos of *Bertia cambojiensis* and *Bertia pergrandis* stored at this Museum, to Bernard Dupont for the photos of *Bertia brookei* and to Christa Hemmen for supplying the original description of *Bertia pergrandis*. Thanks are also due to the reviewers for useful comments.

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**Figure 1.** Images1-4: *Bertia sertzeri* n.sp., Khánh Hòa, Vietnam, Holotype 78.6 mm wide, Image No. 4 shows sculpture at penultimate whorl with many granules, ANSP; Images 5-8: *Bertia cambojiensis*, Syntype at NHMUK for comparison; Images 9-12: *Bertia pergrandis*, Syntype at NHMUK for comparison; Images 13-16: *Bertia brookei* for comparison, Image Nos. 13, 14 and 16 by Bernard Dupont, Image No. 15 by Reeve; Images 17-20: *Bertia sertzeri* n.sp., Paratype, 75mm wide, with animal when alive, Image No. 19 shows internal organs of the snail, NNT.

**Iconography and Distribution of the Cape Verde Island Abalone,  
*Haliotis tuberculata fernandesi* Owen & Afonso, 2012, with Comparisons to  
*H. tuberculata coccinea* Reeve, 1846, of the Canary Islands**

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**ABSTRACT** Specimens of *Haliotis tuberculata fernandesi* collected from Santa Luzia Island, Cape Verde Islands, are illustrated to provide additional representatives of this subspecies. Comparisons are made with *Haliotis tuberculata coccinea* Reeve, 1846, of the Canary Islands. Differences in shell morphology between the two subspecies are discussed in greater detail.

## INTRODUCTION

The Cape Verde Islands, located nearly 600 km off the west coast of Senegal, are the southernmost archipelago in Macronesia and are unique amongst these island groups in possessing a mixture of marine fauna and flora composed of tropical (often amphi-) Atlantic and warm temperate Mediterranean - Atlantic elements, as well as extensive endemics (Afonso *et al.* 2008; Afonso & Tenorio 2011; Duda & Rolán 2004; John *et al.* 2004; Lüning *et al.* 1990; Morri *et al.* 2000; Wirtz 2001, 2009).

*Haliotis tuberculata fernandesi* Owen & Afonso 2012, the southernmost subspecies of *H. tuberculata* in the Cape Verde Islands, represents an endemic derived from the warm temperate Atlantic (Wirtz 2001; Owen & Afonso 2012). When *Haliotis tuberculata fernandesi* was initially described in 2012, only a handful of specimens were known from collections and were limited to Boavista, Sal, and São Vicente Islands (Owen & Afonso 2012; Fig. 1). Additional specimens were also reported from Santa Luzia and Santiago Islands, but were not available for study (Fig. 1). Recently, collected material from Santa Luzia

Island provides additional examples of *Haliotis tuberculata fernandesi* and reinforces the subspecific designation of this taxon in comparison to other Eastern Atlantic haliotids, particularly *H. tuberculata coccinea*. The aim of this report is to provide additional images of the Cape Verde subspecies of *Haliotis tuberculata*, characteristics that separate it from *H. tuberculata coccinea*, and an updated distribution map of the Cape Verde abalone.

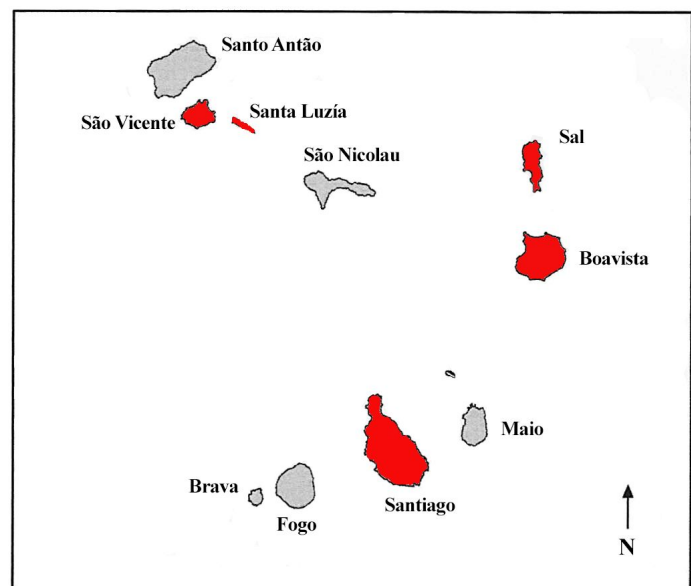


Fig. 1. Map of Cape Verde Islands. (Islands specimens taken from are shaded in red)

**Material and Methods:** Shells were faintly moistened with mineral oil and the excess was wicked away. Specimens were photographed with a Canon A650 digital camera (12 megapixel resolution) or scanned with a HP ScanJet G 4010 scanner.

**Abbreviations of collections:**

BOC: Buzz Owen Collection, Gualala, California, USA; DDC: Dwayne Dinucci Collection, Union City, California; FFC: Franck Frydman Collection, Paris, France; NMNZ: Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand; PRC: Peter Ryall Collection, Austria; RFC: Ramiro Fladeiro Collection, Valhascos, Portugal; RKC: Robert Kershaw Collection, Narooma, NSW, Australia.

**Material Examined:** *Haliotis tuberculata fernandesi*, Cape Verde Islands, >80 shells; *H. tuberculata coccinea*, Canary Islands, >100 shells.

**Taxonomic Note:** The type specimen of *H. tuberculata coccinea* (described in Reeve, 1846, as *Haliotis coccinea*) is incorrectly attributed as being from “Cape Verd Islands”. However, the strong spiral ribbing and bright red coloration of the specimen are indicative of the Canary Islands population (Geiger & Owen, 2012).

## RESULTS

Four photo plates are included and show the differences between these two *Haliotis tuberculata* subspecies: three illustrate 45 specimens of *H. tuberculata fernandesi* from the Cape Verde Islands, and a single plate illustrates 15 shells of *H. tuberculata coccinea* from the Canary Islands. The latter were selected from five different islands in the archipelago. Most of the Cape Verde material was collected from Santa Luzía Island from March - July 2015.

**Description:** Most Santa Luzía Is. shells of *H. tuberculata fernandesi* are similar in coloration to specimens collected from the other islands in the Cape Verde archipelago (particularly Sal Island), usually moderate pink to dark purple-red. However, the large sample size also shows other color variants including brown and (mostly) yellow specimens. Additionally, many of the shells are marked with bright flammae or display patches of green, white, brown and yellow. Specimens lack strong spiral ribbing, being smooth or with very faint and shallow ribs (Pl. 3). By contrast, *H. tuberculata coccinea* (Pl. 4) has very deep and pronounced ribbing, with an occasional exception (bottom row this plate). They also lack purple-red coloration, which is the dominant color form in the Cape Verde Island subspecies.

