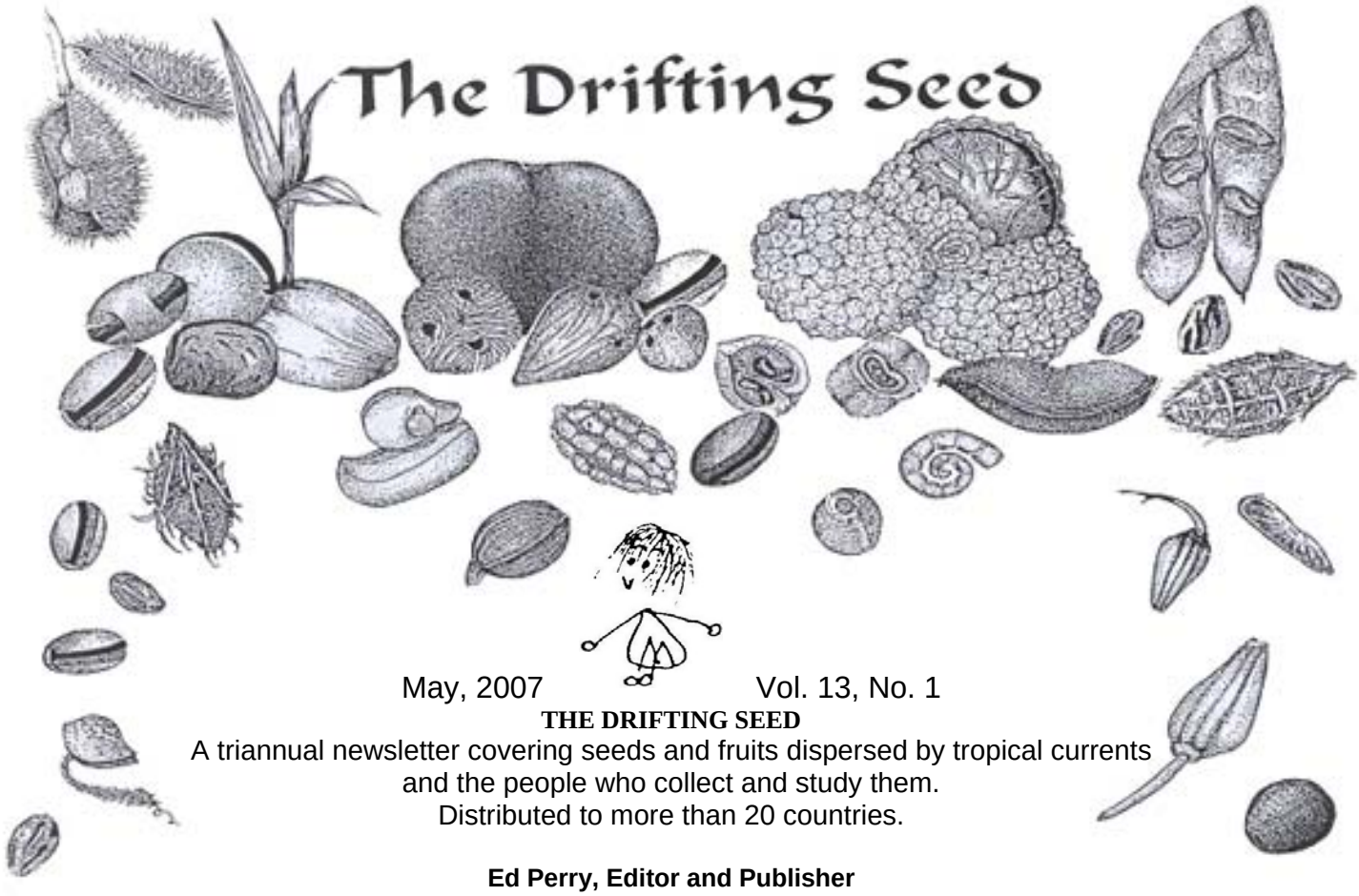

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THE DRIFTING SEED

A triannual newsletter covering seeds and fruits dispersed by tropical currents and the people who collect and study them.
Distributed to more than 20 countries.

The 12th Annual International Sea Bean Symposium will be held at the Cocoa Beach Public Library, October 19th-20th, 2007.

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A Leatherback's Sojourn: The Palm Beach Sea Story

by Stephanie "Queen Sea Bean" Bernstein
QueenSeaBean@aol.com

Monday, April 16th, 2007 was a cool and breezy day in South Florida so my husband Steven and I decided to head to the beach to go beaning. We just dropped off our taxes at the post office and wanted something fun to do to celebrate. We love to take long walks along the beach and comb through the wrack so we headed to Palm Beach to see what we could discover. We tend to go to Lake Worth but the beaches are full of people and there is little to no privacy in which to bean. Also, the city and county comb their beaches making it all the more difficult to collect beans.

This particular afternoon started out quite bean poor; we did not find very much along the strand—a few hog plums, some country almonds and a couple of lantern tree seeds so we decided to take a break and look out at the coast to watch the surfers weave in and out of the water. The nor'easter was upon us and the Atlantic looked more like the Pacific with wave after wave crashing down with fury. In fact the beach we were standing on had become severely eroded from the punishing tides.

Turning our back on the surf once again we began to hunt for sea beans—after all our goal was to find beans! Steve crouched down to carefully examine a large pile of dry wrack and I decided to head toward the rocks to see if any beans were stranded high along the sea wall. All of a sudden I saw the most unbelievable sight out of the corner of my eye. I spun around to find out what it was and gazed with udder shock and amazement to see an immense leatherback sea turtle emerge from the ocean and crawl through the breakers just a few yards away. I could not contain my joy and screamed with excitement. At first Steve had no idea what I saw, most likely thinking I found a cool bean but then he too saw her on the shoreline coming closer to us. What an unexpected thrill!

She was massive—larger than I had ever imagined and here she was inching toward us while coming to shore to lay her eggs during the day; how atypical! She looked so surreal—as if one of the large heavy rocks from the seawall had come to life. She had to climb the steep scarp to reach the dune line—we never thought she'd make it but she did. The nesting took about two hours for her to methodically excavate a body pit before digging a decent egg chamber using her rear flippers as digging tools. Steve and I laughed as she flung sand all over the place as she rotated her body to position herself just right before going into her egg laying trance. We were close enough to see her rhythmically extend her pinkish neck and expand her throat like a large bellows to breath while she sat still to clench and expel her clutch into the soft sand. Her eyes were wet and dripping with excreted tears to expel excess sea salt while at the same time keeping her eyes moist during the process.

