

*of Sea  
and Shore*



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OUR COVERS

Our front cover features a painting by Richard Ellis of New York City. The Busycon canaliculatum (Linne), the Channeled Whelk, ranges from Cape Cod to Northeast Florida and has been introduced into San Francisco Bay in

California. You can see other Richard Ellis paintings on the cover of the January 1975 issue of Audubon magazine and inside that same issue - all illustrating species of whales. (continued next page, column one)

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Editor: THOMAS C. RICE

## OF SEA AND SHORE

ABOUT OUR COVERS  
Continued from page 1

We feel very fortunate to be able to present these gorgeous paintings on our covers (see the Spring 1973 issue of OS&S for another Richard Ellis painting).

Inside our front cover are a few items you may have heard of before. The mollusk that the non-collector hears about when he visits the Pacific Northwest, especially the Puget Sound region, is the geoduc. (Pronounced gooey duck.) This is the largest burrowing bivalve in the world, sometimes weighing ten pounds and more. The siphons extend for as much as three feet and are so large that the shells cannot contain all of the flesh when the animal retracts. The geoduc lives in sandy mud at and below the extreme low tide line. A visitor to a Puget Sound beach during a minus tide would see a very strange sight - a number of posteriors stuck up in the air, while possessors of same are upside-down attempting to extract the geoduc from its burrow. Since it lives in shifting sands the hole you dig in your quest of the tasty mollusk constantly falls into itself. You are limited, by state law, to three geoducs per day, but you'll be fortunate to get one. The majority of the population of *Panope generosa* live in offshore depths of 20 to 40 feet and in Puget Sound commercial divers obtain permits to harvest the clams for sale in local markets. Oh yes, our geoduc doesn't quite look like this one! The shell is real, but the animal is manufactured by Konzak, Inc., not by Mother Nature.

Surrounding our geoduc are examples of the current "rage" in shell jewelry. For years those visiting Hawaii have been offered "puka" shell necklaces, but in the past year these have really caught on - and the price has inflated to as much as \$100.00 for a strand. For a long time I wondered just what a "puka shell" was - what species is it. Look closely and you'll discover it's the broken off, wave-washed, nuclear (or upper) whorls of a small cone shell.

The smaller-diameter necklaces are he-she and are made by Indians of one pueblo in New Mexico. The tiny "beads" are made by cutting small squares from olive or penshells, stringing them and then working the string against an abrasive until the beads are rounded and highly polished. With the resurgence of interest in Native American craft work these are now in great demand, especially when combined with other craft items, such as Zuni animal carvings of turquoise.

## Walter J. Eyerdam



This issue of OF SEA AND SHORE is respectfully dedicated to the memory of Walter J. Eyerdam. Those who have been receiving our magazine since the beginning are aware of Walter's many expeditions as outlined in a series of excerpts we published from his journals.

Walter Jacob Eyerdam died on New Year's Day 1975. He will be greatly missed by a large number of Northwest residents who, over the years, treasured their friendship with him. Shortly after your Editor became interested in shells he met Walter Eyerdam. A visit to Walter's home was like visiting a museum of Natural History. And listening to Walter's stories of his adventures was like talking to a living history book. One could not help but be overwhelmed with the vastness of nature when Walter led you through the organized jumble of his "museum". Whether viewing the shells, hummingbirds, ethnological items, or the multitude of herbarium specimens, Walter always had a story to tell either about the particular species, or collecting it, or the area in which it was found. Many scientists and scientific institutions, as well as individual collectors, have benefited from the stamina, industry and determination of this singular man. Our sympathies to his daughter Mrs. Lilo Homchick and her family.

A native of Seattle, Washington, born eighty-two years ago, Eyerdam studied at the University of Washington before becoming a world traveler, adventurer, big game hunter, naturalist, ornithologist, paleontologist, mammalogist and conchologist. His collecting of

mollusks and other natural history objects was extensive - even while a cooper on fishing fleets in Alaskan waters he found time in off hours to dredge for marine life or hike the fields and forests for botanical specimens.

As a member of the Whitney South Seas Expedition in 1929, in the Solomon Islands, he helped collect a number of bird species new to science. These were not the only new animal species first collected by this humble man - several dozen species of mollusks, birds, fossils, mosses and a volcano in Siberia were named in his honor.

Walter Eyerdam visited some fifty countries in his travels. This included five trips to Russia and its Siberian steppes in the late twenties. Once jailed in Irkutsk for taking aerial photographs, he was later feted in the Kremlin and was one of the few individuals allowed to view the captured wealth of the Byzantine Empire and the crown jewels of the last Russian dynasty.

Following a stroke some three years ago Walter had lived with his daughter near his home. Each day he would walk to his home and relive memories of days gone by. His daughter says he particularly enjoyed reading the excerpts from his journals in OS&S.

Those of us who knew Walter are enriched through that friendship. We miss him, but know that his love of nature and his respect for the beauties of this earth will live on through the large collections he gathered during his life.

TOM RICE

*From the Editor's Desk*

I hope you'll enjoy this enlarged issue of our magazine. We hope to continue with the larger size, provided we obtain enough articles so - please send us yours!

We have one change to announce. Rather than issuing the magazine on the 21st of the month (March, June, September and December), we will be publishing the magazine on the last day of the month. Deadlines for advertising, etc. remains as before - the first day of the month of issue.

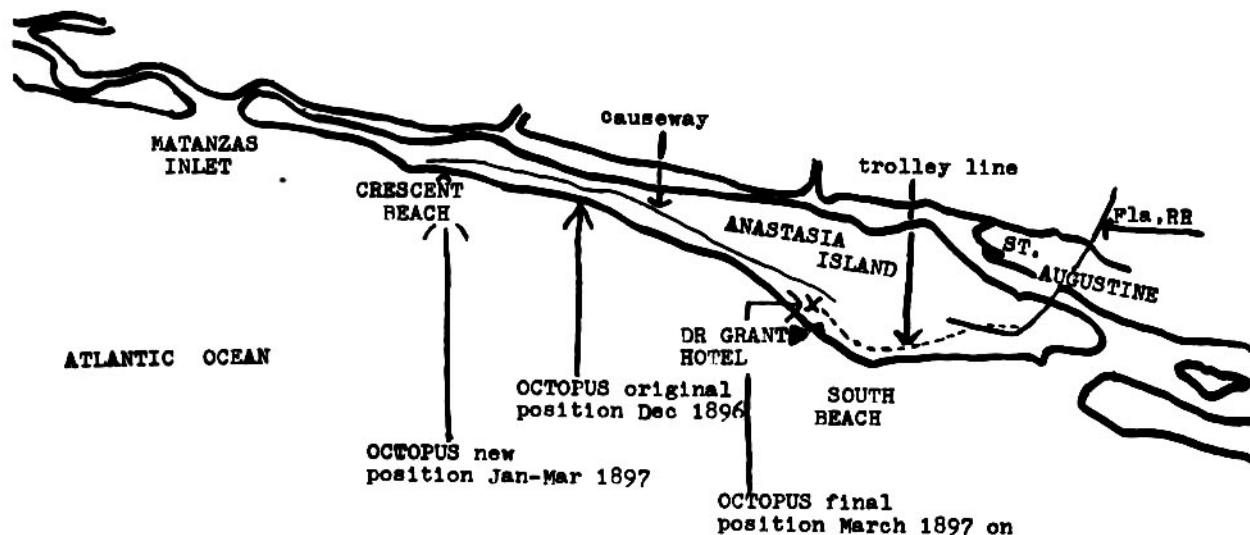
So, thanks to you who have sent in the articles used in this issue and we'll look for more from you and from those of you who have a story to tell.

Until next time, good shelling.

*Tom*  
Tom Rice

# Octopus giganteus Verrill: A New Species of Cephalopod

By GARY S. MANGIACOPRA\*



Map showing the various locations of *Octopus giganteus*, from December 1896 to March 1897. Based on a map drawn in 1916 for the St. Augustine Historical Society, St. Augustine, Fla. Drawing by the author

## AUTHOR'S PROLOGUE

Reports of the remains of "sea monsters" being found washed ashore on beaches are usually referring to the mutilated carcasses of sharks, whales, oarfishes or other known denizens of the deep.

But occasionally an animal, unknown, perhaps one whose existence is not even suspected, may, in this manner, be discovered by chance.

For such a chance discovery has occurred in 1896. This discovery is still causing a controversy in marine zoology. The controversy being: were the remains found those of a species of octopus of size equal to, or surpassing, those of giant squids?

## THE STORY

The story of this giant unknown resident of the sea began uneventfully on the evening of November 30, 1896, as two young bicyclists, Herbert Coles and Dunham Coretter, were cycling along Anastasia Beach, near St. Augustine, Florida. Their planned trip to Matanzas Inlet, at the far south end of Anastasia Beach, ended abruptly when they came upon the remains of an immense carcass that was deeply embedded in sand.

The find was immediately brought to the attention of Dr. DeWitt Webb, who would become the leading figure in this controversy. Dr. Webb

undertook the sole responsibility of collecting and recording the facts concerning this discovery.

By profession a medical doctor, Webb's interests included local history and the natural history of the St. Augustine region. His interest in science and history led to the founding of the St. Augustine Historical Society and Institute of Science, of which he served as President for 34 years. During this period he devoted considerable time, effort and financial expense for the maintenance and expansion of the society. Dr. Webb's life's work in the medical profession and the political field, showed him to have been a most active and competent person, who was held in respect and would receive help by the citizens of the city in regards to the carcass.

Upon learning of the two boys' discovery, Dr. Webb, as a naturalist, was interested in examining the carcass and perhaps preserving parts of the whale, which it was assumed to have been, for the historical society.

Due to the distance and lateness of the day it was not until the next evening, December 1st, that Dr. Webb, along with several others, was able to examine the beached "whale". Their first examination revealed the following interesting facts. Due to the isolation of the beach at this time of the year the carcass was probably beached for several days before its discovery; its estimated weight of five tons had caused it to sink into the sand to a considerable depth. The carcass was much mutilated at one end and

was in an advanced state of decomposition. The portion visible above the sand measured 23 feet in length, 4 feet high and 18 feet across the widest part of the "back". The outer surface or hide was of a light pink color, nearly white, and it had a silvery appearance. But the most interesting and startling fact that Dr. Webb concluded was that the remains were not that of a beached whale, as originally supposed, but of a monstrous octopus!

The location of this gigantic octopus at the time of this first examination was four miles south of the hotel of Dr. George W. Grant, who was also in charge of the pavilion at South Beach. Dr. Grant tried to secure the monster for purposes of exhibiting it at the pavilion, but failed, probably due to the intervention of Dr. Webb on behalf of the Society.

Cloudy weather and rain prevented Dr. Webb from reexamining the octopus until the 5th of December. But, during the days of waiting, Dr. Webb must have realized the importance and uniqueness of this chance discovery and that the facts should be accurately determined and recorded.

On December 7, 1896, Dr. Webb, with two amateur photographers, Mr. Edgar Van Horn and Mr. Ernest Howatt, revisited the site. Photographs were taken showing several different views of the octopus as it lay embedded in the sand as it was originally found. Unfortunately, the original photographs taken at this