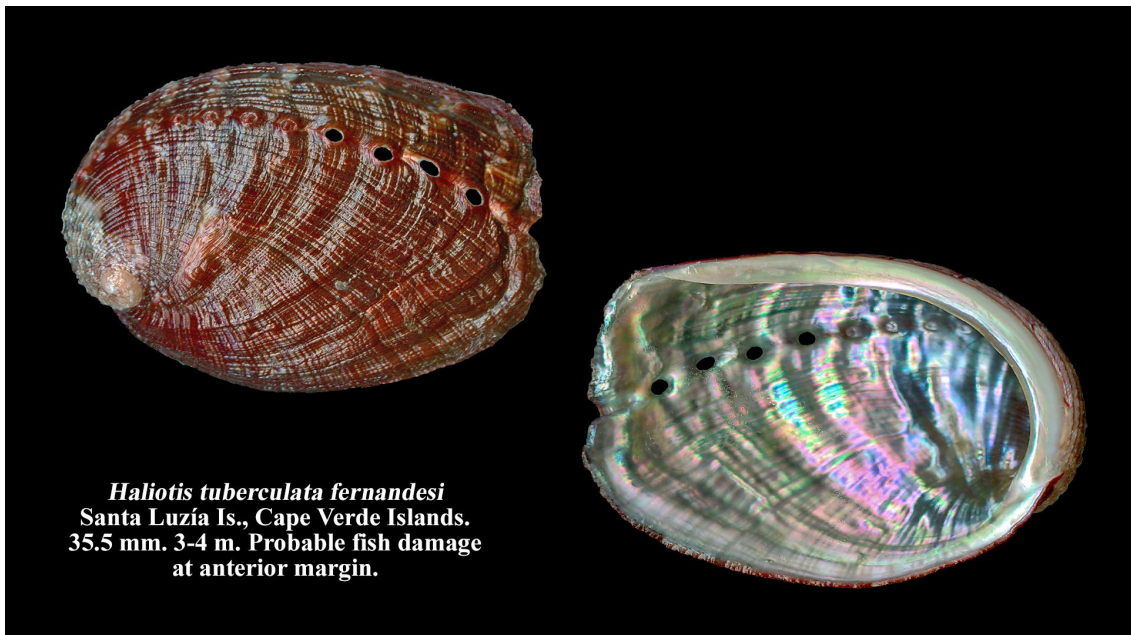
**Biological Note:** Of the greater than 75 specimens examined from Santa Luzía Island, approximately 25% exhibit predation damage at the anterior margin (Plate 3). Each of these specimens survived a predation attempt and later deposited new shell growth. Interestingly, this predation damage is similar to that produced by labrid (wrasse) or balistid (triggerfish) reef fish. Similar damage can be observed among shells of *Haliotis rubiginosa* Reeve, 1846, from Lord Howe Island (Owen, pers. obs.).

## ACKNOWLEDGEMENTS

We wish to thank Ramiro Fladeiro and Silvia Pereira for providing the Santa Luzía Island specimens and numerous photos and scans of *H. tuberculata fernandesi*. We would also like to thank D. Dinucci, F. Frydman, and R. Kershaw for providing photographs of specimens from their private collections.

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*Haliotis tuberculata fernandesi*  
 Santa Luzia Is., Cape Verde Islands.  
 35.5 mm. 3-4 m. Probable fish damage  
 at anterior margin.





Plate 1. *Haliotis tuberculata fernandesi* Owen & Afonso, 2012. Cape Verde Islands, various localities.

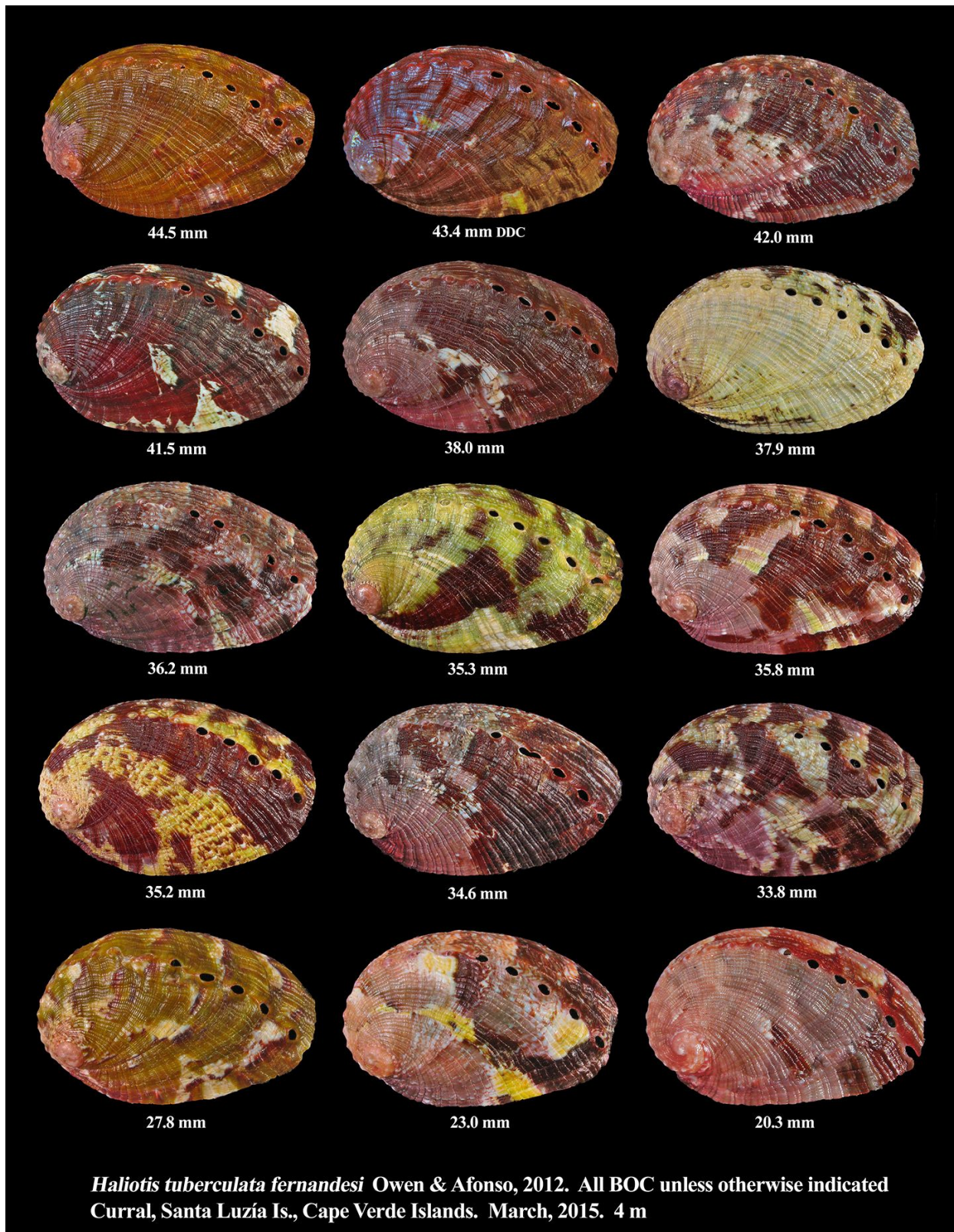


Plate 2. *Haliotis tuberculata fernandesi* Owen & Afonso, 2012. Buzz Owen Collection. Curral, Santa Luzia Is., Cape Verde Is.