We shared this awesome sight with a German tourist named Hans George who was overwhelmed by this incredible and unexpected sight and a Palm Beach police officer who eagerly watched with

amazement. In fact the policeman called Florida Fish and Wildlife to cordon off her nest for protection.

Steve and I were rewarded for our patience and were the only ones left to witness the magical completion of her work as she masterfully camouflaged the nest with sand. The scalloped ridges on her carapace became very distinct when she turned her massive girth around toward the ocean to return home. We slowly walked over to her and could see the pink undersides of her flippers as she intently rowed through the sand toward the sea. She was a beautiful leatherback sea turtle yet not unscathed as we noticed three old propeller scars on her left carapace. We walked with her as she traversed down the dune and gave her a gentle pat on the head. A huge wave crashed over her and in an instant she was gone as she was swept out to sea. She swam with great determination and pride through the frothy surf and the ocean seemed to swallow her as we followed her along the horizon to see her off into the deep blue sea. Occasionally we saw her pick her head and shoulders out of the water in a valiant effort to make her way to deeper waters. Surfers on their surfboards cheered and blew her kisses.

Remember when I said the day started out bean poor? Well all of the sudden the tide came in with great strength. There was no longer any dry beach to walk along so we had to make the long trek back to Phipps Park in the high tide. We got soaked and we laughed with glee as the water came up to the rocks along the sea wall and suddenly realized we were in a soup of fresh sea beans! It was amazing like some kind of dream. All around us we saw happy little hamburger beans bobbing up and down in the water at our feet. We have never been lucky enough to find wet beans! I also found a sprouted hamburger bean (which I have since planted), a big *Mucuna fawcettii*: 36mm x 35mm x 20 mm (thickness) and a few very intriguing but not yet identified sea beans.

With a plump satchel full of sea beans we made it back to the car in disbelief of the luck we had, never was the beach so exciting. If not for my love of sea beans we would never have journeyed along the beach that day and observed the wondrous leatherback's emergence from the sea.

When we got home we learned of the awful tragedy at Virginia Tech. The heartbreaking news was in great contrast to the beautiful day we had and we felt thankful to have had such a magical day together at the beach. In memory of the fallen teachers and students of Virginia Tech we named the leatherback sea turtle Virginia. A few days later we visited Virginia's nesting site and were pleased to see that Florida Fish and Wildlife did indeed cordon off the nest with wooden stakes and pink fluorescent ribbons. One of the stakes was already marked with the date and time but something was missing. Now the picket is marked with the date and time and the leatherback's name—Virginia!

Editor's note: The wonderful leatherback photos accompanying this article were taken by Park Ranger Terry O'Toole of Sebastian Inlet State Park, on the east coast of Florida. He and some other rangers were also lucky to witness a daytime leatherback nesting and snapped these photographs.

Goodbye Three-lobed *Mora*
HELLO THREE-LOBED *PACHIRA*!
by Gerald Sullivan, geraldsully@yahoo.com

There has been concern for a number of years that the drift seed commonly known as the three-lobed *Mora* may indeed not be a *Mora* at all. Well over a year ago, Editor Ed sent me an article by Gunn et al., which contained a small free-hand sketch that resembled a three-lobed *Mora* but was designated as *Pachira* sp. He also indicated that he was not entirely convinced this was correct. A quick, cursory surf of the Internet on *Pachira* convinced me they were whistling "Dixie" since none of the photos of *Pachira* even remotely resembled the three-lobed *Mora* we have grown to love. It was quite apparent that Gunn had misfired.

Recently I sent several photographs of the three-lobed *Mora* previously collected on the Texas barrier reef commonly known as Mustang Island to a former colleague, Herr Professor-Emeritus Doctor B. L. Turner, PhD, who served a great many years as department chairman of an area now recognized as the Section of Integrated Biology at the University of Texas at Austin. WHEW! Billy conferred with Dr. Tom Wendt, Curator of the Herbarium at "the University," who, lo and behold, identified the photos as *Pachira aquatica.* Dr. Turner enthusiastically concurred. "Tom is an expert on the tropical tree flora of Mexico, so there is little doubt as to the accuracy of his identification." Thank you, Drs. Wendt and Turner, for your contribution to the fascinating world of the drifting seed.

A return to the Internet review of *Pachira aquatica* revealed considerable information concerning the plant and its resulting drift embryos. Commonly, this plant is referred to as the money tree, Guiana chestnut, provision tree, Saba nut, Guinea chestnut, Malabar chestnut and shaving-brush tree. In its native terrain of Mexico through Central America and into northern South America, this flowering tree may grow to a height exceeding 100 feet. Those grown domestically as ornamentals may reach a height of 30 feet. Apparently the more accessible the water, the taller the tree.

From the flower develops a single (one, uno, ein, etc.) giant seed which may best be described as a chocolate brown, fully inflated, seamless, NFL football that may exceed a foot in length and having a thick, roughened outer surface. Polyembroyony exists in this *Pachira* seed. The size of the seed does not directly relate to the number of resulting embryos which may number one or two, or may exceed a dozen. The resulting fresh embryos are edible, possessing a peanut taste and when roasted take on a chestnut flavor. Those embryos which a seabeaner encounters in the wrack are, of course, not edible. Approximately 25-30 embryos were collected over two seasons. Most were approximately 2.5 to 3.5 inches in length, 2 inches in width and 0.5 inch thick.

In order to insure the survival of the species, Mother Nature, in her infinite wisdom has incorporated a biological mechanism in an attempt to protect the germinating embryo. The fully developed seed splits wide open from tip to tip followed by the release of the embryos. At the time of their beach arrival, the embryos are generally ovoid in shape, flat, yellowish with green or darkened blotches. Near midline a notch or groove evolves resulting in a shape reminiscent of a fetus in the classical fetal position in its mother's womb. The emerging cotyledon forms deep within the notch accompanied by a folding of approximately 1/3 of one end of the embryo followed by the folding of the

other end. What remains is the middle section opposite the base of the groove, which is the last section to fold, finalizing the envelopment process, thereby, furnishing protection from the fierce tropical sun rays and dehydration. Many arrivals have already completed this entire process and are dark brown in color and fully folded.

This process is somewhat illustrated below with the series of three photos of stranded three-lobed *Pachira* from Mustang Island.

Now that the *Mora / Pachira* issue has been resolved, everyone is “happy as a clam.”

References:

Gunn, C.R., J.M. Andrews and P.J. Paradine.
1976-1982. Stranded seeds and fruits from Yucatan Peninsula.
An. Inst. Nal. Aut., Mexico Serie Botanica 4753: 21-60.