\*Milford, Connecticut

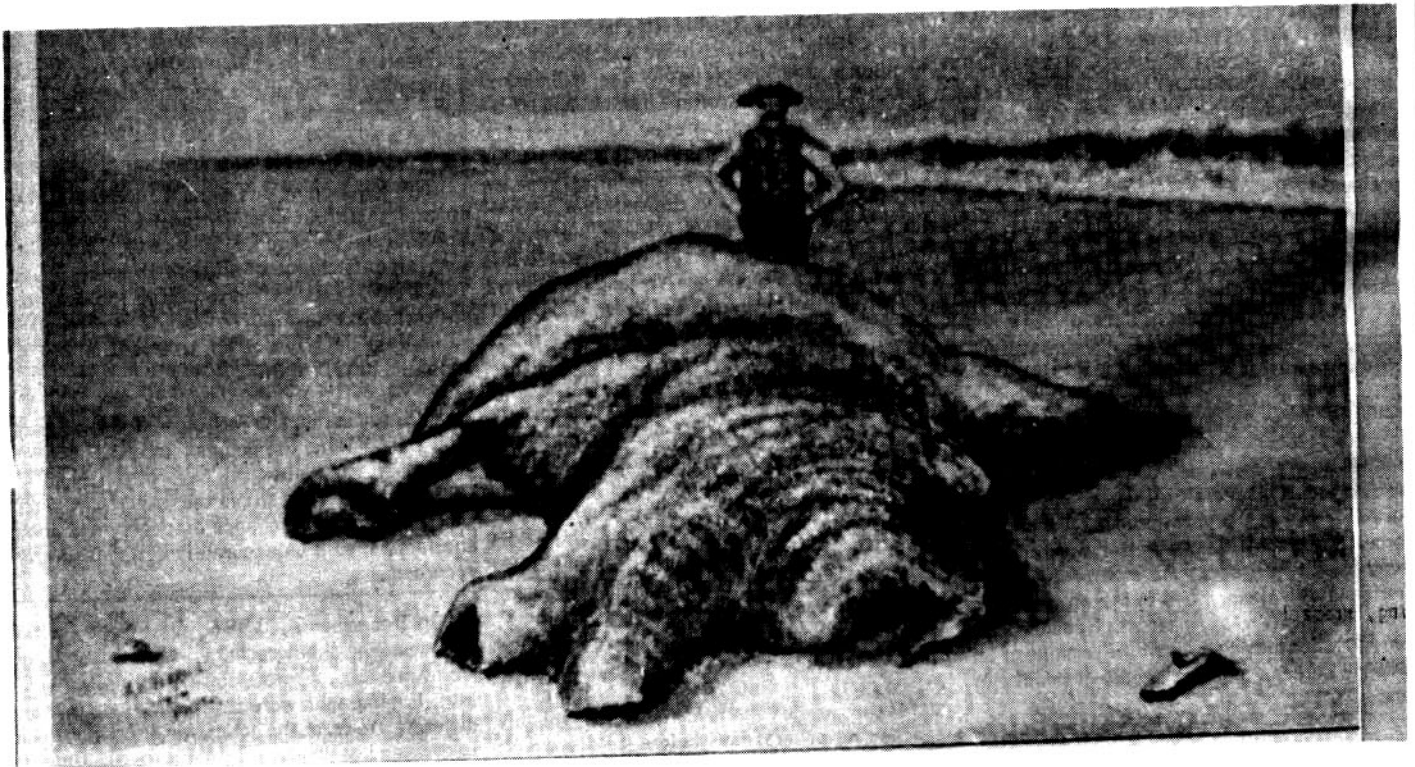
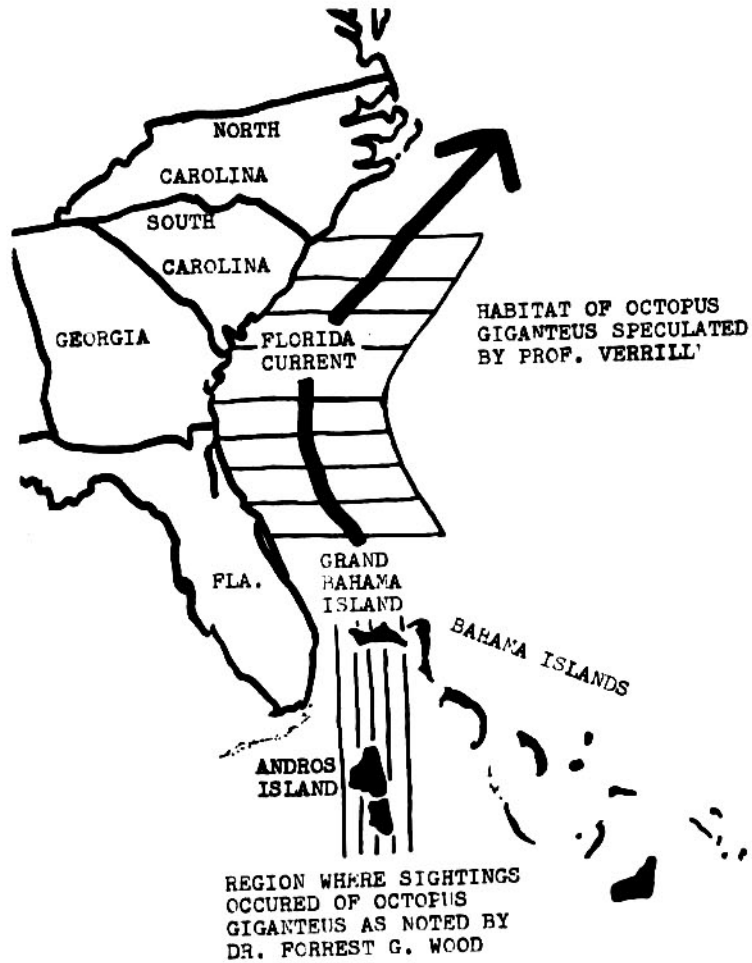


date have yet to be located, but drawings based on two of these photographs have survived.

The first drawing, and the most important of the two, shows the pear-shaped body with the largest section near the broadly rounded posterior end and flatter toward the smaller mutilated end. Due to mutilation and decay the head is almost unrecognizable as shown in the end view, but the most important feature visible is what looks like the remains of the stumps of five arms in the foreground. The person in the background in the drawing is probably Dr. Webb and gives an indication of the size of the carcass.

The second drawing shows, in a side view of the carcass, the posterior end being the thicker section, gradually tapering to the stumps of the arms, of which two are discernible.

Several days after these photographs were taken, a Mr. Wilson claims that he did excavations in the sand around the carcass and found the fragments of the arms. These findings of Mr. Wilson would later be criticized as Dr. Webb, nor any other person, is recorded to have been with Mr. Wilson on the day of his examination. In a written statement made by Mr. Wilson to Dr. Webb, he states, "one arm was lying west of the body, 23 feet long; one stump of arm, west of body, about 4 feet; three arms lying south of body and from appearance attached to same (although I did not dig quite to body, as it laid well down in the sand, and I was very tired), longest one measured over 32 feet, the other arms were 3 to 5 feet shorter."



The Florida Monster, end view, drawn by A. Hyatt Verrill, from a photograph taken December 7, 1896. Credit: The American Naturalist, April, 1897.





The Florida Monster, side view, drawn by A. Hyatt Verrill, from a photograph taken December 7, 1896.  
Credit: The American Naturalist, April, 1897.



Photo of the Florida Monster, taken second week of January, 1897. Credit: St. Augustine Historical Society.

Soon after the examination of Mr. Wilson a severe storm had washed the carcass out to sea, to be cast ashore again two miles further south near Crescent Beach. When the carcass was later reexamined the reported arms were missing, probably due to the waves washing the carcass from its original beached site. Doubt as to the verification of this important discovery would later cause suspicion upon other facts obtained by Dr. Webb.

Dr. Webb began a series of letters to various scientists, telling of this discovery. The ear-

liest of his known letters was dated December 8, and addressed to Mr. J. A. Allen. A portion of the letter read, "You may be interested to know of the body of an immense Octopus thrown ashore some miles south of this city. Nothing but the stump of the tentacles remain, as it had evidently been dead for some time before being washed ashore. As it is, however, the body measures 18 feet in length by 10 feet in breadth. Its immense size and condition will prevent all attempts at preservation. I thought its size might interest you, as I do not know of the record of one so large."

Mr. R. P. Whitehead acquired the letter from Mr. Allen and forwarded it to Addison Emery Verrill, Professor of Zoology at Yale University, New Haven, Connecticut. Noted as a systemic zoologist, who, during his lifetime published over 350 articles and papers on zoological subjects, many describing the more than one thousand new species he had classified. But of all his accomplishments in the field of zoology, he is best recognized for his work on the cephalopods, proving the existence of the Kraken, those legendary sea monsters that were actually what we know now

as the giant squids.

(See *Of Sea and Shore*, Winter 1973-74 issue for an earlier report on this monster. Page 194.)

Professor Verrill was indeed interested in this discovery of a huge octopus and, based on the information in the letter, a brief notice was published in the January, 1897 issue of the *American Journal of Science*. Based upon the dimensions given, Verrill concluded that it indicated a giant squid, rather than an octopus as reported, but a squid larger than the Newfoundland specimens that he had examined in the 1870's.

Verrill's position was, as this was written in 1879, that no naturalist had ever examined an octopus which had reached the dimensions of the giant squids (60 feet). Though many writers tell of dying whales who vomited the fragments of huge species of octopus, but none of which had been scientifically examined and these reported fragments probably belong to the giant squids.

But Verrill reversed his opinion, for after publication of his brief notice, he received, from Dr. Webb, additional information and photographs showing four different views of the carcass.

The first article that Verrill published telling of this discovery of a giant monster of the deep, was as a Sunday supplement for the *New York Herald of January 3rd*. The first portion of the article recounted the discovery of the body and the dimensions given. Based on the information of a reported fragment of an arm 36 feet long by 10 inches at its broken extremity. Verrill estimated, by comparing the proportions with smaller species, that the arm's length would be 75 to 100 feet by 18 inches at the base and would reach an area 200 feet in diameter. The remaining portion of the article dealt with the discovery of the giant squids and his personal examination of them and of the life-sized models made and exhibited. Verrill concludes that the octopus found on the coast of Florida is unlike anything previously discovered and far exceeds any of the giant squids reported.

The next article in which Verrill formally presented this discovery of a new species of cephalopod was published in the following February issue of the *American Journal of Science*. With the additional information, and based especially on the photographs sent to him by Dr. Webb - showing an eight-armed cephalopod, probably a true octopus of a gigantic size - Verrill postulated that the species is one on which sperm whales feed off the southern coast. On the statement of a whaling captain, who claimed to have seen suckers as big as dinner plates on fragments of arms vomited by sperm whales killed in this region, the size of the suckers would have been as large as that (no suckers were found on the mutilated carcass. Author's note).

Officially the octopus was named *Octopus giganteus*. Criticism has been voiced at Verrill's failure to name the species in honor of Dr. Webb, since he was the person who identified

and recorded all the data about the octopus. Verrill thought that the species might be related to the *Cirroteuthis*, as the two posterior stumps shown in the front photographic view made on December 7th might have been the remains of the lateral fins, though Verrill mentions they were too far forward for fins and too far back for arms. Verrill theorized that they may just be arms twisted out of their true position and the statement by Mr. Wilson would eliminate this supposition.

This is the first gigantic octopod described from an actual specimen. But Verrill, at a later date, would question the correctness of the information obtained. He had based his published statements entirely on the information obtained by Dr. Webb during the early part of December.

Due to the distance, stormy weather and personal commitments, Dr. Webb was not able to reexamine the carcass until the second week in January. During this interval of six weeks the carcass was washed from the sea in which it was originally found and examined. When again located it had suffered further mutilation, such as the loss of the alleged fragments of the arms. Dr. Webb began his second and much more detailed examination. The examination would, in the months to come, reveal facts that would contradict his earlier findings.

Dr. Webb reported his new findings in a series of letters to Dr. Verrill and also to Professor William Healey Dall, Curator of Mollusks at the National Museum in Washington, D.C. Neither the replies from Dall or Verrill are in existence, but seven letters written by Webb to Dall, over a period of three months, of his new findings and his efforts in examining the carcass have survived.

Dr. Webb's earliest known letter to Dr. Dall, undated though written in the early part of January, states, "Your very instructive letter is at hand. I send you by this mail some new photographs which may help you in determining the character of the specimen. I spent the greater part of two days with a corps of photographers, that is one professional and several amateur, with a lot of help but found as I wrote Mr. True that all of us with the aid of strong tackle could not eventurn the monster over. We could with a dozen men pulling at the ropes only partly raise it as you will see. I have another scheme which I hope to accomplish if I can raise the funds and that is to draw it by means of horses and a windlass farther up the bank entirely out of the pit so that the hood can be spread out and then I hope to be able to get men to cut through the enormously thick hide which measures in some places 3½ inches in thickness and so open the whole thing up. The hood is so tough that when it is exposed to the air an axe makes very little impression upon it. Judging from the difficulty of moving it it must weigh 6 or 7 tons for 12 men with a block and tackle ought to move anything less."

The remaining portion of the letter is missing.

A picture taken on this date shows Dr. Webb (?) standing next to a dome shape mass several feet in height and diameter with a rope around its middle. No discernible features are noticeable.

Dr. Webb's second letter, and the longest one available, is dated the 17th of January. "Owing to defective light the photographer was unable to complete the printing of the photographs to his satisfaction until yesterday. They will be forwarded to you tomorrow (Monday) by Express and I will think you will be pleased with them as he has taken great pains with them. I shall soon, however, be able to send pictures of still greater value. Yesterday I took four horses, six men, 3 sets of tackle, a lot of heavy planking and a rigger to superintend the work and succeeded in rolling the invertebrate out of the pit and placing it about 40 feet higher up on the beach where it now rests on the flooring of heavy plank. After getting it out we found it on being straightened out to measure twenty-one feet instead of eighteen as I first reported to you. A good part of the mantle or head remains attached near to the more slender part of the body. This was spread out as much as possible. The body was then opened for the entire length of 21 feet as you will see by the new photographs yet to be sent. The slender part of the body was entirely empty of internal organs. And the organs of the remainder were not large and did not look as if the animal had been so long dead as it appeared to have been when first washed ashore some six weeks since. The muscular coat which seems to be about all there is of the invertebrate is from two and three to six inches in thickness. The fibers of the external coat are longitudinal and the inner transverse. There was no caudal fin or any appearance as if there had been any. There was no beak or head or eyes remaining. There was no pen to be found nor any evidence of any bony structure whatever. It is still in a comparatively good state of preservation and so would it not be a good thing for yourself or Prof. Verrill of Yale or both of you to come down and examine it for yourself and so determine its exact place better than I can. I think too that as our Museum here is quite small and this invertebrate is something of a cosmopolitan whether it would not be better for the Smithsonian or Yale to have it as there is still time for its preservation and its weight will not be so great after the thick hide is partially dried.

"Indeed I do not see why it should not be set up. If you think of coming at all you ought to come at once. I have written a similar letter to Prof. Verrill. You see I have said invertebrate rather than squid because that is entirely safe."