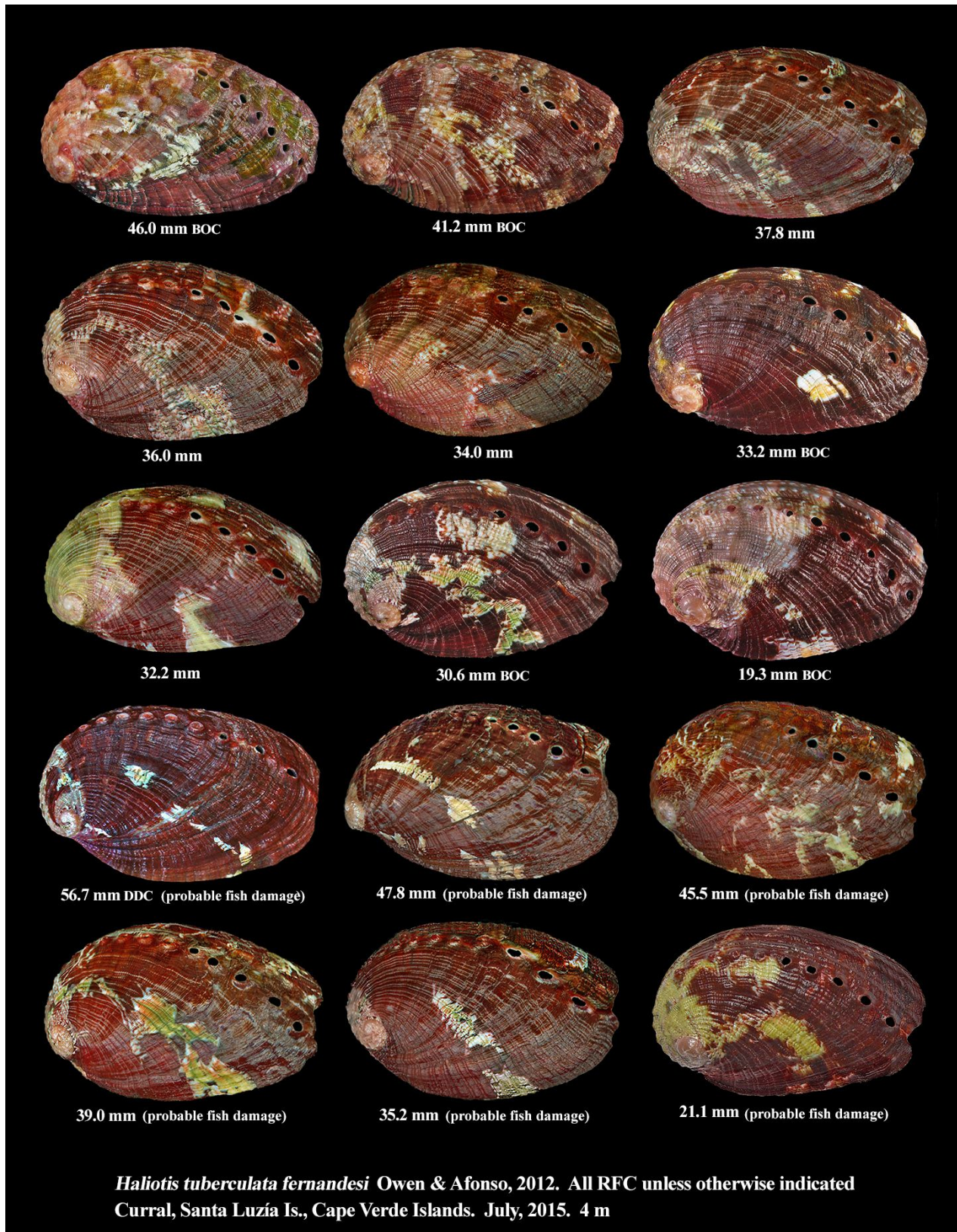


Plate 3. *Haliotis tuberculata fernandesi* Owen & Afonso, 2012. Ramiro Fladeiro Collection. Curral, Santa Luzia Is.

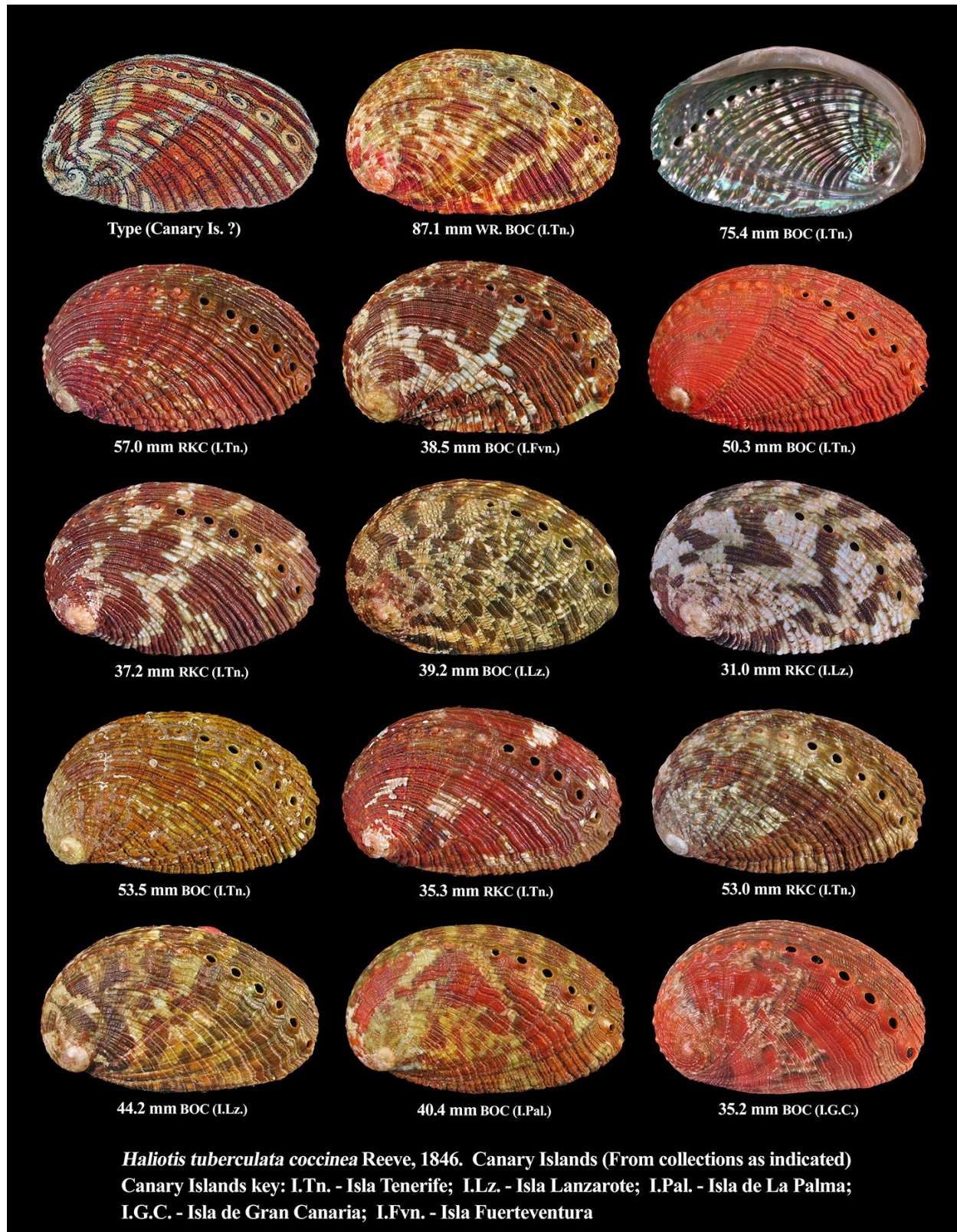


Plate 4. *Haliotis tuberculata coccinea* Reeve, 1846. Canary Islands.

## *Jaspidiconus*: what are the options?

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**ABSTRACT** The number of species of *Jaspidiconus* recognized in three recently published works are compared. These references varied in the number of species recognized as valid ranged from 6 to 36 taxa. Using a metric, Percentage synonyms, the degree to which taxa are lumped was measured. The Percentage synonyms varied from 0 in the base document to 69% and 56% in the other documents. Such variation among publications by different authors suggests that morphological species concepts are too subjective to allow direct comparisons among publications or identification of valid species. In contrast, use of molecular methods may avoid the problems of the subjective morphological species concepts. However, molecular methods are only valid when they are applied to geographically coded samples to arrive at clades in the phylogram. Use of molecular methods for samples that have previously been identified to taxon by morphological methods is biased by the need to identify samples to species first to obtain a phylogram.