But in every walk with Nature one receives far more than he seeks.
John Muir in *Steep Trails*

Avocado Seed from the Dutch Coast

by Gerhard C. Cadée, cadee@nioz.nl

Real tropical drift seeds are rare on the Dutch coast. Less than 50 were reported over the last 50 years (Brochard & Cadée, 2005). Their numbers increased in the last years. This is related to an increase in attention they got, not to global warming. Although a correlation with that phenomenon cannot be denied this is not a causal one (Cadée, 2005). This increase in attention has also resulted in an increase in observations of man-imported tropical seeds and fruits (see e.g. Cadée, 1997, 2006). Every strange seed encountered on our coast we regard as a treasure that poses an interesting problem in identification.

The avocado seed

When in August 2006, Herman and Henny Roode found the seed of fig.1 on Texel and showed it to me, I was puzzled. I could not find any picture of it in the drift-seed literature (Gunn & Dennis, Nelson, 2000; Perry & Dennis, 2003). It is ball-shaped with a diameter of over 3cm, on one side it has a depression, the opposite side is pointed. Its dark-brown surface is more or less tubercular, and shows shrinkage cracks through which the reddish inside becomes visible. Upon drying at home, the seed split in two halves and showed its embryo inside. Ed Perry, to whom I sent a picture, immediately recognized it as a seed of the avocado (*Persea americana*). He had found similarly eroded avocado seeds. Jeremy Smith in Australia confirmed this identification. But I wasn't completely convinced. However, Wim Kruiswijk, a well known beachcomber in Zandvoort (NL), wrote me he had found an entire avocado fruit on Zandvoort's beach in the summer of 2006. When he removed the seed from the fruit, it split open in a similar way as the seed from Texel, also exposing its embryo. Moreover, later I found a convincing picture in Gaertner (1805) showing the inside of the seed (fig. 2)

No real drift seed

There can be no doubt, the avocado fruit and seed on the Dutch coast were man-transported, consumed on the beach or thrown overboard from one of the many vessels passing the North Sea.

Figure 1

An avocado fruit can drift. Its seeds not always do. I experimented with 3 seeds from avocados bought in a shop: they all did not float. Earlier Cadée & de Ruyter (2006) reported that also not all *Entada* seeds do float, although this is one of the best-known drift seeds. Guppy (1917) mentions doves as dispersing the (smaller) seeds of the related *Persea indica* on the Azores. Man will be now the most important distributor of avocado fruits and seeds.

I am very thankful to Henny & Herman Roode and Wim Kruiswijk who presented me with the avocado seeds they found on our

beaches. I also thank Ed Perry and Jeremy Smith for their help in the identification. As more people may find this seed on the beach and not find it in the drift seed literature, I thought it worthwhile to picture it here.

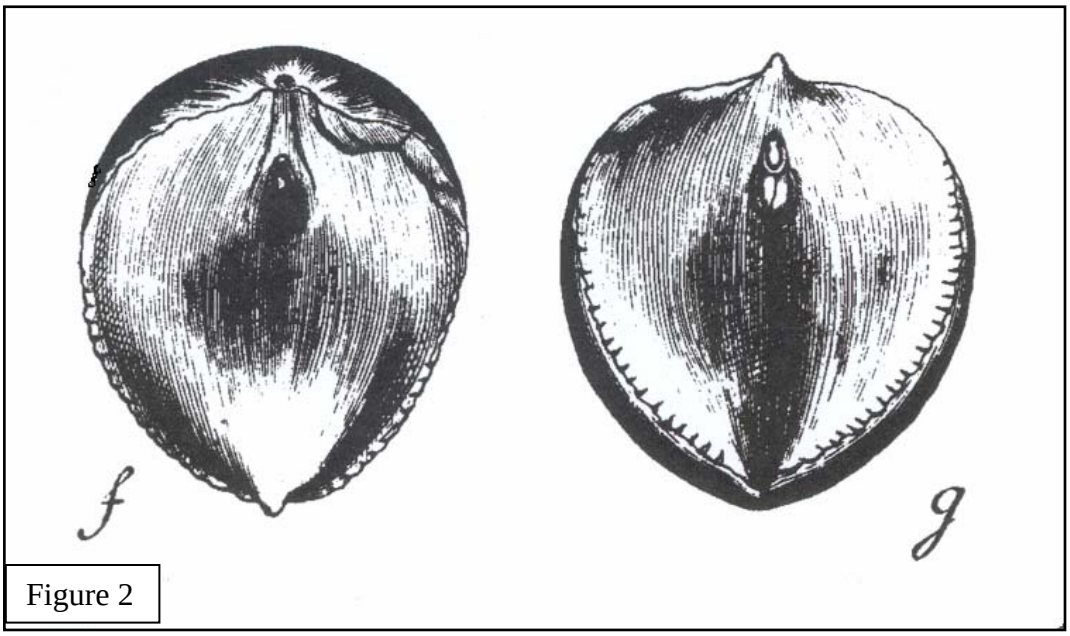


Figure 2

Figure Captions

Fig. 1. *P. americana* seed found on Texel by Henny & Herman Roode, inside and outside (scale in cm).

Fig. 2. *P. americana* inside seed from Gaertner (1805, Plate 221).

References

Brochard, C. & G.C. Cadée, 2005. Tropische drijfzaden van de Nederlandse kust. *SWG Tabellenserie* 30: 1-66.

Cadée, G.C., 1997. The human factor in tropical drift fruits and seeds from the Dutch coast. *The Drifting Seed* 3(2): 3-4.

Cadée, G.C. 2005. Is the increase in tropical drift seeds found on the Dutch coast related to global warming? Poster, North Sea symposium, October 2005, Texel.

Cadée, G.C., 2006. Riddle of Dutch mystery drift seed solved: *Macadamia tetraphylla. The Drifting Seed.* 12(3) in press.

Cadée, G.C. & R. de Ruijter, 2006. Non-floating *Entada* seeds on the Dutch coast. *The Drifting Seed*. 12(1): 2-4.

Gaertner, K.F., 1805. *De fructibus et seminibus plantarum*. vol. 3 *Supplementum Carpologiae*. Facsimile reprint, Asher, Amsterdam 1974, 256 pp.

Gunn, C.R. & J.V. Dennis, 1976. *World Guide to Tropical Drift Seeds and Fruits*. Demeter Press, New York, 240 pp (reprinted 1999, Krieger Publishing, Malabar, Florida).

Nelson, C.E., 2000. *Sea Beans and Nickar Nuts*. Bot. Soc. Brit. Isles, London. Handbook no 10: 1-156.

Perry, E.L. & J.V. Dennis, 2003. *Sea-beans from the Tropics.* Krieger Melbourne, Fl. 232 pp.