In a P.S. Dr. Webb mentions, "I send you a specimen of what in the picture looks like hair covering the hood but which you will see looks like the fiber of dried tendons. It completely covers the hood."

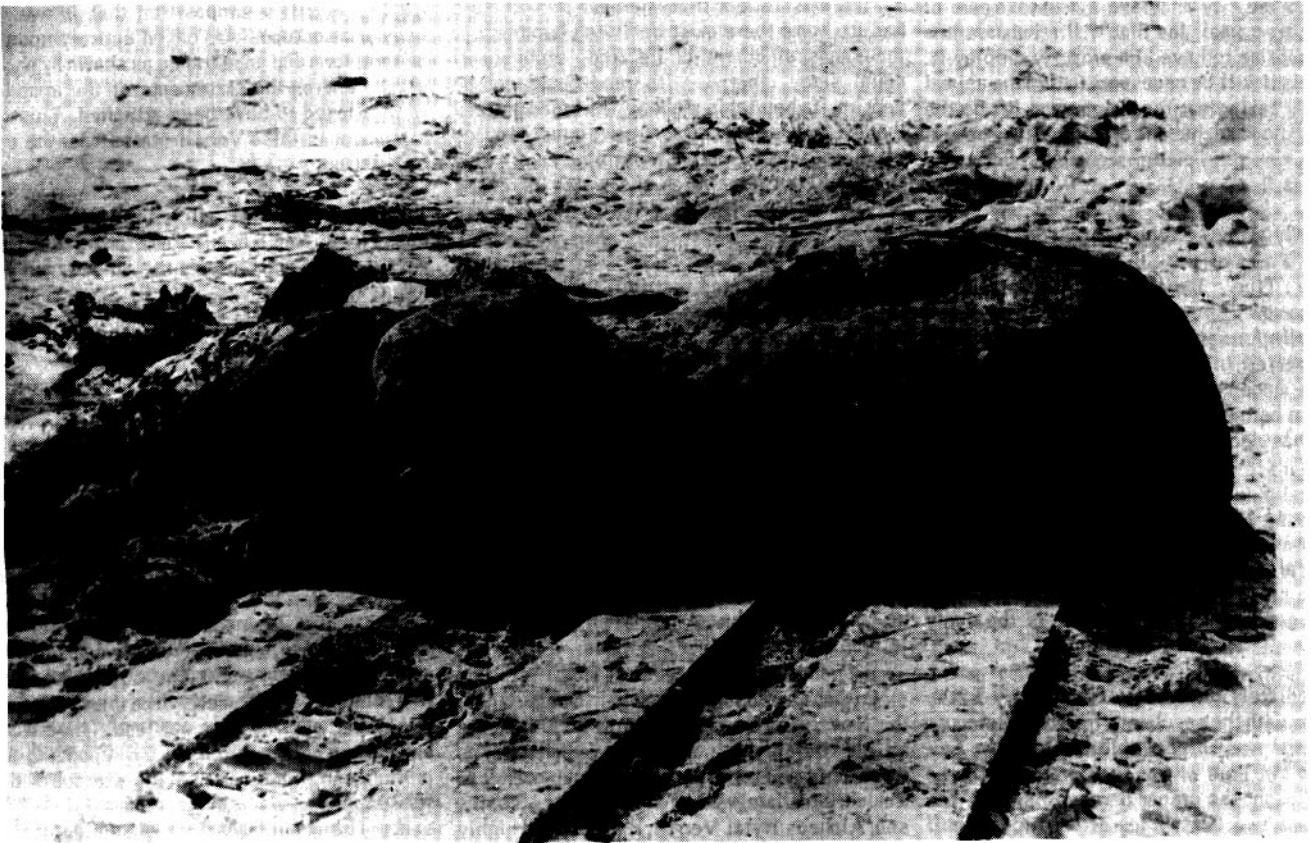


Photo of Florida Monster, taken second week of January, 1897. Note large break in the outer surface, showing the massive muscles of the creature. Credit: The St. Augustine Historical Society, St. Augustine, Florida.

But neither Dall or Verrill would personally examine the octopus. Perhaps due to Prof. Verrill's busy schedule, and the possibility that Yale could not afford to send Verrill or an associate to Florida at that time, and so Verrill had to work solely from the data and photographs sent by Dr. Webb.

The same reasons may have also prevented Prof. Dall from examining the octopus. For, in an undated reply from Y.A. True to Prof. Dall, "I am sorry to say that the Secretary does not see his way clear to have the cuttlefish examined at the cost of the Institution and the Museum can scarcely afford the expense at this time. Could not measurements etc. be made by Dr. Webb and some specimens saved?"

A brief letter followed on the 18th of January. "I sent by express this afternoon the pictures. The delay was in consequence of the care necessary to properly develop them. I trust they will reach you all right.

"I think I made one mistake in my description. The external muscular layer is circular and the internal longitudinal. I was obliged to go down in hot haste this morning to make a legal claim of it as one of the men who go about giving shows was going down and have it cut up and bring it up as a show. I went down and staked it around and put ropes around it and

put up a notice that it was in my possession so that I do not think there will be any more trouble."

But Dr. Webb's revision of his description of the musculature is not characteristic to either the whale or octopus. And it seems that the aforementioned Dr. Grant was still trying to acquire the sea monster for exhibition, though failing again because of Dr. Webb's intervention.

The following day, the 19th, a brief notice was published in a local St. Augustine newspaper, based on information supplied by Webb. The importance of this brief article is that this is the only printed reference in which Dall, along with Verrill, acknowledges that the remains were that of an invertebrate animal, the largest one recorded. The remaining portion of the article tells of the examination and of the aid and assistance obtained by the citizens and the various companies of St. Augustine, and on behalf of the Society, Dr. Webb thanks for the help received and ending that no person may interfere with the removal of any part of it.

Three weeks pass before Dr. Webb writes again to Dall. On the fifth of February, "I made another excursion to the invertebrate and brought away specimens for you and for Prof. Verrill of Yale. I cut two (2) pieces of the

mantle and two (2) pieces from the body and have put them in a solution of formalin for a few days before I send them to you. Although strange as it may seem to you I could have packed them in salt and sent them to you at once although the creature had been lying on the shore for more than two months. And I think that both yourself and Prof. Verrill while not doubting my measurements have thought my account of the thickness of the muscular, or rather tendonous husk pretty large so I am glad to send you the specimens and will express them packed in salt in a day or two.

"Had I not better send all the specimens to you and you send two (2) to Prof. Verrill and keep (2) for the Smithsonian?"

"Please write me at once as to this as it will save me some trouble and give you the opportunity of examining all four (4) of the specimens. My time has been so limited when I have gone down that I have been unable to make a satisfactory examination of the viscera. Indeed it seems to be all stomach with -- firmly attached to the external husk or hull as you will see by the examination of the specimens.

"I have a scheme on foot which I propose to put into immediate execution and that is to bring the entire creature up the beach some six miles nearer the end of the little railroad that



runs from the city and have a man take care of it charging a small fee that will reimburse him and enable me to have him properly display it. To do this it will be necessary to turn the animal over after taking out the viscera and lift up the mantle or hood so that the display will be better. As it is now, the pictures convey a very poor idea of it."

Shortly after, Webb writes on February tenth, "Yours of the 8th at hand as also one from Mr. True. I will ship the specimens to you tomorrow. They have been in the solution of formalin for several days. I think you will be interested in them. I expect to have the creature moved up in a day or two when it can be put in better shape for examination. Prof. Verrill has decided to call it the Octopus Giganteus."

"I wrote to Prof. True to the expense of formalin in quantity as there will have to be a good deal used in the attempts to have the creature preserved. It will be worth while to make a good deal of effort if it is the 'only one'."

Immediately following, on February 12th, "The box with the specimens from the 'Octopus Giganteus' was shipped this afternoon by Express to Mr. True who as the Curator in charge was I thought the proper person to send it to. There are two (2) pieces of the hide or hull which as you will find is in one part 10½ in. thick and two (2) pieces of the hood or mantle."

"In a few days I will be able to send you photos of the creature which will give you a much better idea of its actual appearance than the others. It is now in the process of removal."

This letter would mark the beginning of the controversy as to the correct identification of the carcass based on the tissue specimens sent.

While the specimens were in transit, Verrill had published another Sunday supplement for the Herald on February 14th. Titled the article "A Sea Monster Off Florida's Coast", Verrill writes of the facts since obtained from Dr. Webb. But the importance, for this is his only published account, is that Verrill speculated on the size, habitat and population density of these sea creatures.

Verrill speculated that, "the living weight of the creature was about eighteen to twenty tons. When living it must have had eight enormous arms, each one hundred feet or more in length, each as thick as the mast of a large vessel, and armed with hundreds of saucer shaped suckers, the largest of which would have been at least a foot in diameter."

"Its eyes would have been more than a foot in diameter. It would have carried ten or twelve gallons of ink in the ink bag. It could swim rapidly, without doubt, but its usual habit would be to crawl slowly over the bottom in deep water in search of prey."

"We must reflect that wherever this creature had its home there must be living hundreds or thousands of others of its kind, probably of equal size, otherwise its race could not be kept up. Its habitat is probably the broad plateau that extends out to sea about two hundred miles off the coast of South Carolina, Georgia and North Florida, on which the water increases very gradually in depth down to two hundred fathoms."

Verrill speculated that this region was the feeding grounds of the sperm whales and it was probable that this giant octopus was killed and partially eaten with the remnants being washed ashore in a storm.

Due to the fact that his Yale salary was insufficient to meet the needs of his family, Verrill wrote countless articles for publications as a second income. These articles were for the benefit or at least interest of people who were not scientists. Verrill was a scientist who would not make a statement unless he felt he could back it up. Therefore, these speculations are valid.

On this same date, published in Connecticut, the New Haven Evening Register contained the article "Octopus For Yale", the importance, as this would add an aspect in the controversy at a much later date, was written by Prof. Verrill's son, Alpheus Hyatt Verrill. Hyatt Verrill highly praised his father for his work on proving the Viking legends of the Kraken, which were in actuality the giant squids. Recounting the facts of these discoveries in the 1870's he noted that it was not until this present winter that anything the Kraken's size had been discovered.

Preservatives were forwarded to Dr. Webb to preserve as much as possible of the creature and that portions of the body and anatomy were expected to arrive in the city (New Haven, author). On February 23rd the specimens arrived at Yale University.

And on February 23rd Prof. Verrill wrote the first two letters of retractions, which were subsequently published in Science for March 5th and the Herald of the seventh. Stating that he had just received some large masses of exterior integument preserved in formalin in sizes from three to ten inches thick, elastic, very tough and hard to cut. Composed mainly of tough cords and fibers of white elastic connective tissue that were much interlaced and bound together with irregular cavities and canals in some places. Little oil was present in the tissues. Verrill concluded that these structures resembled that of the blubber of some cetaceans and that the creature could not have been an octopus, but a vertebrate animal!

But Verrill was unable to refer this bag-like form to any part of any known whale or any other creature that is large enough to have such a massive covering and that he was puzzled as to how it could have been attached to any

whale. Verrill's supposition that it was the body of an octopus was based entirely upon its general form and appearance as shown by photographs and on the statements of the arms that were alleged to have been attached. This last statement is false Verrill states as he ends both letters.

A brief notice was printed the following day in the local New Haven paper stating that Prof. Verrill could not classify the animal, but that it was not an octopus. Verrill thought that it possibly came from some unknown species related to the whale.

But Verrill was not the only person to examine the tissue specimens sent by Dr. Webb. At the National Museum Professor Frederic Augustus Lucas, who specialized in the sciences of anatomy and palaeontology, had examined the tissues and written in the March 8th issue of Science, "Professor Verrill would be justified in making a much more emphatic statement than that the structure of the masses of integument from the 'Florida monster' resembles blubber, and the creature was probably related to the whales. The substance looks like blubber, and smells like blubber and it is blubber, nothing more nor less. There would seem to be no better reason for supposing that it was in the form of a 'baglike structure' than for supposing that stumps of arms were present. The imaginative eye of the average untrained observer can see much more than is visible to anyone else."

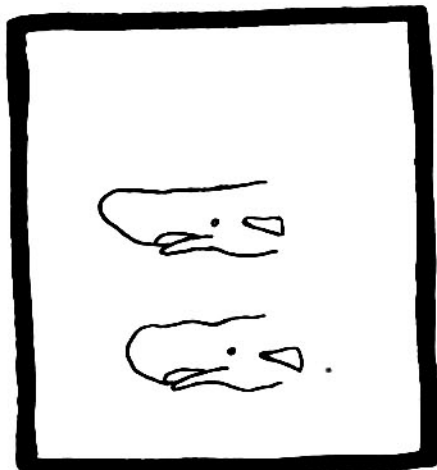
The last sentence is an undue remark towards Dr. Webb and the many others who had personally examined the carcass, for Dr. Webb had shown himself to be an accurate observer.