**KEYWORDS** Morphological species concepts, *Jaspidiconus*, metric comparisons, western Atlantic.

### INTRODUCTION

I enjoyed David Berschauer's Iconography of the *Jaspidiconus* and the comparison of the Cape Verde *Africonus* 'species flock' in the eastern Atlantic and the large number of potentially valid species of *Jaspidiconus* in the western Atlantic (Berschauer, 2015). He noted that the two were similar in that they have paucispiral protoconchs suggesting that they do not have extended dispersive larval stages. Normally this situation is taken as evidence that snails with this sort of protoconch do not have as good dispersal abilities when compared to snails with multispiral protoconch and supposed longer free floating larval stages (see Berschauer's discussion). The length of the larval periods associated with various protoconch morphologies is for the most part unknown so any assumptions made are hypotheses but seem to be reasonable ones. I would like to have seen comparisons between *Jaspidiconus* and other genera (e.g., *Kohniconus*

and *Dalliconus*) of Conilithidae (see Tucker & Tenorio, 2009 and 2013) most of which have multispiral protoconchs and with others such as *Perplexiconus* and *Coltroconus*, two conilithid genera along with *Artemidiconus* of the Conorbidae all of which have paucispiral protoconchs, but are not considered here. These last three genera all have relatively few species even if suggested synonyms are listed as valid. The last two also have relatively restricted ranges (i.e., mostly in Brazil) compared to *Jaspidiconus*. What this means, I think, is that dispersal ability is not the only determinant of the number of species that any particular genus will produce. However, biogeographic influence on systematics is not the purpose of this paper. Rather, it is to show exactly how little we actually know about all of these species of *Jaspidiconus*. I intend to do this by using Berschauer's (2015) most recent account and comparing it to accounts by other authors from the 21<sup>st</sup> century. Given the assumption that we know what we are talking

about, these species lists should more or less agree with each other. After all, we are all looking at the same shells.

## MATERIALS

I am using Berschauer's (2015) Iconography as a guide to possibly valid species based on the biogeographic provinces of Petuch (2013). I am also listing the species as either valid species or synonyms from Tucker & Tenorio (2013) and from Kohn (2014). Geographically, Tucker & Tenorio (2013) cover all of the provinces and subprovinces listed by Berschauer (2015). Kohn (2014) excluded the Brazilian provinces recognized by Petuch (2013). I have selected this comparative material because it is easily available to collectors of cone shells. This list is admittedly somewhat biased because I was the coauthor of one of the three references that I surveyed. Other available references were not used because they cover smaller geographic areas (*e.g.*, Tucker, 2012). Others (*e.g.*, Abbott, 1974) are too old and do not include many of the newly described species of this last decade of systematic research on cone shells (*see* Table 1).

Because Kohn (2014) did not cover the entire western Atlantic region and did not have access to descriptions of many new species of *Jaspidiconus*, I have prepared a metric in Table 1 allowing Kohn's book to be compared to Tucker & Tenorio (2013). It uses 'Percentage synonyms' in order to judge degree of lumping (or splitting) (Table 1). A higher value indicates a greater degree of 'lumping' than does a lower value, which would indicate a greater degree of 'splitting'. The value for Percentage synonyms is 0% for the species included by Berschauer (2015). Berschauer (2015) did not list synonyms and all illustrated species were considered valid species.

## DISCUSSION

Based on Percentage synonyms the book by Kohn (2014) most strongly lumps the various *Jaspidiconus* species together and at roughly twice the rate compared to Berschauer's listing. Kohn (2014) only discusses six species of *Jaspidiconus*. In contrast, Tucker and Tenorio (2013) took more of a splitters' approach to the species of *Jaspidiconus*. They listed 22 *Jaspidiconus* taxa. Kohn's 69% Percentage synonyms is about a third higher than is the 56% for Tucker & Tenorio (2013). The two percentage synonyms of 69% versus 56% for what are essentially the same species of *Jaspidiconus* indicates the general lack of congruence in the systematics of *Jaspidiconus*. It is further demonstrated by the relatively few taxa (6) used by Kohn (2014) compared to Tucker & Tenorio's (2013) 22 taxa and Berschauer's (2015) 36 taxa. Moreover for both Kohn and Tucker & Tenorio all of the Net changes are negative. In other words neither list species as valid that are not also listed as valid by Berschauer.

Such discrepancies may indicate that shell morphology cannot reliably be used to distinguish the species of *Jaspidiconus*. Apparently competent or expert students of cone shells can differ by as much as 50% in the number of valid species of *Jaspidiconus* that they recognize. There is no objective way to evaluate these classification schemes. Obviously, use of shell morphology as a basis for identifying species of *Jaspidiconus* will require precise identification and definition of shell morphological traits.

One possible method that may help clear up the systematics of the *Jaspidiconus* is use of DNA or RNA from mitochondrial genes. A preliminary tree (subtree A. Kohn, 2014, p. 420) included four taxa of the *Jaspidiconus* including

*J. stearnsii*, *J. mindanus*, *J. jaspideus*, and *J. pealii* (species nomenclature follows Kohn, 2014). This tree is not of much use because it includes only four of the 36 taxa that Berschauer (2015) listed as potentially valid species. A better approach may be to completely ignore the possible taxation as an identifier but instead use as many individuals from the many provinces and subprovinces without using taxon as an identifier. If there is more than one taxon, then these should show up in the trees as separate clades. The clades can be judged on this basis and on the possible relatedness of the various geographically defined taxa. Once sufficient individuals are processed, the known clades can be matched to the morphological species. Molecular genetics cannot work so long as all the factors including geographic origin are not included in the analysis. It is not possible to construct trees from animals already identified to species prior to producing the tree without introducing collector bias. Puillandre *et al.* (2014) demonstrates the value of approaching a species level problem using many individuals identified where they came from rather than being identified by subjective shell morphological traits.

#### ACKNOWLEDGEMENTS

I thank David P. Berschauer for discussions of the *Jaspidiconus* problems. Dr. Edward J. Petuch kindly provided me copies of his books and reprints of his papers. Dr. Manuel J. Tenorio discussed the status of the recently described species of *Jaspidiconus*.

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**Table 1.** Comparisons of the systematics of *Jaspidiconus* in publications by Berschauer (2015), Kohn (2014) and Tucker & Tenorio (2013).

<b>Berschauer species</b>	<b>Subprovince</b>	<b>Endemic to</b>	<b>Kohn</b>	<b>Net change</b>	<b>T &amp; T<sup>5</sup></b>	<b>Net change</b>
<i>pfluegeri</i>	Georgian	Not endemic	<i>J. pealii</i>	-1	<i>J. jaspideus ssp</i>	-1
<i>fluviamaris</i>	Floridian	Not endemic	Not included		<i>J. fluviamaris</i>	
<i>pealii</i>	Floridian	Florida Keys	<i>J. pealii</i>		<i>J. jaspideus ssp</i>	-1
<i>vanhyningi</i>	Floridian	Not endemic	<i>J. jaspideus</i> <sup>1</sup>	-1	<i>J. vanhyningi</i>	
<i>mindanus</i>	Floridian etc	Not endemic	<i>J. mindanus</i> <sup>4</sup>		<i>J. mindanus</i>	
<i>stearnsii</i>	Suwannean	Suwannean Subprov.	<i>J. stearnsii</i> <sup>2</sup>		<i>J. jaspideus ssp</i>	-1
<i>mindanus bermudensis</i>	Bermudan	Bermuda	<i>J. mindanus</i>	-1	<i>J. mindanus ssp</i>	
<i>branhamae</i>	Bahamian	Abacos	<i>J. pealii</i>	-1	<i>J. j. pealii</i>	-1
<i>exumaensis</i>	Bahamian	Exuma Sound	Not included		<i>J. j. pealii</i> *	-1
<i>herndli</i>	Bahamian	Great Bahama Bank	Not included		<i>J. herndli</i> *	
<i>nodiferus</i>	Bahamian	Not endemic	<i>J. jaspideus</i>	-1	<i>J. j. pealii</i>	-1
<i>oleiniki</i>	Bahamian	Bimini Chain	Not included		<i>J. j. pealii</i>	-1
<i>verrucosus</i>	Bahamian	Not endemic	<i>J. jaspideus</i>	-1	<i>J. j. pealii</i>	-1
<i>agassizii</i>	Antillean	St. Croix	Not included		<i>J. m. mindanus</i>	-1
<i>anaglypticus</i>	Antillean	Puerto Rico	<i>J. pusio</i>	-1	<i>J. anaglypticus</i>	
<i>berschaueri</i>	Antillean	St. Maartin	Not included		<i>J. berschaueri</i> *	
<i>duvali</i>	Multiple	Guadeloupe	<i>J. pusio</i>	-1	<i>J. pusio</i>	-1
<i>mackintoshi</i>	Antillean	Virgin Islands	Not included		<i>J. m. mindanus</i>	-1
<i>alexandremonteiroi</i>	Nicaraguan	Cayos Miskitos	Not included		<i>T. ceruttii</i> *	-1
<i>allamandi</i>	Nicaraguan	Roatan Island	Not included		<i>J. allamandi</i>	
<i>roatanensis</i>	Nicaraguan	Roatan Island	Not included		<i>J. roatanensis</i>	