When we try to pick out anything by itself, we find it hitched to everything else in the Universe.
John Muir in *My First Summer in the Sierra*

Sea-Beaning in the Bahamas

by Patty Foreman, Clearwater, Florida

It is June 2006 and my sea-beaning story for 2005 somehow got put on the back burner. To continue my story as promised, in 2005 Ted and I returned to Guatemala with our catamaran *Ibis* for our return cruise from Guatemala through Belize and Mexico to Florida. We spent 5 months on the trip beachcombing at every opportunity and I racked-up collecting:

78 seahearts	4 Mary's beans
16 sea purses	5 gray nicker nuts
51 hamburger beans	1 brown nicker nut

Back at our condo in Clearwater I started making plans to attend the 10th Annual International Sea-Bean Symposium in October at Cocoa Beach. Ted and I worked on a display for the event that showed our trip and the sea-beaning spots we discovered.

By now I was into polishing sea beans and making some jewelry. These items I added to our display. The symposium was fun and it was exciting to be around people that are as enthralled as I am about this very interesting hobby. The two-day event is a must for all sea-beaners. There's lots of new information to be had and it's great meeting people that have been sea-beaning for years. In my travels I find that there are many people out there that have never heard of sea-beans!

In February 2006 aboard *Ibis* we were on our way to the Bahamas. We checked-in at Nassau and headed down to the Exuma Cays. March and April were spent in Georgetown on Great Exuma Island. The Family Island Regatta brought a cruising friend, Danny Miller, aboard *X Isle* from the Florida Keys. Danny is a sea-beaner and the person that turned me on to *The Drifting Seed* back in 2003. We three made plans to cruise the Jumentos and the Ragged Islands in search of sea-beans and some out island adventure. These cays are south and east of Great Exuma and are the southernmost, only 50 miles from Cuba. They are uninhabited except for Duncan Town at the lower end of Ragged Island. The excitement built as we talked about the untouched, we hoped, windward beaches we were going to be able to beachcomb. Access to these remote windward beaches exposed to the full force of the ocean depended on settled weather and a stalwart crew. The weather was good, so with *X Isle*'s big dinghy we were able to look for sea beans on Flamingo, Jamaica, and Little Nurse Cays. Ted and I with four eyes to Dan's two found more sea-beans. Danny was also busy collecting fishing floats, flip flops, an old anchor and the tail section of a downed drug plane he took back to Marathon to jazz up his cheeke hut. This flotsam would look cool on the cheeke.

By the time we arrived in Duncan Town with our haul, we decided to go to the one-room school house and present a program on sea-beans. With all the environmental books, *The Drifting Seed*, polished beans and sea-bean jewelry to display, we had the sixteen students and two teachers excited about sea-beans. And the idea that they could find sea-beans on their local beaches was a big addition to the excitement.

I left my autographed copy of *Sea Beans from the Tropics* by Ed Perry and John Dennis and *The Little Book of Sea-Beans* by Cathie Katz and Paul Mikkelsen so they could all read about these little jewels and look for them in the wrackline on their beaches. The girls were very interested in the jewelry and in ways to polish the beans and make jewelry. The boys were soon busy rubbing the seahearts and nickernuts on the sidewalks and then putting the hot bean to the flesh. These beans

have been called "hots" for years by the locals! The next day at a luncheon to raise money for a field trip for the students, we discovered that Mr. Boodran and his wife Ophelia had taken the kids down to the beach to look for sea-beans. They found over fifty, and presented me with twenty-five sea hearts. It was an interesting experience to interact with the children and the adults. The visit to Duncan Town and meeting the Bahamians that lived there was the highlight of our cruise to these out islands.

A visit to Duncan Town takes you back to the Florida Keys in the 40's or 50's. All supplies come in on the *Captian C*—the weekly mail boat from Nassau. Of course technology has arrived in the form of satellite TV, cell phones and computer Internet.

It must be remembered that Duncan Town is a very remote place in the Bahama islands, only 60 people living here and sixteen plus of those 60 are children. In its heyday Duncan Town had 500 people and a flourishing salt trade with Cuba, the Dominican Republic and the Bahamian out islands. The salt trade ended with the revolution in Cuba and refrigerated fishing fleets. There is a big salt pan here that is no longer worked. However, it still floods and works on its own to some degree so that salt may still be recovered in limited amounts. The people left survive on fishing, government jobs and the hope of future tourism. The town ladies make wonderful straw items: hats, baskets, and straw mats for the floor. They send these items off to Nassau and Freeport for sale to the tourists.

On the return trip to Georgetown we sea-beaned on Double-Breasted Cay and Raccoon Cay. On Double-Breasted Cay over a 100 seahearts were found. Sea-beaning is an interesting thing to do as we travel to the many different beaches. The great thing is you never know what you will find! The jewels from the sea are just waiting to be discovered! Sea-beaning has added enjoyment and excitement to my life. What a neat hobby—making jewelry and items from my beachcombing finds.

Patty's Finds:

166 seahearts (*Entada gigas*)
19 hamburger beans (*Mucuna* spp.)
3 sea purses (*Dioclea* spp.)
6 calabashes
3 starnut palm (*Astrocaryum* spp.)
10 laurelwoods (*Calophyllum* spp.)
1 brown seapurse unidentified
1 pod unidentified
1 cabbagebark (*Andira inermis*)

Sea Beans at the Ragged Island All-Grade School
by Danny Miller, M/V *X Isle*

In May, 2006 in the company of Ted and Patty aboard *Ibis* the author cruised among the uninhabited Jumentos Cays in the south western Bahamas, also known as the Ragged Islands by locals. Located along the northern edge of the Crooked Island Passage, beachcombing is excellent along the windward beaches of the cays. Patty on *Ibis* is an avid sea-beaner and I had promised good pickings on my fifth trip in the cays. On arriving in the Duncan Town area, I proposed that we make a presentation at the Ragged Island All-Grade School to the students about the drift seed treasures on their local beaches.

I was warmly received by Robert Boodram, school Principal, and the arrangements were made. On May 11, 2006 the crews of *Ibis* and *X-Isle* presented a short informal "show and tell" to the sixteen students. A short introduction to drift seeds and how such seeds were partial evidence to Columbus that lands lay to the east. All Bahamians are familiar with the fact that Columbus first landed in the Bahamas at San Salvadore.