Also published in this same issue of the 19th was a much longer and more detailed letter written by Verrill on the 12th. "I have made additional studies of the specimens received, which confirm the cetacean affinities more definitely. The extreme firmness and toughness of the thick elastic masses of integument show that the structure must have been intended for resistance to blows and to great pressure, and could not have pertained to any part of an animal where mobility is necessary. They are composed of a complex of strong elastic connective tissue fibers, like those of cetaceans. There are no muscular fibers present in any parts sent. This lack of muscular tissue and the resistant of the integument are sufficient to show that the creature could not have been a cephalopod, for in that group a highly contractile muscular tissue is essential."

"The structure found is closer to that of the integument of the upper part of the head and nose of a sperm whale than to that of any other structures known to me. It is probable, therefore that the great bag-shaped mass represents nearly the whole upper part of the head of such a creature."

Verrill put forward his sperm whale nose





Bottom: Normal nose of the sperm whale.  
Top: Abnormal nose to account for the shape of the Florida mass, as proposed by Prof. Verrill. Drawn by the author.

theory, though he had reservations, to account for the mass. Verrill's theory that the mass may have been attached to the skull of a sperm whale which had developed an abnormal or diseased nose, though he himself could not account for the shape of the mass, described as a huge, round, closed end which was supposed to represent the nose, but is unlike the head of the sperm whale. No blowhole was described and the internal cavity was unlike that of the sperm whale.

Dr. Webb received the news that his discovery could not have been an octopus, but a whale, identified by experts several thousand miles away and his last known letter was written on March 17. "As you already know Prof. Verrill now says our strange animal cannot be a cephalopod and that he cannot say to what animal it belongs. I do not see how it can be any part of a cetacean as Prof. V. says you suggest. It is simply a great bag and I do not see how it could have been any part of a whale."

"Now that I have had it brought six miles up the beach it is out of the way of the tide and the drifting sand and will have a chance to cure or dry up somewhat. If it were not for the soft mass of the viscera which was so difficult to remove that we left it there would be but little odor. As it is there is no great amount."

"Where can I purchase the Formaldehyde for this by the dozen?"

This is the last known letter to Dall, who ended his involvement in this controversy.

Prof. Verrill also ended his involvement by writing the final two retractions that refuted the octopus identification in the April issues of the *American Journal of Science* and the *American Naturalist*. Verrill retracted his previous statement in the *American Journal of Science* that the carcass was identified as that of a giant octopus. Though, in a footnote, other zoologists who had examined the Decem-

ber photographs, and several of whom had also examined the samples of tissue, still believed that the creature may belong to some unknown genus of Cephalopoda allied to the octopus. Of the integument, Verrill writes, "Some large irregular canals permeate the inner and less dense portions of the thick masses. These may have contained blood vessels originally. From the inner surface of some of the pieces large cords of elastic fibers proceed inward. These now hang loosely from the masses of integument. Dr. Webb states that they were found attached on all sides to a long saccular organ which occupied most of the central cavity of the great mass." Whalers, Verrill states briefly, could not recognize it as any part of a whale.

In the *American Naturalist* Verrill formally retracted his octopus identification and presented his sperm whale nose explanation. Re-counting the facts of the carcass, Verrill concluded that the mass had originally come from the nose of a sperm whale which had its original form changed by mutilation. Photographs taken of the underside of the thicker region had shown an irregular roughness extending forward, but not quite to the end. This may have been where it was attached to the skull of the whale, or it is most probable roughness caused by abrasion. Included with his article were two illustrations based upon photographs taken December 7, drawn by his son, A. Hyatt Verrill.

Verrill, in his final retraction, writes, "That it came from the head of a creature like a sperm whale in structure is the only one that seems plausible from the facts now ascertained." And there the interest of Prof. Verrill ended.

But the interest in this Florida monster was not solely in America. Two British publications had reprinted several of the Verrill articles, *The Annual* and *The Magazine of Natural History and Natural Science*, the latter in its May issue. In wry British wit, *Natural Science* noted, "Octopus giganteus Verrill turns out to be nothing more than a mass of blubber, probably from the head of some huge cetacean. The moral of this one is that one should not attempt to describe specimens stranded on the coast of Florida, while sitting in one's study in Connecticut."

This is the only printed ridicule that Verrill received and it is doubtful that Verrill retracted his octopus identifications because of criticism from other zoologists, for, as noted, other zoologists still thought it may have been an unknown cephalopod. It is far more likely that Verrill retracted his statements upon examination of the preserved tissue specimens and came to the conclusion that there was simply not enough evidence as to support the octopus identification and Verrill, embarrassingly, could not tell what animal it could have come from.

Twenty years later, in 1916, A. Hyatt Verrill writes a brief passage of this unknown mass found on the Florida coast. "Specimens

were sent to Prof. Verrill, but on examination it was a very different creature than the unknown cuttlefish as it was assumed to be", Hyatt ends that no scientist could guess as to what animal it came from. This contradicts what was published by Verrill and Lucas, who identified it as coming from some type of whale. Hyatt does not refer to the fact that he drew the illustrations of this monster, nor of the newspaper article that praised his father, who was still alive. The question arises as to why Hyatt would write this passage in this manner? Either Hyatt, who definitely knew the facts of this incident, included this passage to liven his chapter on unknown animals of the seas, or that Prof. Verrill still after this passage of time could not identify the animal from which the mass originated.

As to the fate of the remains of the Florida monster, they were taken the six miles to the railroad terminal on the beach and enclosed by a fence to protect it from drifting sands. What happened thereafter remains unknown to me.

As to the preserved specimens of tissue at Yale, in 1911 the old Peabody Museum was being replaced and the collections were stored at fifteen different locations. The best answer as to the ultimate fate of these tissue specimens was written by Willard D. Hartman, Curator of Invertebrate Zoology of the Peabody Museum of Yale University, "I do not know the reasons for the disappearance of the specimen of the monster at the Peabody Museum. To my knowledge it had already been lost when I was a student here in the early 1940's. There was a period of 15 years between the time that the old Museum was torn down in 1911 and the new one built in 1926 ... many specimens were lost during this period. Perhaps the 'sea monster' was among them."

Aside from the brief mention by Hyatt Verrill in 1916, the history of this mass remained forgotten until 1931 when Mr. Charles Hoy Fort, a collector of anomalies, wrote a brief passage of this sea monster, among others, in his book, *Lo!* This small reference kept the matter from being obscured throughout the years, though it was consigned to other reports of sea monsters being washed ashore. The latest reference, in 1970, by John A. Keel, also a collector of anomalies, is a small note referring to this incident.

But no other serious research occurred during these years until 1957. In that year Dr. Forrest G. Wood, Jr., then Director of Exhibits and Curator of the Research Laboratories of Marine-land, Florida, came upon a yellowed newspaper clipping while searching for some notes on octopus behavior. This brief clipping told of the giant octopus found on a nearby St. Augustine beach and aroused Dr. Wood's interest and he began a personal project to investigate the reported find. By 1962 Dr. Wood had completed his acquisition of the available information of the beached creature and had also learned that the preserved tissue specimens were still in existence at the Smithsonian

Institution. After several inquiries to the Curator of Mollusks at the Smithsonian, Dr. Wood succeeded in acquiring permission for Dr. Joseph F. Gennaro, Jr., in 1963, to examine and cut away a small piece of the preserved tissues for examination and the possible correct identification of the animal from which the specimen came.

Unfortunately, shortly after Dr. Gennaro examination the container holding the pieces of the octopus was misplaced and lost during a move at the Smithsonian, suffering an identical fate to the Yale specimens some 50 years previously.

Dr. Gennaro had prepared for histological examination the tissue of the Florida creature, along with control specimens of the squid and octopus. Under normal microscopic examination of the slide of the Florida creature, no identifiable cellular arrangement was observed, but neither was any such feature visible in the squid or octopus slides used as controls. What was observed was the distributed patterns of the connective tissue. By using polarized light and comparing the connective tissue pattern of the Florida creature to the control slides of the squids and octopus. Dr. Gennaro was able to conclude that the Florida creature slide was similar to the octopus slide, had no similarities to the connective tissue of the squid and absolutely no structure pattern similar to the mammals (including the cetaceans). This eliminated the possibility that the mass had originated from the head of a whale as proposed by Verrill. The verdict was that the tissue had come from an octopus!

In 1971 the accumulation of fourteen years of research was published as a three-part article "An Octopus Trilogy", co-authored by Dr. Wood and Dr. Gennaro. The response by the readers of Natural History to this discovery that a great octopus existed and that others may still be living, was that the readers thought the article a hoax. No less than the prestigious Wall Street Journal had published a front page report of the response by the readers. It was the Editor's whimsical presentation of the findings that tended to give the story two interpretations and the one taken by the readers was that it was considered an April Fool joke.

The following issues of Natural History reinstated the belief of the readers that it was a hoax by the letters printed in the letters department. But this was the first article in 40 years that Natural History had published in a tongue-in-cheek manner. During the early 1930's two other articles dealing with unknown animals, sea serpents and the Loch Ness Monster were presented in an even more farcical manner.

Even the Ocean Citation Journal Index failed to correctly list the finding as an octopus, but rather as a giant squid.

The findings were, however, taken seriously by no less than Jacques Y. Cousteau in his book Octopus and Squid. Cousteau even added

to this controversy by recounting the reports of fishermen sighting a creature like a squid in the region between Florida and the Bahamas. The author even mentioned that an expedition was formed to photograph the creature and that pictures were taken at 300 and 600 feet and had shown an undefinable stretch of brown flesh.

The question arises as to why should this discovery be met with hostility and ridicule? Perhaps the thought that a truly giant monster of the deep existed had shaken the beliefs of what should or should not exist in the oceans and it is easier to ridicule than to revise one's opinion. For no one had simply taken the time and effort to reevaluate the data and findings of Drs. Wood and Gennaro.

In the spring of 1972 I was a student at the University of New Haven and decided to use the giant octopus as the theme of my written thesis for my biology major. I decided to choose this subject since Prof. Verrill was of Yale University, only a few miles from my own school and I assumed that I could easily acquire all the original references in a few months; the few months took nearly three years!

I started my research at the Kline Science Library with the scientific periodicals and, at a later date, to the Yale Sterling Library to locate the newspaper articles. Research was done at the New Haven Historical Society on Prof. Verrill's life and later research on the life of Dr. Webb was done at the St. Augustine Historical Society in Florida.

Writing Dr. Wood in the early part of December of that year, I had received a reply suggesting that I check more carefully in the references given in his article. An apology is due to Dr. Wood, for it was several weeks later that I learned of the criticism that he received and my letter was too short and not specific.

That same month I also received, from Dr. Gennaro, a copy of a forth-coming article for Argosy magazine, containing the latest work that he had done. Argosy magazine, under the guidance of the Science Editor, the late Ivan T. Sanderson, a noted zoologist and famed naturalist, had a policy for several years of presenting articles of unknown animals. Unfortunately, I learned too late that Mr. Sanderson had died that same month and inquiries to the society containing his archives told me that he had left no notes on the octopus.

Though Dr. Gennaro's article was presented in a layman's form it did contain one major fact that was not presented in his original article for Natural History, as the work had not been completed until some time after the original article appeared. This was the analysis of the last remaining piece of the octopus that was in Gennaro's possession. Dr. Gennaro states, "the chemical constituents of the monster's collagen were of the type found in the octopus, and that none of this type of tissue

exist in the squid at all."

With this single piece of evidence it cannot now be disputed that the carcass was that of an octopus. Doubt can be placed upon the statements made by Dr. Webb in 1897; doubt can be placed upon the examination of the tissues by Verrill and Lucas; doubt can even be placed upon the histological analysis done previously by Gennaro; but doubt CAN NOT be placed upon this collagen analysis.

On March 17, 1974 I met, though too briefly, Dr. Wood, as he was guest lecturer at Mystic Marinelife Aquarium in Mystic, Connecticut. I explained to Dr. Wood that I was unable to acquire the final references to complete my research. He suggested that I write to him as, unfortunately, he was pressed for time at the moment. He later generously supplied me with the references and answers to questions that I put to him.

I had confirmed all of the references that were quoted in the Natural History article, plus references that Dr. Wood did not list, or know about, thus refuting the criticism that the article was very imaginative and based on fantasy and few facts.

But, if we disregard the history of this single animal, just what do we know about these giant octopuses? That one did exist in 1896 and that the size, based upon its mutilated remains, would indicate an overall length of about 100 feet, is all that is known. Any other statements concerning these animals would be speculation based upon second hand facts, but without speculation there can not be a reference point to begin with.

As to the regions where these animals may live, Dr. Wood relates in Natural History of reports of these octopuses being sighted in deep waters, in depths of 600 feet, at Andros Island and at Grand Bahama Island in the Bahamas. Prof. Verrill speculated that these animals may live off the southern coast of North America, in depths to two hundred fathoms. (Dr. Wood did not know of the February 14th newspaper article by Verrill and Verrill's opinion of where these creatures may live. Author.) The Florida Current which flows from the tip of Florida to Cape Hatteras, North Carolina, may have carried, if these animals are only native to the Bahamas, the dead carcass that was washed ashore in Florida. Or these animals, in addition to living in the Bahamas region, may be living in the coastal area of the Florida Current, giving a wider habitat range.