<i>sargenti</i>	Nicaraguan	Roatan Island	Not included		<i>J. j. jaspideus</i>	-1
<i>acutimarginatus</i>	Venezuelan	Not endemic	<i>J. jaspideus</i>	-1	<i>J. j. jaspideus</i>	-1
<i>jaspideus</i>	Multiple	Not endemic	<i>J. jaspideus</i>		<i>J. j. jaspideus</i>	
<i>arawak</i>	Grenadian	Grenadine Islands	Not included		<i>J. arawak*</i>	
<b>Subtotal</b>		<b>0/36</b>		<b>-9/13</b>		<b>-14/25</b>
<b>Percent synonyms</b>		<b>0%</b>		<b>69%</b>		<b>56%</b>
<i>pusio</i>	Multiple	Not endemic	<i>J. pusio</i> <sup>3</sup>		<i>J. pusio</i>	
<i>damasoi</i>	Cearaian	Ceara coast	Not included		<i>J. damasoi</i>	
<i>damasomonteiroi</i>	Cearaian	Not endemic	Not included		<i>J. damasomonteiroi*</i>	
<i>ericmonnieri</i>	Bahian	Bahian Subprovince	Not included		<i>J. ericmonnieri*</i>	
<i>henckesi</i>	Bahian	Todos os Santo Bay	Not included		<i>J. henckesi</i>	
<i>marinae</i>	Bahian	Porto Itaparica Is.	Not included		<i>J. marinae*</i>	
<i>ogum</i>	Bahian	Aratuba, Itaparica Is.	Not included		<i>J. ogum*</i>	
<i>pomponeti</i>	Bahian	Todos os Santo Bay	Not included		<i>J. pomponeti*</i>	
<i>poremskii</i>	Bahian	Bahia State	Not included		<i>J. poremskii*</i>	
<i>pusillus</i>	Multiple	Brazilian Province	<i>J. pusio</i>	-1	<i>J. pusio</i>	-1
<i>simonei</i>	Paulian	Not endemic	Not included		<i>J. simonei*</i>	
Number of taxa		36		6		22
Deviation				-10		-15

\* indicates species that are discussed on the *Illustrated Catalog of Living Cone Shells* web site ([www.conecatalogupdate.com/taxa-described-in-2014](http://www.conecatalogupdate.com/taxa-described-in-2014)). Most of them are accepted as tentatively valid species pending further study. However, they were not included in the printed version of Tucker & Tenorio (2013).

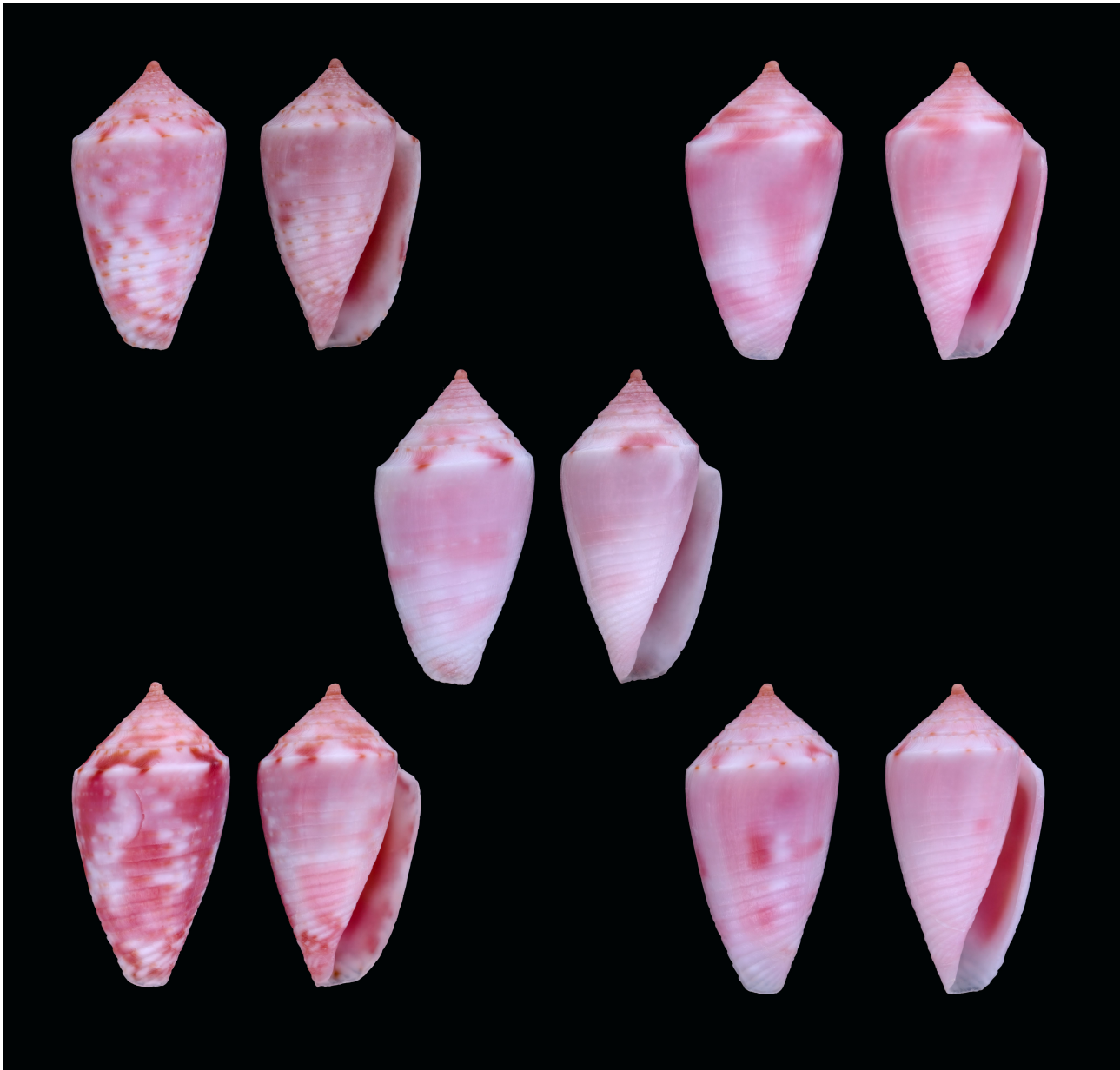
1. Kohn included *sulcatus* Mühlfeld, 1816; *corrugatus* Sowerby II, 1870, *verrucosus piraticus* Clench, 1942; *pseudojaspideus* Nowell-Usticke, 1968 as synonyms of *J. jaspideus*.