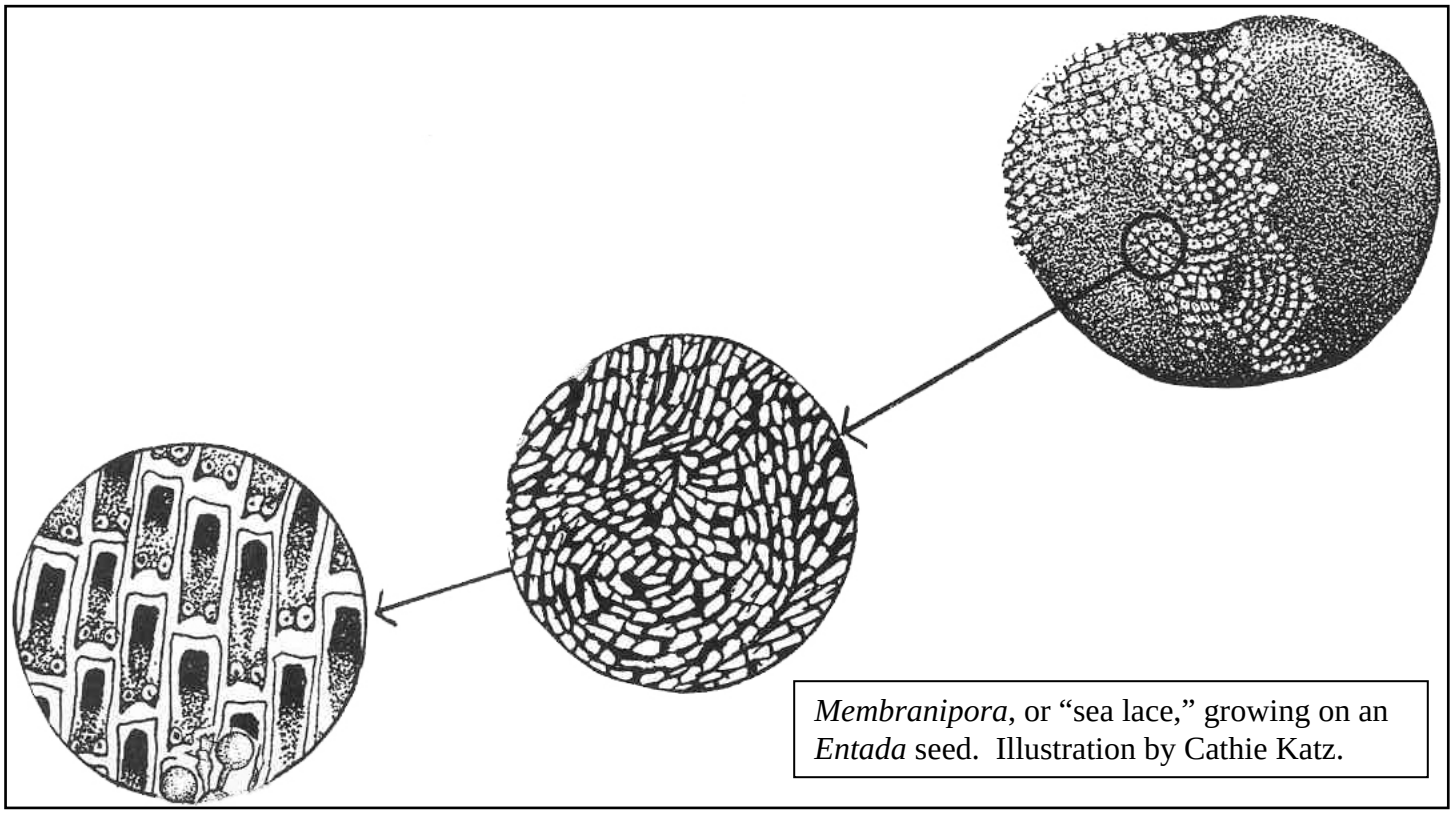
Patty was particularly good with the children as any Grammy would be. She had no less than three sea beans as gifts for each of the children, while I only brought my box of samples, carefully collecting them after display. Robert Boodram and his wife Ophelia, the only teachers, were also very interested in our good will mission. This married couple teach all sixteen students in grade one to nine in the Duncan Town school, reminiscent of the one room schools of yesteryear. However, this out island school has an air-conditioned computer room with twelve Dell computers.

A more orderly, curious, and disciplined group of students could not have been found. We have commented among ourselves about this fact and imagined the results in a school based in the U.S. It was a fine day. We hopefully spread some good will from our country at a time when the U.S. has squandered the good will of the world toward us. We certainly created new sea beaners, as Robert took the class to the town's windward beach that very afternoon and collected some fifty drift seeds. We learned of the class outing to the beach on Saturday at a benefit lunch fundraiser for a school trip. Patty brought a bag full of books and generously left a copy of Ed Perry and J. V. Dennis' excellent book *Sea Beans from the Tropics*. It was a rewarding day I will never forget.

Bryozoa on Coconuts

by Dr. Roger A. Hewitt
12 Fairfield Road, Eastwood, Leigh-on-Sea, Essex SS9 5SB, UK

Recently coconuts F and D sank in the experimental seawater tanks reviewed by Hewitt (2005). After drying it was found that F had a white calcite sheet of the bryozoan *Membranipora* grown while in the tank, on the lower surface, covering half of one of the three still intact 'eyes' (total bryozoan area 20mm by 15mm).



Membranipora, or "sea lace," growing on an *Entada* seed. Illustration by Cathie Katz.

Beachcombers should look for this potentially oceanic encrustation on huskless coconuts as a clue that they have not been floated by humans recently. If all three eyes are covered coconuts will probably cease to gain weight in the seawater. Coconut C (density 0.99 g/ml on day 1200) and E (density 0.90 g/ml on day 1200) are now gaining weight; unencrusted with bryozoa which adds little weight. Coconut D sank on December 14 2006 on day 1155 of floatation and coconut F on November 26 after 1105 days.

Reference:

Hewitt, R. A. (2005). Drift Coconuts. *The Drifting Seed* 11(2), 6-8; 11(3), 7.

editor's note: In the production of this newsletter we received another letter from Roger Hewitt now reporting that "coconut C sank on March 25 after 1282 days." That only leaves one out of six still floating (coconut E).

The beauty of the natural world lies in the details, and most of those details are not the stuff of calendar art.
Natalie Angier

Heritiera littoralis found in Finland – the second record from Europe

by Mikko Piirainen, mikko.piirainen@helsinki.fi
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In April 2007, I received a letter at my office in Helsinki, with a large seed or fruit found on a sea shore in SW Finland. I determined it as the fruit of *Heritiera littoralis* (Sterculiaceae), a mangrove tree from the Indian Ocean and SE Asia area. Because the finding was so unexpected in Finland, I consulted some drift seed experts, and got confirmation for my determination with the kind help of Torbjørn Alm (Tromsø, Norway), Charles Nelson (Cambridgeshire, U.K.) and Gerhard Cadée (Texel, the Netherlands). This record is the second one in Europe; the first was made in 2000 near Rotterdam, the Netherlands (Cadée & Nijhuis 2001).