There is also a report of a possible Pacific species of the Octopus giganteus. In the vicinity of the island of Chiloe off the Chilean coast, latitude of 42 degrees South, a reported fight of a 50-foot sperm whale with an octopus whose 30-foot tentacles were around the whale's head, while the whale was eating two of the tentacles. Though not a third of the size of the

Continued on page 51.

## The Sponge - A Many-celled Animals

By NORMA CARLSON\*

Typical features which distinguish animals are: mouths, stomachs, body cavities, nervous systems, coordinated means of locomotion and sight - but not so the lowly sponges. Each cell of a sponge feeds itself with a tiny whisker-like cilia, by a constant stirring of the water. The sponge live like an animated filter, straining out the minute organisms contained in the stream of water that passes constantly through the body. Water, at all times, enters through microscopic pores that riddle the entire surface. This Phylum of animals has been named Porifera or "pore-bearers".

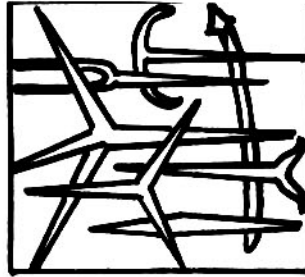
For ages sponges were described as animals, plants, both animal and plant, and even an unliving substance excreted by the many living animals that live within the cavities of the sponges. Aristotle was the first to point out that a sponge was not a plant. They were then believed to be one-celled animals. Later it was decided that sponges were individuals with cells of different kinds with certain functions to do.

The sponge, as you see it, is only a skeleton or framework of the living animal. The entire surface is covered with a thin slimy skin, usually black when living in shallow tropical seas - the pigment serving as protection against the intense light. In sheltered places, on reefs and under rocks, they may be red, green, yellow, or even blue. However, color seems to mean nothing.

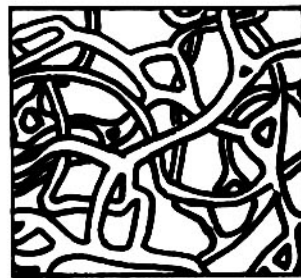
The organic part of the sponge is a soft, jelly-like substance composed of three layers - the external (ectoderm), the internal (endoderm) and the middle (mesoderm). The endoderm has cylindrical cells, each cell with a flagellate hair. The ectoderm is composed of flat cells. The cells of the mesoderm or main mass of the body, have various functions, such as framework construction, digestion and reproduction.

The framework secreted by the mesoderm may be horny, silicious, or calcareous, or a combination of the first two substances, according to the genera. The old fashion bath sponge is a horny sponge, composed of fine flexible fibers called spongin. The best of these come from the Mediterranean and off the coast of Florida and in the Bahamas - having been taken in the latter two since 1849. Five species of commercial sponges are taken from Florida's waters. They are graded in order of their importance as: "sheepswool", "yellow", "grass", "velvet" and "glove".

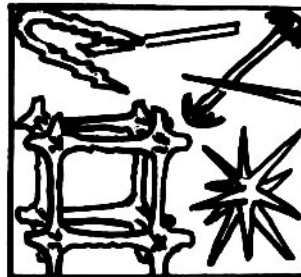
Most sponge fishing is done from small boats, with usually two people to the boat. One sculls while the other, using a glass-bottom bucket, scans the bottom. The sponges are dragged up by a long pole with an attached



Spicules from a calcareous sponge



Fibers of a horny sponge



Spicules from a silicious sponge

hook - in water three to twenty feet deep, seldom over thirty feet. The sponges are "killed" by being exposed to the elements for several days. They are placed in "crawls" or pens, where the action of the waves washes them. After a week, if clean, they are dried, sorted, strung on cords, pressed and baled for shipment. The wool sponge, *Spongia gossypina*, of Florida, attains, under favorable conditions, a weight of one-tenth of a pound in six months and reaches a size of commercial value in one year.

Propagation of sponges has proven successful. The living sponge is cut into pieces and the cuttings are fastened securely to small rocks and replaced in shallow water. Sponge fishing is on the decline.

(drawings by the author)

In other species of sponges the spongin is intermingled with spicules of silica, or of carbonate of lime, in various shapes. The curious "Venus Flower-basket" or the "Glass Rope Sponge" have frameworks composed of silicious spicules alone. These sponges are found in the Philippines and Japan.

The spicules are many shapes: some rod like, knobbed, three-pointed, six-pointed, anchor-like; and are a feature in the classification of sponges. The spicules from a framework to support the soft cellular mass, keeps the canals from collapsing and enables the sponge to grow to a considerable size.

The sea floor is the home of sponges, from the intertidal regions to the greatest depth. On rocky shores, from the low tide level, almost every rock will house encrusting sponges on its underside. Rock walls will be covered with sponges where the sea waves keep them wet. Wharf piling and submerged structures are usually encrusted with sponges. Larger, tubular or finger-like branching sponges live in quiet waters, often attached to pilings. The largest sponges are the "logger-heads". They live anchored in sand in shallow water along the Florida Keys and southward.

Sponges are differently shaped for various natural reasons. Vase-shaped, only possible in sheltered water, otherwise the sponge would be easily dislodged. A flat, encrusting shape will be found wherever there is wave action - having an area of attachment and nothing opposed to the waves and current. Then there are the branching and finger-like sponges in sheltered areas on pilings and rocks, below low tide level. Sponges can be cake-shaped, tubular, palmate, cup-shaped, vase or hat-shaped, conical, spherical, uniformly horizontal or vertical.

Sponges reproduce by eggs formed in the mesoderm. The eggs escape as ciliated spheres and swim about until they find a place on which to attach themselves. They grow and mature quickly after becoming fixed in place. Some sponges may live for a year or less. The large slow growing "loggerhead" may live to be twenty to fifty years old.

Sponges have few enemies. The spicules of calcareous and glass sponges make them inedible to most animals and the disagreeable odor is extremely offensive to most humans.

The ancient Greeks used sponges for cleaning and bathing and for padding helmets and leg armor. The Romans used them for paint brushes, mops and substitutes for drinking vessels. Before synthetics and man-made sponges, the sponge industry produced, every year, over one-thousand tons of sponges.



The cavities, inside a sponge, offer ideal shelter to many small animals. Although narrow and dark, the tunnels or canals are always well supplied with a stream of clean water containing microscopic food organisms. Small crustaceans and worms are the commonest dwellers. Brittle stars wander in and out in search of worms and small crustaceans. The dark, bulky, massive and inert "loggerhead" sponge shows no sign of life to the casual passer-by, unless he should see the deliberate closing of some of the round openings that penetrate the flat upper surface. One permanent lodger in the "loggerhead" is a small shrimp. Wandering in and out of the passageways, they scrape food from the walls of the sponge. As they creep along they carry their antennae and large claws before them, probably hoping not to meet a larger creature. Other shrimp, amphipods, worms, isopods and their like may number into the thousands if the sponge is large. This small, amber-colored shrimp, *Synalpheus brooksi*, the pistol or snapping shrimp, can be heard distinctly, knocking and hammering, by snapping his large claw. Many times I have come across a "loggerhead" sponge, *Spherospongia vesparia*, that had suffered a huge gash made by an outboard motor's prop (such boats have no business running in such shallow water) and have been amazed at the life within the sponge. Mantis shrimp, *Squilla empusa*, were there in all colors and sizes up to four inches - a bonanza for the salt water squarist.

The sulphur-yellow boring sponge, *Cliona celata*, found on both Atlantic and Pacific coasts, covers shells and rocks like a fungus. It forms thick irregular crusts several inches in diameter. Boring sponges are the chief agents in the disintegration of shells that accumulate on the sea floor and responsible for much of the conversion to shell gravel and, finally, to shell sand. When the boring sponge lives on shells, it spreads over both surfaces, forming little burrows and eventually penetrating the shell in every direction, honeycombing and completely destroying it by absorption. Sometimes it settles on living shells and greatly irritates the animal, which constantly secretes new shell matter to cover the perforations.

Another sponge, *Suberites compacta*, grows in sandy or muddy shallow pools along the Carolina coast of the eastern United States. It has a fine texture, but is firm and compact, with a smooth surface and is colored yellow.

A very fragile, little calcareous sponge lives here and there amongst the seaweeds. They are masses of tiny, vase-like tubes, only a half-inch high and is named *Leucosolenia botryoides*. *Grantia ciliata* is a small urn or oval-shaped sponge with a wide opening at the top - surrounded by projecting spicules, occurring in the same places.

The pale green or yellow-green "crumb of bread" sponge, *Halichondria panicea*, lies flat and almost paper-thin on rocks facing the sea. In deeper water and in the rock pools it builds up thickened masses, with a cone and

crater structure. Brittle stars hunt food in this sponge.

Tetilla is a glass sponge living in the soft mud flats in bay areas along the coast of southern California, anchoring in the mud by means of root-like holdings composed of spicules.

A bright red incrustation on shells and stones is *Microciona prolifera*. As it grows larger it forms irregular lobes and tubular prominences. When fully developed it had many forking branches. The branches are somewhat flattened and palmate at the ends. It grows in clusters six inches in diameter, of a dark orange-red color. When dry it is gray-green, brittle and bristly.

The finger-shaped sponge, *Chalinopsilla oculata*, has a thick stem, more or less flattened, dividing into branches which vary in form and thickness, finger-like with some compound lobes. The undulating surface is smooth, texture rather hard but delicate, color when living a dull orange-red, fading to white when dead, found in shallow water.

*C. arbuscula* is similar to *C. oculata*, but more delicate, slender branches six to eight inches high and as wide. Color is buff or gray when living, and yellowish-white when free of animal matter.

*Mircinia campana*, a species that varies greatly in form, has some varieties with branches, but commonly known as the "hat" sponge or "vase" sponge. It is found in the Atlantic along the Florida Keys, in water four to forty feet deep. The spiny lobster hides under it and *Cypraea cervus* can often be found "huddled" close to its base. When living the color is brownish-black and remains dark brown when dried. They make excellent planters, when properly cured, for plants and ferns, and "old time Conchs" of the Keys used them for hats.

The velvet sponge, *Spongia meandriiformis*, has a surface like a protruding flattened cushion of fiber which resembles the convolutions of a brain coral. Sometimes these cushions extend into long, pencil-like structures. The oscula or craters are large and ragged on the edges. It grows to seven or eight inches with an irregular shape.

*Spongia tubulifera* is one of the commercial sponges and is known as the "glove" sponge. It is of least market value, having inferior elasticity, becoming brittle with age. However, the Mediterranean sponge of the same genus, *S. adriatica*, is of the finest quality and greatest value. *S. tubulifera* grows on rocky bottoms in shallow water on the east coast of Florida to an average height of five to six inches. The surface is covered with fine tufts and free from ridges. There are small apertures on the sides and one or more oscula on the top. The living color is black and the form variable.

\*Leisure City, Florida

The first-grade commercial sponge is *Spongia gossypina*, or "sheepswool" sponge. It has an irregular shaggy surface, covered with tufts, largest oscula in the depressions. Sometimes the structure is dense with few openings and small ones between the tufts. Living, the color is black. Although coarser than the best Mediterranean sponges, it is more durable and quite as elastic.

The "yellow" sponge, *Spongia elastica agaricina*, is the second-grade of commercial sponges. It is found growing with "sheepswool" in a depth of two to twenty feet. It is common, massive and cake-shaped. The entire surface is covered with a network of small, fine, cones.

The third commercial grade sponge is *Spongia graminea*. It carries the trade name of "grass" sponge. The shape is cone-like with either a flat or a funnel-shaped top. The oscula are on the upper surface. The sides are fluted with deep furrows which contain the small incurrent apertures.

Sponges bridge the eons of time. Those living today are little different from the first sponges that spread across ancient rocks and fed from the primordial sea. Sponges existed 300 million years ago, before the first fossil period. All that remains when the living tissue is gone are hard little spicules, these are found in the first fossil-bearing rocks of the Cambrian Period.

## SEA SHELL MOBILES

Continued from page 54

hold the shell firmly and apply the bit gently. As you drill you will get the "feel" of the hardness of the shell and will know how much pressure to apply. You must always be careful as thin shells will break with too much pressure and your drill can break the more sturdy shells. It would, therefore, be worthwhile to practice with a few shells that you don't care about. As you string the shells always tie each securely, two knots are necessary to avoid slippage, especially when using fishing line. To hang this mobile either tie a leather strap or a rope to the driftwood. This must be done first so that the mobile is made while hanging. If your piece of driftwood is such that you do not want holes drilled in it, you can just tie the strands securely.

Another idea - for that breezy spot - is to use one type of shell only, such as small oyster or scallop shells. By placing the strands and the shells close together the shells will touch slightly and the wind will cause movement, producing a very pleasant tone.

So, when you've been on a vacation and picked up an interesting piece of driftwood, plus all of the shells you could find, none of them good enough for your collection, and you're now wondering what to do with these treasures -- make a mobile. Each time you pass it as it hangs in, or outside, your home, you'll remember the good times you had.