2. Kohn included *stictus* A. Adams, 1854, as an unused senior synonym for *J. stearnsii*.

3. Kohn included *minutus* Reeve, 1844; *crebrisulcatus* Sowerby II, 1857, and *boubae* Sowerby III, 1903 as synonyms of *J. pusio*.

4. Kohn included *elventinus* Duclos, 1833, *rosaceus* Sowerby I, 1834, *cretaceus* Kiener, 1847, *lymani* Clench, 1942, and *karinae* Nowell-Usticke 1968 as synonyms of *J. mindanus*.

5. "T & T" is Tucker and Tenorio, 2013.



**Comparison plate:** *Jaspidiconus vantwoudti* new species herein by Petuch, Berschauer and Poremski, 2015. Additional specimens from the André Poremski collection. Top row: 11.8 mm and 12.1 mm; middle specimen 13.4 mm; bottom row: 12.5 mm and 12.9 mm. Specimens collected at Arashi Beach, Aruba, in coarse rubble at 6 to 8 feet of water in a high wave action environment. Photos by André Poremski.



## Have a shell collection you would like to sell?

The San Diego Shell Club is interested in high quality estate collections comprised of any and all types of shells, marine or land, and all genera and species. Your shells will be used to generate income to support the Club's efforts in continuing public education about shells and conservation of marine life throughout the world. If you have considered selling your collection to a dealer and were unhappy with the offer, then please contact Dave Waller, SDSC Acquisition Chairperson, at [dwaller@dbwipmg.com](mailto:dwaller@dbwipmg.com) to schedule a time to review your collection and provide you with another offer to consider.

## CLUB NEWS

### July 16, 2015, Regular Meeting, held at Casa del Prado

Meeting called to order at 7:30 p.m.

- Prior minutes were read and accepted.
- Treasurer's report was presented, followed by social media and the Editor's report.
- Announcements were made about the August Shell Show & Sale, and the September party.
- David Waller and Paul Tuskes reported on the success of the Club's exhibit at the Fair.
- Paul Tuskes introduced Paul Valentich-Scott and made a presentation of the Club's "Festivus Award" for outstanding lifetime achievement in malacology to Paul Valentich-Scott and Eugene V. Coan.
- Thereafter Paul Valentich-Scott gave a fascinating presentation on the future of bivalve research, with a Power Point presentation and extensive color images.
- The door prize was won by Marilyn Goldammer.

Meeting adjourned at 9:15 p.m.

**August 16, 2015: No Regular Meeting.** Shell Show & Sale in Balboa Park.

**September 13, 2015: No Regular Meeting.** September Party.

## Orchids in the Park

**Paul Tuskes**

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The shell exhibit and sale at Balboa Park on Sunday the 16<sup>th</sup> of August was a big success from all perspectives. Many new members who had joined after the San Diego Fair came to visit, tell stories and purchase shells, and then enjoy the park. Members present included: Marty Schuler, David Berschauer, Rick Negus, Paul Tuskes, Robyn Waayers, Rob Martinsen, Bob Abela, Larry Catarius, and Dennis and Laura Willoughby. David Berschauer, Marty Schuler and Paul Tuskes had shell displays and educational information. Rick and Cheryl Negus, and Rob Martinsen had a wide variety of shells



for sale. The Club also had some books and a “one dollar table” of shells for sale. Members enjoyed visiting with each other, and I may have found a new dive partner. We also spent a great deal of time talking to the hundreds of visitors who came in to see the shells and talk about their experiences. The dollar table was a hit with both adults and children. Special events like this are not only good publicity and attract new members, they also give current members a chance to visit and share experiences. If you were a couch potato that weekend ... you missed the boat.

## Sunny September Party

**David P. Berschauer**

**25461 Barents Street, Laguna Hills, CA 92653**

[shellcollection@hotmail.com](mailto:shellcollection@hotmail.com)

Silvana Vollero graciously held this year’s annual end of summer party at their lovely home in San Diego, on Sunday, September 13, 2015. The weather gods were kind to us as we had a nice sunny day; it is southern California after all. There was a fantastic turn out, with over 30 Club members, their spouses and children in attendance. Fantastic home made food, beverages, deserts, and comradery and conversation were enjoyed by all. Needless to say shells and shell books made an appearance at the party. Silvana and Bob were wonderful hosts, and we thank them for hosting an enjoyable get together.



## William Swainson F.R.S., F.L.S.

Mary Agnes Wotton, Wellington Shell Club

[ma.wotton@xtra.co.nz](mailto:ma.wotton@xtra.co.nz)

Most shell collectors are familiar with the name of Swainson in connection with conchology but like myself, might not have been aware of his reputation as an unsurpassed illustrator of birds, molluscs, plants and other natural creatures, not to mention his sketches made of places visited during his career with the Commissary-General (Supply Corp) of the British army of occupation based in Palermo, Italy (1806-1815). His sketches of Wellington, to which he emigrated with his family in 1841, are some of the most valuable pictorial records of the city's earliest years.



William, in his own words, had “*a passion for natural history even when a small child; and every spare moment I could command was divided between drawing and collecting.*” His father John Timothy Swainson, a Collector of Customs, in his spare time was a naturalist and a foundation member of the Linnean Society. During his time in the army, William amassed vast collections from Mediterranean countries which he visited, studying zoology and botany in his spare time and making sketches of shells, fishes, birds and flowers as well as landscapes. Ill health caused him to retire from the army and on his return to England he began pursuing his interest in natural history more seriously and became a Fellow of the Linnean Society. Supported by Sir Joseph Banks, he was also elected a Fellow of the Royal Society in 1820.



In 1815 Swainson went on a three year expedition to Brazil, again amassing considerable collections especially of shells, insects, birds and ferns. However, on his return to England he was largely ignored by the scientific community in spite of his membership in the Linnean Society – he was an amateur naturalist who had collected unscientifically for the trade in natural curiosities. He had “a portfolio of drawings, representing the most striking and picturesque and vegetable scenery, together with maps of the different routes pursued.” It was printed without any comment, or one word of praise. “*I abandoned all intention of publishing them in a separate work. I was discouraged by the idea, that the unpatronised researches of an unknown individual might probably be thought insignificant, when compared to those of naturalists sent out by governments, and which the editor lavishly praised in the same number of his Journal.*” He mentions this to show how the feelings of young authors may be influenced and their “energies repressed”. As he had no academic qualifications, in 1820 Swainson to his acute disappointment, was passed over for a position as a keeper at the British Museum for which he had applied, although he had impressive testimonials.

In 1820 Swainson met Mary Parkes at the Mayor's Ball in London, attended by 900 people. She was an inveterate writer and kept a Pocket Book diary at this time where she recorded her meetings with Swainson. On 29 Nov. she wrote "*We spent three hours with Mr. Swainson and Mrs. Traill was with us, looking over his rich collection of shells, insects and birds. No gratification can be higher than that of being allowed to participate in the enjoyments of a mind so rich and elegant as his. His shells are most choice and picked and he possesses many which he believes are solely his. The cardiums are magnificent and most choice. The cypraeas are a great pride to him for he has a beautiful series of old and young of this species. For the spindle shell he has been offered thirty pounds and if he had bought two of his cardiums they would have been worth five pounds each. The nautilus is the largest ever seen is worth twenty guineas and the wentle trap is magnificent. The turbo's are most beautiful and the pecten's – in short – all.....*"

Around this time Swainson's friend John Audubon, the world's finest bird artist, introduced him to the new technique of colour lithography. He began experimenting with the process as "something that might be used in producing zoological plates fit for colouring". This he brought to a high degree of artistic excellence. He worked hard for long hours. 1820 saw the publication by Longman of his "Treatise of Malacology: or, the natural classification of shells and shell fish". "Zoological Illustrations of new, rare or interesting Animals...from the classes of Ornithology, Entomology and Conchology" was published in 1821, the first of three volumes. It was produced in a series of monthly parts for which he paid himself and it was well received. The final volume was published in 1823. Swainson had already started working on his "Exotic Conchology", unable to issue more than four parts of the first edition in 1821-1822. A re-issue was published in 1834 with 16 additional plates and the second edition appeared in 1841, the year he emigrated to New Zealand. Original copies of this work are currently available between US\$4,800 and US\$7,600.