The fruit was found at Kuuvannokka Cape on Ruissalo Island, in the territory of Turku town in SW Finland in early spring 2005 under thin ice in shallow water at the shoreline by a young girl and her family. According to the finders, the fruit was attached to some kind of a stalk, which was broken, when the fruit was detached from the ice. There are no roads or buildings very close to the locality, which serves as a recreation area, but a much used navigation route comes rather close to the shore here. Understandably, the origin of the fruit was unknown to the finders.

In practice, it is impossible that the fruit could have drifted from the native area of the species: around the southern end of Africa, across the Atlantic Ocean first to the Caribbean Sea and then to Europe, into the Baltic Sea through the narrow sounds between Denmark and Sweden, and finally all the way to the inner archipelago at the SW Finnish coast—though *Heritiera* fruits can float at least 10 years and even more (Brochard & Cadée 2005: 37). Most probably it was either thrown away or accidentally dropped (from a ship?), and drifted on the shore.

Heritiera fruits are known as souvenirs, and they have also been imported at least to the Netherlands for selling in flower shops; the latter use is also the most probable explanation for the finding in the Netherlands (Cadée & Nijhuis 2001, Brochard & Cadée 2005). If the fruit found from Ruissalo was really attached to a stalk, it is a proof of its origin as a decorative item used in flower arrangement—real drift seeds are probably never stalked (Gerhard Cadée in e-mail, May 2007), but a stalk would be needed to bind the fruit in a floral design. I had a look at some larger flower shops in Helsinki, but didn't find *Heritiera* fruits. However, this doesn't actually prove anything, because there are several import companies and wholesale dealers in the branch, whose assortment also varies from time to time.

In this case, this kind of anthropogenic dispersal of seed is only an interesting curiosity. However, seeds carried and thrown away by people may also have more serious consequences: alien species may be extremely harmful to the native vegetation and fauna. So, better not to "sow" seeds in the nature—even the sea—however interesting they would be.

References

Brochard, C. J. E. & Cadée G. C. 2005. Tropische drifzaden van de Nederlandse kust. Tabellenserie van de Strandwerkgemeenschap KNNV, NJN en JNM 30: 1–66.

Cadée, G. C. & Nijhuis, H. 2001. *Heritiera littoralis*, New for The Netherlands and Europe. The Drifting Seed 7(1): 9–10.

Do Pearls Come From Coconuts?

by Dr. Wayne Armstrong, mrwolffia@cox.net

During my career as a college botany teacher, I was skeptical about the existence of pearls from coconuts. Several reputable botany textbooks flatly stated that these pearls were a hoax, and I had no reason to doubt these authors. Then one day I visited the Fairchild Tropical Garden in Coral Gables, Florida, where I saw the famous Maharajah coconut pearl on display in a glass case. It was sitting in the inner shell (endocarp) of a coconut and supposedly came from a "blind coconut" without germination pores. The Maharajah coconut pearl was presented to Dr. David Fairchild during his 1940 expedition to Celebes and the Java Sea. Seeing is believing, and how could I doubt the authenticity of a coconut pearl on display at such a prestigious botanical garden. During the past decade I have received a number of letters from people who own these "botanical jewels." They always ask me the same question: "What is the monetary value of a coconut pearl?" Recently I received a photo of an alleged coconut pearl in Singapore with a suggested price of $60,000 U.S. dollars. The following article concerns my reevaluation of the authenticity of coconut pearls and some advice to prospective buyers.

In 1982, Biochemist Abraham D. Krikorian, professor emeritus at State University of New York at Stony Brook, published a detailed review of the literature on coconut pearls. Some of the references cited by Dr. Krikorian suggest that coconut pearls may exist. In his classic six-volume work entitled *Herbarium Amboinense* (1741-1750), the distinguished 17th century naturalist Georg Eberhard Rumphius described and illustrated exquisite coconut pearls owned by Malaysian dynasties, often mounted in jeweled settings of gold and silver.

In 1925, Dr. F.W.T. Hunger published an article about coconut pearls for the prestigious journal *Nature*. He described two eyewitness accounts of pearls actually observed inside of coconuts, one from Dr. J.G.F. Riedel in Celebes and one from a coconut plantation in Borneo. Dr. Hunger also acquired eight blind coconuts from the Tanimbar Islands of Indonesia, one of which contained a pearl embedded in the endosperm. He concluded that the pearl was the remnant of a calcified haustorium (cotyledon) in a blind coconut that was unable to germinate: "… the newly formed haustorium becomes encrusted under the influence of the coco-nut milk [endosperm] with calcium salts, although it still remains unexplained why the cocos-pearl consists almost entirely of calcium carbonate, while neither the cocos-kernel nor the coco-milk contain this carbonate." The previous statement is untenable in my opinion. How could multinucleate coconut water (liquid endosperm) and a pulpy, cellular mass composed of cellulose and protein turn into a dense calcareous stone? The alleged pearl apparently had no evidence of cellular or vascular structure indicative of cotyledon tissue. Dr. Hunger also cites a coconut plantation where approximately three million coconuts were opened annually for years, and yet no pearls were ever found.

#1

Dutch zoologist A. Reyne, chief of the Coco-nut Research Station at Menado, Celebes, studied the structure of so-called coconut pearls in public and private collections, and concluded that they were pearls from giant clams of the genus *Tridacna*. He examined the concentric striations (lamellae) of

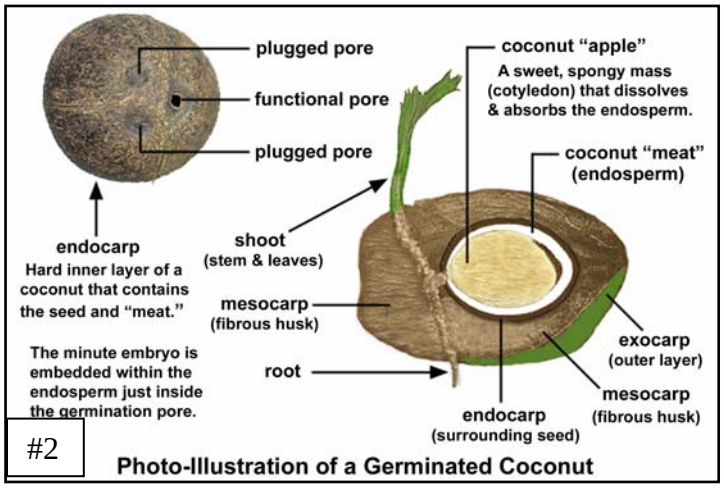
the pearls, including thin sections mounted on microscope slides. According to Dr. Reyne (1939), fraudulent coconut pearls are common and widespread throughout Malaysia, particularly from Celebes. He examined the notorious coconut pearl of Dr. Riedel and concluded that it came from a giant clam. Regarding Dr. Hunger's famous coconut pearl: "I am convinced that it is a *Tridacna*-pearl, as it shows a bipolar structure with the peculiar white veins of the crossed lamellar structure clearly developed. It seems likely that Dr. H., who as a botanist was not familiar with *Tridacna*-pearls, has become the victim of some trick of the natives."