## Incidents of a Shell Collecting Trip to Egypt and Abyssinia in 1870-1871

by Carl Friedrich Jickeli

Translated by MORRIS K. JACOBSON

CONTINUED FROM LAST ISSUE

Toward the end of November I traveled to Cairo. Mr. Pleimes had promised to be my provisions and have them sent to me in Cairo. I spent the first few days in Cairo visiting people to whom I delivered my letters of recommendation. I did not feel very much encouraged about my projected trip and could not look for much help from the government of Egypt. But the Austrian consul, who had come to Cairo from Alexandria for a few days, urged me to go and see Nubar Pasha, the Foreign Minister, since the consulate had commended me highly to him. I paid the minister a visit the same day, but I didn't have much hope of getting what I wanted; I felt I did it for politeness sake. I didn't expect to gain anything. He received me most graciously, and he promised to do everything he could for me. He told me by what date I could expect an answer from him. I had asked for a letter to the representatives of the Egyptian government in places I planned to visit, and for a ticket at reduced fares on the Egyptian Red Sea steamers.

Several days passed and I did no collecting. When I did finally take a trip to the Mokattam Hills, I didn't find a single specimen and I had no better luck on several trips up and down the banks of the Nile Canal. The heavy traffic here proved to be too much for molluscan life. At last I managed to find some *Helix obstructa* and *H. acuta* near a tree in the French colony at Masarieh. The King had presented this tree to the former Empress of France when she attended the celebrations at the opening of the Suez Canal in Egypt. It took me an hour by train to get to Masarieh.

Next day I found my first Nile snails in ponds on the left bank of the Nile. These were *Isidora* which I had already found in Cairo, but they were larger and more beautiful. Up to now I had not traveled up or down the Nile far enough to find undisturbed localities. Therefore I decided to spend an entire day on an excursion to such a spot. I hoped to find mollusks in some sloughs and ponds, or to get some bivalve shells which had been deposited by high water on the flat banks of the river.

I started out early on donkey-back from Cairo and traveled for more than an hour along the Schubra Promenade which is shaded on both sides by splendid sycamore trees. When the Promenade ended, I sent the donkey back. I turned to the left and climbed down about 50 paces to a spot on the banks of the Nile where it makes a sharp bend. I expected to find many bivalve shells on the flat shore.

But I had barely taken 15 steps on the muddy surface when I began to sink in a most distressing manner. I freed myself with much dif-

ficulty and walked back to the promenade where I began to clean the mud off my boots. The Arab passerby said, "Hawadje museir!" (Poor man!) and smiled broadly. But no real naturalist is ever troubled by such things. The muddy surface could probably have carried the swift, light footed Arabs but not the sturdy Austrian in heavy boots.

I walked further. In a short while I reached a ditch running along the Nile. It was separated from the main river by a dam and seemed to consist only of water which had trickled in from the Nile. The shores were high and steep, but I was able to walk comfortably at the edge of the water. I used my net a great deal, but in vain. All I pulled up was mud and stones. An hour and a half later, moving down the ditch where the bottom had become sandy, I finally managed to haul a living *Cyrena* from the water

and a second dip of the net brought up an even larger specimen. Full of excitement I waded into the water and began to grope around wildly with my hands; this turned out to be a more successful method than the net. But soon this improved method gave way for even a better one. I began to look carefully into the water and soon spied the mollusks resting comfortably in the sand, their shells half opened and the anterior end obliquely pointing upward. In about an hour I managed to accumulate a few hundred specimens of at least two species of *Cyrena*, one of which I believe to be *C. radiata* Phil. as well as three young unionids. In exchange for some generous bakshis I got two Bedouins to help me. I now left the ditch and tried a few nearby pools but I had no luck. On the way back to Cairo I spent two or three hours searching for land shells in fields on both sides of the promenade. But I found only a few beetles and spi-



1. Alexandria; 2. Cairo; 3. Suez; 4. Kosseir (Quseir); 5. Yenbo; 6. Medina; 7. Djedda (Jidda); 8. Mecca; 9. Suakin; 10. Massawa (Massua); 11. Asmara; 12. Dahlak Island. Map drawn by Morris K. Jacobson.

ders. By now it had become quite dark and I hurried back to the city.

I now had to get busy preparing for my trip south. The steamer left Suez for Massaua (Massawa) only once every two weeks and it was scheduled to leave on December 19. I had no time to go collecting.

By now I had given up my plan to travel up the Nile from Cairo to Keneh and from there to Kosseir on the sea. I could not find a boat to take me on as a passenger to Kosseir. It would have cost me as much to rent a rowboat to get there as the fare to Massaua itself. Besides, if I went on to Massaua, I would find myself in a place where very little collecting had been done. From Massaua I could also take a short trip by land to Abyssinia and Bogos. In Kosseir, on the other hand, I would be in an area where Dr. Klunzinger had been collecting for many years and where he planned to continue collecting for a long time to come.

There was another reason for my preferring Massaua to Kosseir. In Cairo I had become acquainted with a Swiss gentleman who planned to take the December 19 boat from Suez for business reasons. Thus I would have pleasant company on the trip. I wrote to Mr. Pleimes in Alexandria asking him to buy the supplies I had requested and to send them on to Cairo. Three days later they arrived. I bought a few more things in Cairo and then packed up everything for the trip. I made a small bundle of the supplies I would need on the voyage to Massaua. Everything else was packed in large, solid containers. My supplies consisted of the following: sugar, tea, meat extract, macaroni, parmesan cheese, beans, salt, vinegar (the last two I planned to use only on the Nile), cognac, aquavit, red wine, tobacco, cigars, matches, powder, bird shot, bullets, cord, string, and wire tacks. In addition I had the following tools which I had brought along from Austria: an ax, a door bolt, screws and locks (in case I could not find a room which I could lock), candles, fish hooks, soap, cooking ware consisting of a pot with a handle, a meat roaster, a coffee pot, cups, a grater, spoons, knives and forks, and two plates. My clothing consisted of light but strong suits and silken and woolen shirts. I also had a few pair of light half boots and a pair of high rubber boots. For trips to coral reefs I took along a pair of strong hobnailed boots. My medical supplies, which had been assembled by the German drug-gist Herr Sommer on instructions by Dr. Riel, consisted of a few bottles of castor oil, ammonia, eye wash, sticking plaster, healing plaster, laxitive powder, hismith powder, and sodium bicarbonate. I also brought along a good supply of quinine, cholera drops, citric acid, and a pair of blue eye glasses in case of eye trouble. My entire baggage, including the supplies I previously described and a small case of alcohol, was brought to the train in Cairo on the 16th for transport to Suez. But since I myself had to arrange for the transportation, I paid  $2\frac{1}{2}$  times as much as I paid for the trip from Alexandria to Cairo.

I planned to leave Cairo on the 17th for Suez. By noon of the 16th I still had not heard from His Excellency Nubar Pasha. He had asked me a number of times to call on him but had always dismissed me without any definite answer. Therefore I informed one of his secretaries, Mr. Remy Bersenkovich, that I would have to get along without any favors from him; I was to leave the next day for Suez and could wait no longer. Mr. B. was good enough to take a personal interest in my problems and that same evening I received a document from His Excellency allowing me, as a young German scholar, to ride first class in a Red Sea steamer without charge. The agent in Suez had been informed by telegram that I would soon arrive and he was instructed to introduce me to the various governors of the Red Sea coast.

We arrived in Suez at 7 o'clock and went to the Hotel Suez, a good but expensive place.

The morning of the 18th I called on the agent of the Medjidi; but it took some time before he recognized me as the German traveler he had been expecting. I was only 20 years old and I seemed to be too young for such an important title. Finally he accepted my letters of introduction. But he made every acquaintance of his who showed up and who knew some French and Arabic -- he himself knew only the word "musje" (i.e. monsieur) -- translate the French letter for him while I wasn't looking.

At noon the next day I was notified by a messenger from the agent that the small local steamer was ready to sail. These ships were anchored far outside the harbor. When we boarded we found about 500 pilgrims on their way to Mecca. They were to sail on the steamer as far as Yambo or Djedda. The governor of Mecca was also on board, and since he had to have all the first class cabins for his dozen wives and half dozen followers, the captain had to give up his own quarters to me.

No food was provided on Egyptian Red Sea steamers. Each passenger had to provide his own food, for an extra bakshis one could even get the ship's cook to prepare the food, or one could dine with the engineers who were usually English. Here, for the moderate price of 5 francs one could get some excellent food. But one had to promise to notify those gentlemen one day ahead of time before disembarking. In this way the engineers would not prepare too much food for the next day. I did not know anything about all this and therefore I hastily bought some more provisions before the steamer left.

I put the shelves in the captain's cabin to good use. They had never been filled with the books and instruments for which they had been installed originally. Now I stowed my food there consisting of cheese, sardines, oranges, sugar, bread, radishes, and a few bottles of beer.

The steamer Hedjas was supposed to weigh anchor at 4 PM, but at the request of the gov-

ernor we were under way an hour earlier. My first job on board was to clean some mollusks which I had collected in Suez. Next morning we were still in sight of mountain chains on both sides of the waterway; we had not yet left the Gulf of Suez. Our cabin was very warm and damp, the temperature hovering about 25 degrees R. This did not do my drying specimens any good.

On December 21, when I awoke, we were on the open sea. We sailed directly south until noon of the 22nd, then we veered southeast. We approached the Arabian coast and dropped anchor near Yambo, the harbor of Medina. We stopped here to deliver the mail and to land about 150 of the pilgrims who planned to go from Yambo via Medina to Mecca by caravan. But the Beduins had surrounded Yambo and allowed no one to leave. They were continually firing their guns in the air with much glee to show their scorn for the viceregal steamer and for the governor of Mecca himself. Hence the pilgrims had to stay on board and sail on to Djedda. They were also compelled to make up the difference in the fare. The shipowners in Suez knew that no one could land in Yambo, but they kept this from the passengers. Thus they were able to collect some more money from the unfortunate pilgrims.

Accompanied by a tough sailor, I and my Swiss companion went ashore. We both carried pistols. I found it impossible to go beyond the limits of the city, and even in the streets youngsters assailed us with all sorts of curses. In Yambo we bought some onions and dates.

We weighed anchor on the 22nd of December and as soon as we reached the open sea, we sailed southsoutheast. We followed this course on the 23rd and most of the morning of the 24th. Then we turned to the east toward the Arabian coast and anchored at noon about one half hour away from Djedda. The harbor is frequently blocked by sand and hence ships have to anchor some distance away.

A European ship agent, who was living in Djedda, welcomed my companion. They had met previously for business purposes and the agent invited us to be his guests as long as the ship was in port. We were glad to do this because there are no hotels in Djedda which accept Christian guests. I hope that a malacologist will one day decide to spend some time in Djedda. I am sure that there are many interesting things living on the coral reefs which lie near the city. The reefs are occasionally interrupted by sandy flats covered with seagrasses. In a little bag of beach sand which I took there, I found large numbers of tiny snails like *Bulla*, *Eulima*, *Rissoa*, *Chemnitzia*, *Odostomia*, *Adeorbis*, etc. Our steamer was to stay in Djedda for a day and a half and then sail on to Massaua by way of Suakin. But since this was the period of Ramadan we stayed somewhat longer. In the meantime the steamer "Sagasick" bound from Suakin to Suez had to drop anchor in Djedda because it was short of coal. There was none to spare in Djedda; there-

fore our steamer gave enough fuel to the "Sagasick" to return to Suakin for a larger supply. Thus the ships merely changed their directions; our steamer returned to Suez and on the 29th we sailed on southward on board the "Sagasick".

We reached Suakin (1) in the evening of the 30th. Since the steamer was to stay there for an entire day, I hired a young native the next morning to guide us on a mollusk hunt. My traveling companion also expressed some interest in collecting during his stay in Suakin, but he did not persist very long.

Early next morning our black guide appeared with a kind of boat called a *hurris*. This was a long narrow boat made of very hard wood. When I returned from this excursion, I was informed that the Bey of Suakin had come on board with an invitation to visit the governor of Suakin who is also the governor of the Red Sea. Immediately after dinner we cleaned ourselves carefully and went to Governor Mundas Pasha. We were very warmly received and when I expressed my desire to travel inland, I was immediately told that horses would be furnished. Accompanied by the governor and his train, we inspected Mundas Pasha's cotton plantations and a large water basin which had been built to collect fresh water for irrigation. But I saw no mollusks. In the evening Mundas Pasha invited all the leading figures of the town to partake of a banquet prepared in the European fashion. We stayed with our extraordinarily hospitable host until 11 PM and answered many of his questions dealing with European affairs, in which he was intensely interested.

Back on board, I and my friend had a small New Year's celebration. At the governor's request our steamer stayed in Suakin for an additional day and at noon we paid another visit to His Excellency. We left him after thanking him warmly for all he had done for us.

We weighed anchor early on January 2, 1871. In addition to the usual pilot who accompanies each Red Sea ship during its entire trip, we also had another one. The trip from Suakin to Massaua - which takes most of the first two days - is extremely dangerous, and it requires careful steering by a pilot with special training. We made only slow progress because the coal we had loaded in Suakin was of poor quality and our motor was badly worn. Thus our engineer could not raise much steam. We encountered strong headwinds on January 3 and sailed only three English miles per hour. We were in danger of using up all our coal before reaching Massaua, and we had to drop anchor near the island of Thal alah essaghira. Here everybody from the captain down to the cabin boy spent all their time fishing. We finally reached Massaua late in the afternoon of January 6. The trip had taken us 19 days, including our stays in Yambo, Djedda, and Suakin.