Swainson married Mary Parkes in 1823, his half-brother the Rev. Mr. Charles Swainson officiating, beginning the happiest and most productive years of his life. In 1828 the two spent 3 months in France, her parents looking after the two children, Willie born in 1824 and Mary in 1826. John Audubon, accompanied them to France where most of their time was spent in Paris with Swainson regularly visiting the Museum. Mary Parkes kept a journal of their visit with the following entry for Oct. 7, 1828: "*I again went to the Musee and at three o'clock we went to the Prince Massena's to see again his rich cabinets of birds and shells. The latter are truly magnificent in their perfection, for they were Lamarck's and the Prince gave trente mille cent francs for the whole, and he is perpetually adding to it. It is not only one fine specimen of a species, but in most instances several fine specimens of the same shell. Where he has not the species, he places a drawing, and this is particularly the case with the Cones which is a most extensive collection, contained in two long divisions, on each side one range of drawers. I counted one hundred and sixty drawers. The shells are gummed on pieces of book binders board, coloured white, and each row divided by a strip of black wood; the Pictens were most beautiful, and the Patella were of surprising polish.*"

At the age of 45, Swainson was at the height of his scientific career and looked forward to extending his reputation as one of the world's leading naturalists then in February 1835, a year later, his beloved wife Mary died leaving him devastated and with five children to bring up. Everything seemed to be going adversely against him – his advocacy of the quinary system, an unaccepted

method of zoological classification, was ridiculed and his fortunes in other directions plummeted too. He became disillusioned and critical of the British scientific establishment which had failed to embrace his ideas, all of which inclined him to think there was no future for him and his family in England. It was then that he finally decided to emigrate to New Zealand. William was elected a member of the First Colony of New Zealand, and the New Zealand Land Company, as it was then called. He was also a member of the Church of England committee for the appointment of a bishop to New Zealand. Except for his shell collection and other less perishable objects, his other collections were sold to raise necessary funds.

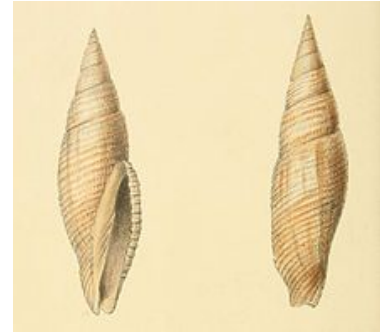
William had advertised for a governess and engaged a Miss Ann Grasby. However, the New Zealand Company had strict views about unattached gentlewomen aboard ship and refused permission. A man might emigrate perfectly decorously with a wife in tow but not with a governess-help. William decided to marry her in spite of the children's opposition and Ann became William's second wife. They set sail for New Zealand in 1840. But Swainson's troubles had just begun.

Arriving at Port Nicholson on 24 May 1841 with his second wife and four of his children – the youngest Edwin was left in Gibraltar with foster parents – Swainson decided to live in Wellington, settling for the time being at High Cliffs, a house belonging to a Mr. Watt “at the further extremity of town”. William's dream of pursuing his scientific interests at leisure in the new colony may have earned him near enough to a free passage, but there was small chance of realizing them: there was quite simply far too much to do. The family lived at Thorndon in the city for two years while their house was being built on property purchased in the Hutt Valley. The floors of the house, called Hawkshead after the Swainson family's sometime ancestral village in Westmoreland, England, were laid down in January 1843. The doors and windows were still in Hokianga, having been delivered there as it was the Swainson's original destination. It was not until June of the same year that the family moved into their home on the banks of the Hutt River. By 1846 he was well settled in the Hutt Valley but after two laborious years, only a small portion of the property had been cleared of bush.



Though he worked habitually on his own, William had joined prestigious societies, readily accepting honorary membership on an impressive list of scientific bodies. But he considered science dead in this country – or at least stillborn. To make ends meet, Swainson sold off large collections which he had left behind in England but bad luck followed as a consignment of lithographic plates was wrecked off Cape Terawhiti and some of his bird and insect species decayed. He also had trouble with the Maoris relating to his occupation of the Hutt land. Finally when this was sorted out, he had a bit more time to devote to his old studies. He wrote to the naturalist Walter Mantell in October 1846:

*“I seem now to have exhausted the Valley of the Hutt, as far as I can ramble therein, so that now I am directing my attentions to the inhabitants of the ocean, namely Shells. ....Animal Life is as little developed on New Zealand Islands as are honest men. To be serious, the land is geologically new, but then the Ocean is as old as the Creation and therefore should abound with animal forms peculiar to that element.... In England, for instance, we have but four species of Patella (limpets) while on the Port Nicholson rocks I have already found seven besides a new Syphonaria, other localities will no doubt possess other species, particularly as the rocky nature of all the Coasts are peculiarly adapted to these adhesive Molluscs. Mr. Taylor, also, stimulates me to a Conchology of New Zealand...”* But in his usual fashion, he bit off more than he could comfortably chew: the conchology of New Zealand, the treatise on Adhesive Molluscs and the zoological chapter for the Acheron book – all remained unwritten.



Misfortunes continued for Swainson when in February 1848, a fire destroyed much of Hawkshead. Lack of money was a constant issue for Swainson and in 1851 he sailed on the survey ship Acheron to Australia to arrange the sale of some land he owned. In August he received a letter from Walter Mantell advising him of his election as an honorary member of the NZ Royal Society. He replied *“....This is the first intimation I have received that such a Society was in being, or that there existed in Wellington generally, the slightest regard or appreciation for scientific pursuits.”* His letter was quite scathing and he declined the honour. Swainson remained in Australia until 1854 doing botanical surveys for the Victorian government.



On December 7, 1855, Swainson died of heart failure at his home in the Hutt Valley, living out the latter part of his life in hardship, toil and frustration in a society that set little store by his skills. His grave is among the trees behind the Lower Hutt Library. Many of his papers, letters and mementoes were destroyed by his widow. Swainson helped swell the collections of many European museums, where other biologists put his specimens to better use, including Charles Darwin. Swainson named a number of molluscan species particularly in Mitridae Swainson, 1829, including *Mitra carbonaria* Swainson, 1822 from Australia and New

Zealand, and one in his genus *Cancilla* Swainson, 1840. His friend Broderip named one after him – *Mitra swainsonii* Broderip, 1836. *Canarium mutabile* (Swainson, 1821) and *Theristrombus thersites*, (Swainson, 1823) both Strombiidae from the Kermadec Islands were named by Swainson as also *Janthina globosa* Swainson, 1822. Originally named by Marwick, *Alcithoe swainsoni*, became a synonym of *Alcithoe arabica* (Gmelin, 1791). Several bird species have been named for Swainson by various scientists including Audubon.





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**Shelling on the Gulf Coast of Florida (Part 1 of 2)**

**Robyn Waayers**  
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In early January of this year, I was finally able to make a trip I've been thinking of since childhood - a trip to the beaches of Florida for shelling. We focused on the Gulf Coast, choosing a motel that served as home base in Englewood, Florida (which is a little bit north of Fort Myers). We then took day trips to points north and south from there. I made a point of doing some homework in advance of the trip regarding rules and regulations pertaining to shell collecting. I highly recommend this page of the Florida Fish and Wildlife Conservation Commission's web site, outlining the regulations concerning recreational shell collecting: <http://myfwc.com/fishing/saltwater/recreational/sea-shells/>.