I recently came across David Fairchild's original discovery of a coconut pearl as described in his book published in 1943: *Garden Islands of the Great East: Collecting Seeds From the Philippines and Netherlands India in the Junk "Cheng Ho."* Dr. Fairchild did not have the actual blind coconut from which the pearl was derived. His photo of the pearl appears on page 128 with the following caption: "This rare jewel is pictured about as it would be found in the white meat of a coconut near the end where the sprout comes out through the pore." The Maharajah coconut pearl that was once on display at Fairchild Tropical garden was not in its original shell. After carefully reading Dr. Fairchild's book, I have changed my view regarding the authenticity of coconut pearls.

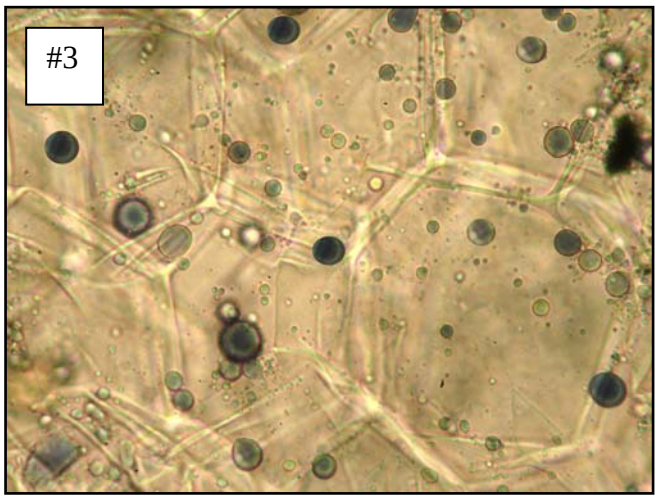
The age-old question "do coconut pearls exist?" may forever be open for discussion; however, extraordinary claims require extraordinary proof, and the proof is lacking here. The meticulous writings of naturalists such as Georg Eberhard Rumphius indicate they are real; however, these naturalists did not see the original blind coconuts from which the pearls were extracted. The pearl apparently develops in the embryonic region of the coconut, but there is no explanation for how such a smooth, spherical or oblong calcareous structure could be formed inside of a coconut.

Intracellular crystals of calcium salts, such as calcium oxalate, are fairly common throughout the plant kingdom. Under a compound microscope, the glistening crystals resemble many-faceted diamonds. The stems of some bamboos contain silica concretions composed of silicon dioxide. Some palm seeds contain vegetable ivory, hardened endosperm tissue containing a polysaccharide called hemicellulose. Like wood, vegetable ivory is essentially composed of dead cells; however, unlike grainy hardwoods it has a texture and hardness similar to ivory. The cellular structure and chemical composition of palm endosperm and vegetable ivory are completely different from the pearls of mollusks.

In mollusks, a calcareous concretion (pearl) is often produced when a foreign object becomes lodged between the shell and the outer flesh (mantle). Foreign objects can be naturally-occurring, or they may be induced, such as in cultured pearls of oysters. The mantle epidermis responds by encapsulating the object within thin concentric layers of aragonite, a form of calcium carbonate known as nacre or mother-of-pearl. Aragonite has unusual optical properties that account for the light refraction and beautiful opalescence of nacre. The crystalline structure of aragonite is orthorhombic, with three triangular sides that act as tiny prisms. A number of mollusks that do not produce commercially valuable pearls still have

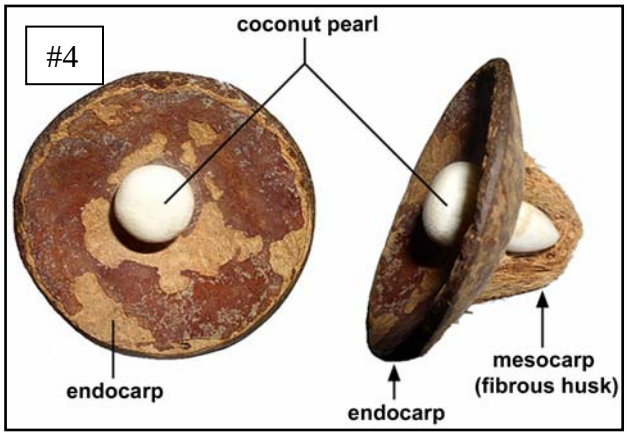


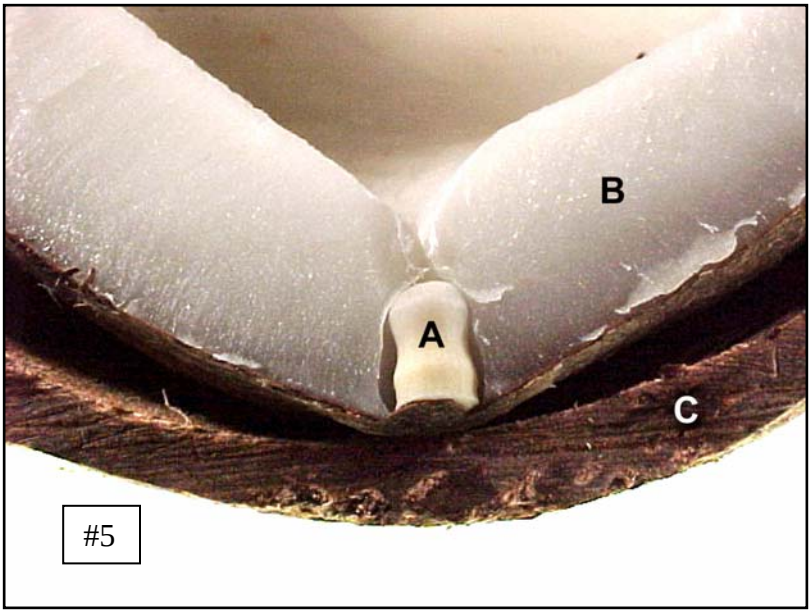
iridescent nacreous layers lining their shells that are used to make mother-of-pearl jewelry.



According to Brown, Kelly and Snow (1988), aragonite pearls from the clams *Tridacna* and *Hippopus* have been fraudulently transplanted into coconuts. These pearls can be readily identified from illumination studies with high intensity fiber optic light, x-ray diffraction, and comparisons of their refractive index and specific gravity. In fact, the above authors reported a fraudulent coconut pearl manufactured from a seashell.