(1) The city of Suakin is now completely deserted as the result of coral growths which closed off the harbor. A recent TV show had striking pictures of this situation. (mkj)



We were warmly received in Massaua by two Germans, one of whom invited me to be his guest during my stay there. I spent the first night on board because of my baggage. My host arrived on board early the next day and arranged to have all my belongings transferred to his home. That same day I had the honor of being introduced to Herr Werner Munzinger. He welcomed me warmly and was good enough to offer to help me in any way he could. In the course of this narrative I will have the opportunity of showing how well he kept his word and to express my deep gratitude to him.

I planned to be quite systematic on my collecting expeditions. First I decided to hire two porters and a boat. My regular collecting would begin only after I had made some cursory inspection trips to seek out the places that looked most favorable. In this I followed the advice of Mr. Weinkauff who sent me detailed instructions for collecting when I lived in Hermannstadt and who gave me more suggestions when I visited him in Kreuznach. By reading this, Mr. Weinkauff can see that I had indeed learned a great deal from him.

The word "bukra" (tomorrow) is the usual way of handling an unpleasant task in the Orient. Such tasks are always postponed till the next day. But it also turned out to be a tremendous obstacle when one is in a hurry. Patience is the greatest virtue for every traveler in the Orient. Unfortunately I had not learned this very well. I was burning with eagerness to begin collecting -- for the first time in my life -- in the lush richness of tropic seas. It was difficult to be patient with the slow, lazy efforts of the boatsmen who were in no great hurry to deliver the boats they had promised. Finally I could wait no longer.

(Photograph courtesy Dr. Adolf Zilch of Senckenberg Museum, Frankfurt, Germany)

As the tide began to fall, I armed myself with bottles, boxes, a hammer and bags and walked toward Ras Metter, the eastern point of the island of Massawa. The rocky shore was quite steep. From it a coral reef reached far out into the sea. The waves had gnawed at the base of the shore undercutting it so that every once in a while it collapses and large boulders fall onto the coral reef. But the area comprising the island changes only a little because what the sea destroys on one side, is replaced on the other by the causeways of coral which the inhabitants lay down as foundations for new houses.

With a single jump I landed on the coral reef. What a sight met my eyes! Boulders lying close to the shore were swarming with *Nerita albicilla*; hundreds of *N. polita* (*rumphii*) in all shades of red, yellow, brown, white, gray contrasted beautifully with the dark stones on which they rested; single specimens of large, handsomely banded *N. quadricolor* were scattered everywhere. Large colonies of *Littorina* lived in isolated places on the boulders. In quite shallow water I found *Conus arenatus* Brug., and *acuminatus* and here and there the banded *Conus taeniatus* Hws. In larger sandy-bottomed pools I collected *Pyrula paradisiaca* Martin, large *Trochus dentatus* Forsk., and splendid specimens of *Murex anguliferus*. On the underside of stones I found several types of *Cypraea*, including the dove-colored, brown-dotted *C. turdus* Lam., *camelopardalis* Perry with white spots on a brown background and several small *fimbriata* Gmelin with scarlet red animals. Under another rock I again found black *Ricinus mendicaria* Lam., with yellow bands, and neat little *Triphora* and *Rissoa*; when I picked up *Turbo chemnitzianus* Lam. they dropped the stones which were clinging to their foot and closed the aperture with a green calcareous operculum. I also collected single specimens of *Pleurotoma*, *Mitra rupelli* Reeve, *bovei* Kiener, together with large numbers of *Pollia rubiginosa* Reeve. The rocks which reached far into the water bore many 4 inch long chitons. I even found some bivalves on the rocky shore, including the handsome *Asaphis violascens*, *Modiola auriculata* Krauss and various species of *Arcacea*. I did not have enough eyes to see with or enough hands to pick up with; all my bottles, boxes, bags, and pockets were filled; some shells were even tucked inside the lining of my jacket. Only those who have had the same good luck can appreciate how happy I was when, at dusk, I returned from my first tropical collecting trip, loaded down with my precious spoils. For those people have also experienced the tremendous joy of collecting alive and in situ large numbers of the species of which we have only one or two shells in our collections, they will understand my joy.

After some time I succeeded in hiring a boat and some willing boys. I had already made a few trips of inspection when my kindly host suggested that I accompany him on a short trip to the Abyssinian province of Hamaszen. I immediately dropped my own plans for this was too good a chance to let pass by. But that same



day Munzinger informed me that he planned to travel to Bogos and from there down the Anseba River to the center of the region between Massaua and Suakin and then return to Massaua via Habab and Samhao. He also invited me to go along. I was hard put to decide between my going with my host or with Munzinger. Luckily it soon developed that I could combine both trips. Munzinger was to wait for me in Bogos where I was to meet him after my trip to Ham-aszen. I gave up all thought of work in Massaua till my return from this inland trip and began to prepare eagerly for the journey. My kindly host and my Swiss companion were also making the same preparations. We hired servants and pack and riding animals and bought flour, durra (a kind of millet, mkj), sugar, coffee, butter, salt, and pepper. Each one of us bought a tanned cowhide to be used as a tent. We already had warm blankets. For the Abyssinians we bought two cases of cognac, a pair of pistols, and ornaments of simulated gold. We also had the younger Abyssinians in mind and laid in a supply of artificial pearls, little bells, brass rings, and pictures of the Virgin. In addition my baggage contained my bottles, boxes, alcohol, and collecting nets as well as a goodly supply of powder, ball, and bullets.

We stored all the possessions we had to leave behind in a strongly built storage shed to protect them from possible fire. We were then rowed from Massaua to nearby Gerar on the mainland, where our baggage and riding animals were waiting for us. In Gerar we stayed in a house belonging to Munzinger. While my companions were busy preparing cartridges for our porters, I grabbed my bottles and went looking for mollusks. Although I searched eagerly all morning I found not even a trace of one. All I got were a few Coleoptera and arachnids besides a single viper. In the afternoon our porters got some practice in shooting. The baggage was repacked in my little square bags and the bags distributed among the various mule and camel drivers. The animals were loaded and finally some weapons and ammunition were handed to everyone. All this took an entire day.

Our caravan consisted of three Europeans and nine porters including the drivers of the pack animals; in addition there was a consular official and two soldiers whom the governor of Massaua had forced us to take along. We had rented two donkeys and two mules to help carry the packs.

On January 17 at 3 AM, while it was still dark, we left M'Kullu. The silence of the night was broken only by the laughter of hyenas who were enjoying some newly found carrion. We traveled along the dry bed of the Maschal River till daylight. Mountain chains rose to the right of our route. When day broke we left the river bed and turned toward the west, climbed over the mountains and arrived at the bed of the Desset River. We followed this stream upwards for a short while and between 9 and 10 o'clock we pitched camp in the river bed at Saati. Here we fired three volleys in honor of Schiller, a

German collector of natural history objects who lay buried here. Then our baggage was unloaded, our porters began preparing some pheasants which we had shot and I went out hunting for mollusks.

At first sight the terrain looked very promising. On both sides of the river were high mountains, thickly covered with vegetation. But everything was parched and dry and I could find only a single Pupa. I had more luck at the outflow of a spring where I found large numbers of splendid specimens of *Melania tuberculata* Müller hiding in the thick algae. At noon the temperature reached 30 degrees R.

We planned to travel this day only as far as Ailet and thus waited till the afternoon before leaving Saati. Leaving the Desset River, we traveled westward, and climbed up to some beautiful plains. We then made our way through thorny bushes and passing through a narrow defile, we came to the lovely Motak Valley. Toward evening we reached Ailet. Mr. Munzinger, returning from his own journey, was also in Ailet and in the evening he paid us a visit. Next morning we visited a hot spring lying southwest of Ailet. The water, supposed to have great healing qualities, was so hot that it took a strong effort of will to put one's foot in it. In the vicinity of the spring, under bushes with cactus creepers I collected several live *Bulimus abyssinicus* Rüppell and a completely calcified *Succinea*.

We were back in Ailet at noon. In the afternoon I visited a second hot spring lying to the west of the first one. Here the water was not so hot and I found *Planorbis*, *Melania tuberculata* Müller and *Isidora*. Next morning we left Ailet, traveling due south. Mr. Munzinger had left Ailet the day before, traveling northwest to Keren in Bogos. We followed the Demos River upstream traveling either in its dry bed or on its right bank. We overtook a few caravans, their goods being carried by oxen, and at about 10 AM we rested on the plateau of Zabergama. Here I found my first calcified specimens of some handsome Abyssinian *Vitri-na* as well as some broken *Succinea* and fine specimens of the same Pupa which I had collected in Saati.

We started out again at 1 PM. Our path, with few interruptions, climbed steadily. Late that afternoon we reached the beautiful plateau of Genda. We traveled for a while over this plateau and at evening made camp. Near us about 10 wild boars were rooting around but I was unable to kill any. While our porters were cutting wood for the fire, I collected a *Succinea* and a few juvenile *H. darnaudi* Pfr. living on grass blades and under stones.

An unpleasant cold rain began to fall at dusk. We learned how we should have sheltered ourselves by watching the people of an Abyssinian caravan which was camped nearby. They stretched their cowhides over some lances fixed upright in the ground and thus managed to have a snug dry spot underneath. It was impossible

to keep the fire burning and we had to keep our pack and riding animals near us to protect them from marauding beasts of prey. Each one of us lay down on his cowhide in his wet clothes, pulled his blanket over his head and tried to forget rain and weariness in a deep sleep.

Early next morning I was awakened by the cold. I was wet through and through. After I had warmed myself a bit with hot coffee, I looked in vain for mollusks in a tributary of the Demos (sic) River. An hour later my companions called me and we started off once more. The road became steeper and more difficult. At times it ran through rock defiles, then over obliquely lying, platelike naked rocks thoroughly wetted by the rain; then it became a narrow, stony mountain path winding its way high over deep valleys. We had to admire the cautious way our mounts walked, carefully testing every spot before trusting their weight to it.

The flora was changing; large candelabra *Euphorbia* began to appear. The higher we climbed the thicker and more numerous they became till finally they transformed the entire region into a cool, shady forest, a malacologist's "Garden of Eden". My companions refused to stop and allow me a little time to explore the terrain so I had to leave my horse in the hands of a porter and fall behind. Every little while I had to run forward to catch up with the rest of the party. Or else I ran ahead for a stretch and hunted snails till the rest caught up with me. I was well rewarded for my efforts. Under piles of fallen branches and rotten stems of *Euphorbia* I collected fine large specimens of five species of *Vitri-na*, some *Hyalina*, 4 species of *Stenogyra*, among them one specimen 55 mm long. Under stones I found one species each of *Ennea* and Pupa, the latter very similar to our own *Doliodolum*. Small *Vitri-na*, possibly the juveniles of larger species, were clinging to the underside of rocks. At last I reluctantly had to give up my system of pick and run. I had to preserve my strength and breath for the trials to come. I would advise every malacologist who is planning a trip to Abyssinia to spend a few days in Genda and to make some excursions to the chains of hills to the north. I am certain he will be well rewarded for his efforts.

We stopped at noon in a narrow pass on the banks of a small body of water. I made use of this time to collect some more specimens of the species I had already taken. On stones in the water I also found a large number of *Ancylus*. That afternoon our trail became very steep. We all had to dismount and lead our animals by the bridle. In this way, Indian file, we spent the entire afternoon climbing steadily. At about 5:30 we reached the plateau of Asmara. That afternoon I collected some more dead specimens of *B. abyssinicus* Rüpp. and *Helix darnaudi* Pfr.

We traveled on the plateau for a half hour more and passed through cultivated fields. We stopped at the village of Asmara and sent a porter into the town to find shelter for us. A  
To be continued.



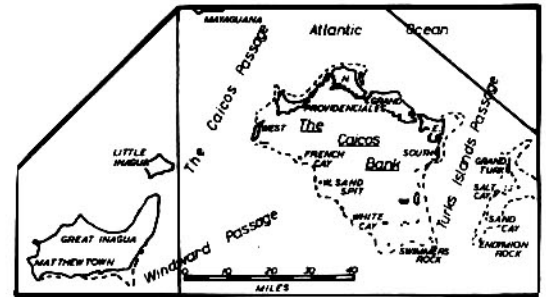
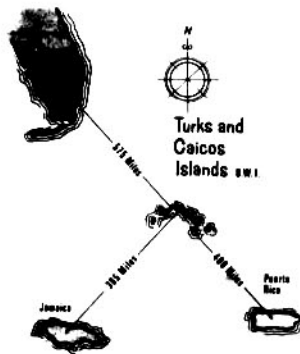
# Vacation Escape - The Turks and Caicos Islands

By

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Florence, South Carolina

Photos by the author.  
Maps by Laim Maguire,  
Caicos Holdings Ltd.