Florida has a lot of excellent State Parks and other well-maintained natural areas along the Gulf Coast. No live shelling is allowed in the state parks, and other localities restrict live shelling as well, such as Sanibel Island. If one arrives before low tide, one has a chance to still find many nice specimens of empty shells in these localities. The competition is pretty fierce, though, and the beaches quickly fill up with eager bag-toting shellers!

Day One: We explored a bit in the Englewood area in the afternoon (after a red-eye flight from San Diego the night before!). Manasota Key has nice gulf-facing beaches, but also has public access to Lemon Bay, which is sandwiched between the key and the mainland. One can explore the shallow water near the mangroves on the bay side, and many interesting mollusks can be found here. The light was failing when we explored the bay side on this day, but immature Florida crown conchs were "hanging out" on the muddy beach and in the shallow water. One appeared to be feeding on a mysterious object that might have been an old octopus's arm.



*Melongena corona*, Florida Crown Conch, Manasota Key, Florida.



*Melongena corona*, Florida Crown Conch, Manasota Key, Florida.

Lightning whelks were common on the bay side as well, some feeding on the numerous oysters that are thick at the base of the mangroves.



*Sinistrofulgur sinistrum*, Lightning Whelk, Manasota Key, Florida

Day Two: This was our Sanibel Island day, but we unwisely got a slightly late start in the morning and arrived at Lighthouse Beach on Sanibel about 10 minutes past the peak low tide (which was around 8:30 a.m.). At that point the hoards of shellers who got there earlier had scooped up most of the easy-to-find empty shells. There were many live mollusks on the sand bars exposed by low tide, though, so I focused on photography of them, as opposed to collecting.



*Bulla occidentalis*, Atlantic Bubbles, Lighthouse Beach, Sanibel Island, Florida.



Immature *Strombus alatus*, Florida Fighting Conch. This beach had many live immatures, and we saw no adults. Lighthouse Beach, Sanibel Island, Florida.



Live *Phrontis vibex*, Bruised Nassa. Lighthouse Beach, Sanibel Island, Florida.



*Americoliva sayana*, Lettered Olive, burrowing in the sand. Sometimes These olives leave shallow trenches several inches long on the sand. Lighthouse Beach, Sanibel Island, Florida.



Live Lettered Olives, a very common species. Lighthouse Beach, Sanibel Island, Florida.



A colorful live *Ficus communis*, Paper Fig Shell. Lighthouse Beach, Sanibel Island, Florida.



*Strioterebrum dislocatum*, the Eastern Auger. Many immatures of this species were burrowing in the sand. Lighthouse Beach, Sanibel Island, Florida.

Before leaving Sanibel, we paid a visit to Gulfside Park and its adjacent beach. I brought snorkeling equipment and decided to give it a shot at this beach, but the water was so turbid that visibility was essentially zero. The beach itself was littered with Rigid Pen Shells, most in fairly poor condition. Sea whips had washed up, but none with simnias attached. Ponderous arks were scattered along the wrack line, also, which are extremely common in Florida, but I was happy to scoop up some with both valves intact and the mossy periostracum present.

We left Sanibel in the early afternoon, as I wanted to explore Manasota Key in the daylight more. We had several hours to do just that, and found a large banded tulip, more lightning whelks and Florida crown conchs on the bay side. Stay tuned for Part 2 in the next issue of *The Festivus*. (End of Part 1 of 2)



*Cinctura hunteria*, Manasota Key, Florida.



*Sinistrofulgur sinistrum*, Manasota Key, Florida. A younger individual, with more distinct markings.

# The Living and Fossil Busycon Whelks: Iconic Mollusks of Eastern North America

Edward J. Petuch, Robert F. Myers, and David P. Berschauer



A Special Publication of The San Diego Shell Club, Inc.

Published October 2015 by The San Diego Shell Club. This book presents a taxonomic revision of the “Busycon whelks” with detailed information on 6 living and 8 extinct genera belonging to 4 subfamilies, and 17 recent and 112 fossil species, together with distribution maps and over 100 color figures. Priced at \$80.00 plus shipping costs.

### Congratulations for excellent field work!

The Editors would like to take this time to congratulate Leo G. Ros and Monica Moron of Aruba for their excellent field work as amateur malacologists in discovering three new endemic species of cone snails in Aruban waters in the last three years: *Perplexiconus wendrosi* Tenorio & Afonso, 2013, *Tenorioconus monicae* Petuch & Berschauer, 2015, and *T. rosi* Petuch & Berschauer, 2015.



Leo G. Ros, of Noord, Aruba is the founder of the Aruba Shell Club (est. 2012) and is an avid naturalist and molluscan explorer who discovered three new cone species and, through his extensive diving and exploration around the island, has greatly contributed to our knowledge of the Aruban molluscan fauna.

Monica Moron of Noord, Aruba (originally from Punto Fijo, Venezuela) studied graphic design at Instituto Universitario de Tecnologia Rodolfo Loero Arismendi (Iutirla), and has been interested in shells since childhood as her family and neighbors in Venezuela were fishermen. Monica is an avid amateur naturalist and one of the co-discoverers of these new cone snail species.



*Perplexiconus wendrosi*



*Tenorioconus monicae*



*Tenorioconus rosi*



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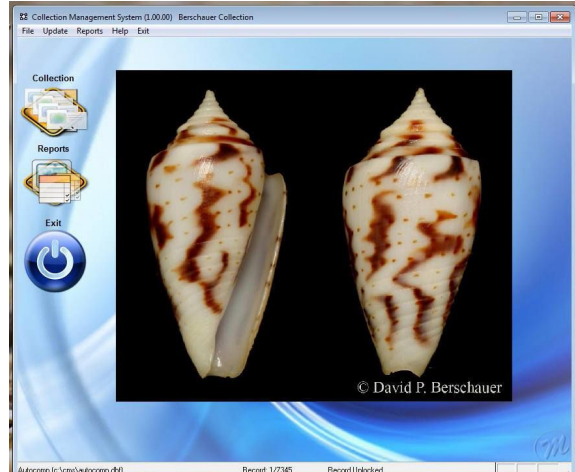
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Aperçu 1 2 >

**ACTUS**

-  Phasmoconus (Fulgiconus) santinii
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**SHELL TRIP**



[rusty annulus.....](#)

Aujourd'hui je suis retourne dans mon spot secret ou vivent les fameuses annulus rouge " Rusty annulus" .. je peux vous dire qu'elles sont de plus en plus difficiles a trouver... Elles vivent aux pieds des racines des palétuviers, dans la boue et nous ne pouvons atteindre la zone qu'à la marée basse... de plus c est

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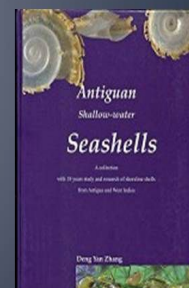
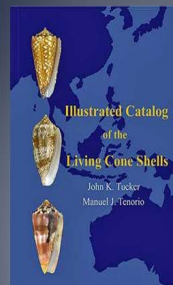
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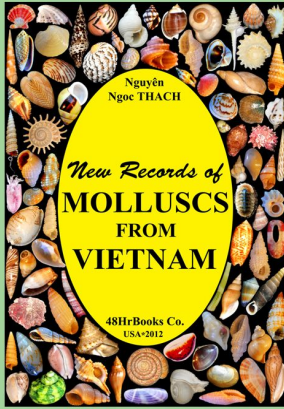

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*Jaspidiconus vantwoudti*

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