Author Neville S. Haile traveled extensively in Malaysia in search of coconut pearls. In Jakarta he purchased a white, pear-shaped stone called "mastika kelapa," supposedly obtained from a coconut. The name mastika (also spelled mestika or mostika) refers to rare Malaysian stones found inside fruits. Striations on the stone together with its specific gravity revealed that it was composed of aragonite, the same material found in mollusk shells. According to Haile





(1974), there are at least three kinds of objects sold as coconut pearls: (1) "Rather crude artifacts made from shell (probably slightly translucent, banded giant clam shell) with rather crude incised grooves." This type fits his original Jakarta purchase. (2) "Chalky white, finely banded and finely grooved pearls probably also artifacts of shell, either young giant clam, or some other kind of shell." (3) "Pearls from mollusks, including giant clams." Haile also states that although a number of bogus coconut pearls have been exposed, this does not disprove the existence of genuine ones. In my opinion there is substantial evidence that pearls are not produced inside coconuts. The existence of coconut pearls seems to be based on faith rather than objective scientific evidence.

Alleged coconut pearls are in collections at two prestigious botanical gardens, including Kew and Fairchild Tropical Garden. The Kew pearl is more oblong in shape, compared with the spherical Maharajah pearl at Fairchild. These large pearls are not inside their original coconuts so they could have come from another source, possibly a giant clam. Detailed examinations have clearly shown that alleged coconut pearls in public and private collections have concentric aragonite layers as in

true molluskan pearls. In fact, fraudulent coconut pearls have been thoroughly studied by Dr. A. Reyne and others, particularly pearls originating in Celebes. It is interesting to note that Dr. Fairchild's famous Maharaja coconut pearl also came from Celebes.

A recent Internet image of a coconut pearl for sale in Singapore shows an oblong white stone within a coconut; however, this "pearl" extends through the endocarp layer into the fibrous husk region. If coconut pearls develop within blind coconuts without functional germination pores, then how did this "pearl" grow and penetrate the hard, woody endocarp. Since the endocarp has clearly been sectioned and removed from the coconut, this "pearl' could have easily been inserted through an enlarged germination pore and into the husk. In addition, the photo shows faint parallel striations described by Reyne for molluskan pearls. There is simply no adequate botanical explanation for the formation of a true, aragonite pearl inside of a coconut. Coconuts do not have calcium-forming tissues comparable with the mantle of mollusks.


#6

Although I once supported the existence of coconut pearls, I now believe there is insufficient evidence to support such a conclusion. Most eyewitness records of coconut pearls cited in the literature are secondhand accounts that were not observed by the authors of these articles. There are a few firsthand, published accounts of pearls observed inside coconuts, but most of these pearls have been shown to be fraudulent. The existence of coconut pearls may be another myth like the "Loch Ness Monster" and "Bigfoot," only in the case of coconut pearls realistic fabrications will always be around to cloud the truth.

References:

1. Armstrong, W.P. 2005. "Coconut Pearls: A Reevaluation of Authenticity." *Ornament* 28 (2): 46-49.

2. Brown, G, S.M.B. Kelly, and J. Snow. 1988. "A Coconut Pearl?" *The Australian Gemologist* 16 (10): 361-362.

3. Corner, E.J.H. 1966. *The Natural History of Palms*. University of California Press, Berkeley.

4. Fairchild, D. 1943. *Garden Islands of the Great East: Collecting Seeds From the Philippines and Netherlands India in the Junk "Cheng Ho."* Charles Scribner's Sons, New York.

5. Haile, N.S. 1974. "The Captivating Quest for the Mysterious Coconut Pearl." *The Straits Times Annual*: 75-77, 159.

6. Hunger, F.W.T. 1925. “Nature and Origin of Coco-Nut Pearls.” *Nature* 115 (2882): 138-139.

7. Krikorian, A.D. 1982. “Coconut “Stones” or “Pearls”: Early Descriptions by Alzina, Kamel and Rumphius.” *Principes* 26 (3): 107-121.

8. Reyne, A. 1939. “Coconut Peals.” Ann. Jardin bot de Buitenzorg 49 (Pt. 1): 43-48.

9. Reyne, A. 1947. “On the Structure of Shells and Pearls of *Tridacna squamosa* (Lam.) and *Hippopus hippopus* (Linn.).” Arch. Netherlands Zoology 8: 206-242.

10. Rumphius, G.E. 1741-1750. *Herbarium Amboinense*. Volumes 1-6. Den Haag, Amsterdam.

Image Descriptions
With the exception of #4, all illustrations & photos by W.P. Armstrong.

1. The infamous “Maharajah Coconut Pearl” sitting in the shell of a coconut. This alleged botanical jewel was once on display at the Fairchild Tropical Garden in the city of Coral Gables, Florida.

2. Sprouting fruit of a coconut (*Cocos nucifera*). The hard inner layer (endocarp) contains the actual seed composed of a minute embryo and food storage tissue (endosperm). The endosperm is the coconut "meat" which is dried and sold as "copra." During germination, a spongy mass develops from the base of the embryo and fills the seed cavity. This mass of tissue is called the "coconut apple" and is essentially the functional cotyledon of the seed. [The white color in photo has been altered to clearly differentiate it from the endosperm.] It dissolves and absorbs the nutrient-rich endosperm tissue to supply the developing shoot with sugars and minerals. Eventually, the developing palm becomes self sufficient, as its leaves produce sugars through photosynthesis and its roots absorb minerals from the soil.

3. Microscopic view of the endosperm of a ripe coconut showing several polygonal cells. The dark spherical objects are fat globules, commonly present in fatty fruits and seeds. Vegetable ivory is hard, dense palm endosperm composed of hemicellulose. The tissue inside palm seeds is very different from the calcareous pearls of mollusks.

4. Left: An alleged coconut pearl from Singapore within the hard endocarp of a coconut. Right: The pearl has extended into the fibrous mesocarp (husk) surrounding the endocarp. This "pearl" was priced at 60,000 U.S. dollars in December of 2003. Photo by N.M. Ngoi.

5. Close-up view inside the germination pore of a coconut showing a small, cylindrical embryo (A) embedded in the fleshy meat or endosperm (B). The base of the embryo (pointing into the coconut) swells into an absorbing organ or cotyledon called the “coconut apple” that fills the entire cavity of the seed as it digests the endosperm. The alleged coconut pearl supposedly forms inside blind coconuts without germination pores.

6. Box fruits (*Barringtonia asiatica*) and a sprouting coconut (*Cocos nucifera*) on the coral sand beach of Tetiaroa Atoll in French Polynesia.