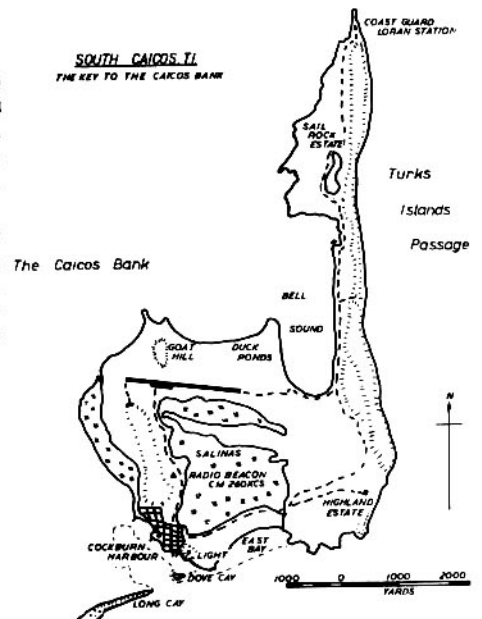
Approximately half way between southern Florida and Puerto Rico lies perhaps the last extensive wilderness paradise of its kind in the West Indies. Dozing peacefully in the southeastern shadow of the Bahamas for nearly five centuries and sustained chiefly by salt, conchs and crayfish for nearly three centuries, the picturesque and offbeat Turks and Caicos Islands have remained pleasantly unspoiled and uncrowded. Though a part of the Bahama Archipelago, they have been called the "outest" of all the out-islands, so far out they are not even in the Bahamas. They have been referred to as the "little orphan isles", as neither the Bahamas nor later Jamaica cared to maintain jurisdiction over these economically poor islands. Since 1962 they have had separate colony status, governed by Great Britain. These islands of yesteryear, 560 nautical miles southeast of Miami and 100 miles north of Haiti, comprise an area of 166 square miles sprinkled over 5000 square miles of ocean.

The chain is made up of 30 small islands surrounded by one of the most spectacular continuous coral reefs of the western hemisphere, only eight of the islands are inhabited. The Turks Islands consist of Grand Turk and Salt Cay. Grand Turk, considered "downtown" by the outer islands, is the administrative center for the group and has a population of about 2500 which includes about 300 men and dependants serving on a U.S. Navy Base and a missile tracking station. The Caicos Islands are made up of South Caicos, East Caicos, Bottle Creek, North Caicos, the beautiful high and rolling Providenciales, Grand

Caicos and West Caicos. South Caicos has the larger population (about 850) and has a U.S. Coast Guard station at its northern tip. The total population of the Caicos group was 6000 in 1960, half that number below age 15.

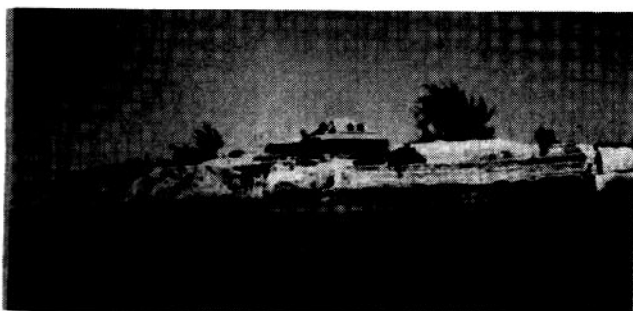
The Turks Island Passage, 22 miles wide and over 7000 feet deep, teems with big game fish and separates the Turks from the Caicos Islands. The Caicos Banks consist of sandy shoals with occasional coral heads. The climate is perfect and delightfully free of humidity, varying from 83° in summer to 77° in winter, with a daily range of 10°. Easterly trade winds make air-conditioning unnecessary. The annual average rainfall is 28 inches which supplies the basins and cisterns, as there are no rivers, springs or wells. A recent folder from the Hotel Kittina on Grand Turk advertises hot and cold water for its 14 rooms, but has frequent references of DWTGDW (don't waste the goddam water). The island is chiefly limestone and is punctuated by coral cliffs, salt flats, crescent beaches, hillocks and tiny settlements with ancient cottages. A thin veneer of topsoil supports a scrubby green vegetation and a few flowers. Most local construction is of stones, including walls and fences many of which are laced with bougainvillea.

Grand Turk Island (so named because of the native cactus with the red fez-like top) was discovered by Ponce de Leon in 1512. Many historians believe now that Columbus first landed at South or East Caicos in 1492 and met Lucayan Indians. Robert Marx, duplicating

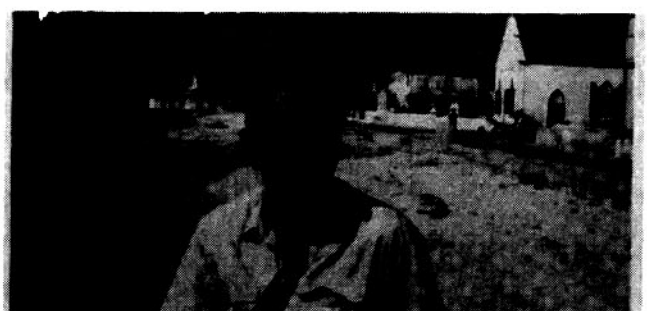


conditions, and navigating toward San Salvador, ended up at South Caicos. He concluded that from the descriptions of the fine harbor and many islands, found in Columbus's log book, that South Caicos was indeed his first landfall. Earlier this conclusion had been reached after the 1957 expedition of Edwin Link (the famous inventor and explorer) accompanied by Captain P.V.H. Weems (a world authority on navigation) and Mendell Peterson (historian). Link's new theory was published in a monograph by the Smithsonian Institution.

In 1500, the Caicos Islands were shown on the de la Cosa Map as "Yucayo". Salt-rakers



The author on a beach on Grand Turk Island.



Rustic "Admiral's Arms" sits atop limestone bluff.

from Bermuda formed the first permanent settlement on the islands in 1678, and intermittently for the next 200 years, the production of salt by solar evaporation was the main industry. After the American Revolution, loyalists (many from Georgia) fleeing America settled on the islands and established cotton plantations, but 20 years later a hurricane destroyed all, and ended dreams of cotton empires. Most of the island inhabitants are descendants of slaves brought to work the plantations. Ruins of the plantations and fading remains of the salt business may still be seen. The mining of guano from the dramatic caves on Grand Caicos, and the sisal fibre industry also contributed to the past economy. Prior to these times, the islands have a storybook history of pirate raids and Spanish and French invasions.



The floating dock at the Inn is protected by a jetty of old conch shells.

In 1944 the American Forces built a 6200 foot crushed-rock airstrip on South Caicos as a refueling station. It has a low frequency radio beacon and is lighted with emergency flares at night. This opened the area to private planes and flying tourists.

Impressed with the beauty of the waters and the serene simplicity of the islands, on a brief refueling stop during a private flight to St. Thomas, Virgin Islands, we (my wife Jo, and retired Col. Ray Clark and wife Mildred) promised ourselves a few days respite here on our return. We contacted the Admiral's Arms Hotel at South Caicos on their unicom frequency and were warned to watch for stray animals on the landing strip as dusk was approaching. Cattle and donkeys have open range and seemingly belong to no one in particular, unless injured, then numerous owners clamor for damages. Upon landing, we were greeted by Liam Maguire, handsome and Cambridge educated, who seemed to be in charge of practically all tourist enterprises, including the airport, hotel, marina, etc. After routine customs protocol in the tiny one-room rock-walled "terminal", we were loaded onto the airport "limousine" which was an old Chevy with its metal body and hood long rusted away and replaced with a wooden bonnet and floor with wooden benches. After a few coughs and detonations (all of the seven or eight vehicles on the island were fueled with high octane aviation gasoline), we had a smooth ride over salt-surfaced roads, the short distance to the hotel.

The Admiral's Arms overlooks the beautiful sheltered harbor. It is casual, quaint and friendly, and now has 15 rooms (only 6 on our first visit). A family-style dining room with

large center table adjoins the kitchen, porch, pub and patio. The cozy little bar, complete with dart board, is a popular spot for the local populace. We were served cool rum drinks and spicy hot conch fritters on arrival as we relaxed on the breezy shady porch, entranced with the panoramic vista and the clarity of the air and water. Meals are adequate and well prepared. The menu depends largely on what each individual contributes from his daily activities. Fish, lobsters and conch meat are plentiful. For a change from seafood there are eggs, home baked bread, chickens, occasional steaks and tins of beef. Green vegetables and fresh

is omnipotent here -- as a food (chowder, fritters, salad, steak), an important trade item, as fishing bait and as a ceremonial dish at all wedding ceremonies because of its alleged aphrodisiacal properties. More recently, the conch people have learned that the undamaged shells shipped to Miami for the tourist trade fetch more than the meat. More than 200 million conchs have been exported in the last 50 years, mostly by boat! A bigger and more lucrative industry now, with the advent of refrigeration, is the seasonal lobster fishing. It is said that in 1970 a mere 66 fishermen, using primitive hand methods, caught 380,000



Floats and shells collected in the islands.

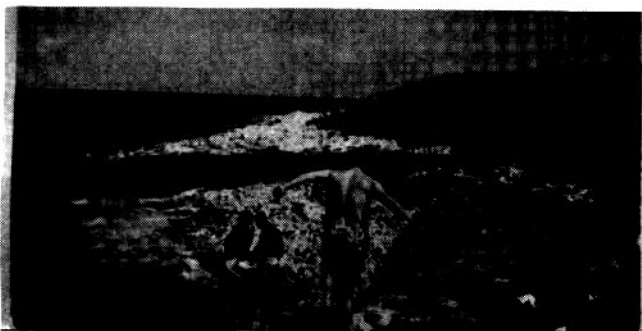
milk are scarce. When asked what I could bring him on my next trip, Maguire replied "fresh lettuce and strawberry ice cream, all you can cram in your cooler".

The village of Cockburn Town is made up of a handsome governor's house, a few neat and brightly painted homes and buildings, and a general store. The overwhelmingly black populace lives in small stone houses crowded together a few hundred feet from the hotel. Though poor in material things these people are friendly, polite, unobtrusive and apparently happy.

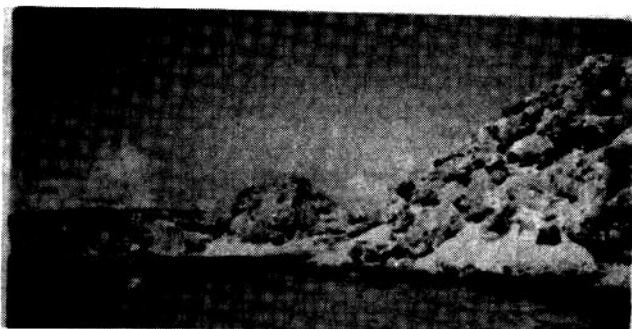
Distant sounds of cocks crowing and dogs yelping through the open windows, start one's day early here. Numerous conch fishermen were already out in the sheltered waters, one to a boat, and each leaning over the side in their characteristic positions. With a long hooked pole in one hand and a glass-bottomed bucket in the other, one pink Queen Conch (*Strombus gigas*) at a time is brought up from the bottom. Many work at this all day in 10 to 14 feet of water. Our guide for exploring and diving was waiting by a jetty constructed entirely of old conch shells, a few steps down from the hotel. We dived in the gin-clear water for a few specimen Queen Conchs and, to my chagrin, the native guide was mutilating them by chopping a hole through the spire, severing the mollusc's attachments to the inner spirals and extracting the animal. This was habit with him as for many years after the demise of the salt business, the chief livelihood of these people was the exchange of dried conch meat for Haitian citrus and other commodities. Grinning sheepishly, he understood when I explained that I was seeking perfect shells. The conch

of these crawfish. We speared a few lobsters from their coral hiding places and were fascinated with the underwater fairyland of brilliantly colored tropical fish, purple sea fans and multi-colored corals. Floating on the surface with masks, we watched our guide free-dive to about 25 feet to spear a parrotfish, only to have it cut in half by a speedy barracuda before he could surface with it. We found beautiful King Helmet shells (*Cassis tuberosa*) and on some of the small uninhabited cays that dot the area saw large colonies of West Indian Top Shells (*Cittarium pica*). The meat from the few Top Shells that we took was a raw delicacy for the guide, as well as that from chiton shells (*Ceratozona squalida*) that we pried loose from the rocks. The fanciful Bleeding Tooth shells (*Nerita peloronta*) were abundant on the rocks at the intertidal zone. Some of the cays are covered with a thick green growth of cactus and are inhabited only by lizards and iguanas, so unafraid of man that we could approach to within a few feet of them. Low tide afforded miles of clean sand bars on which to find the Netted Olive shells (*Oliva reticularis*) and hotel kitchen ladies were delighted to boil our uncleaned shells, savoring each piece of fresh mollusk.

As word got around the village that I was interested in sea shells, I acquired, for a small price, a rare albino Queen Conch (undamaged) and two beautiful conch pearls. On a subsequent trip to Caicos, at the request of the Customs Officer, I brought him a used cornet, as he was trying to organize a boy's band. Three hours after its delivery I hardly recognized the instrument as it was cleaned, oiled and polished - fit for the Queen's Regimental Band! I was rewarded with another conch pearl.



Shelling on a remote cactus-covered cay. The only inhabitants are docile lizards and iguanas. The cay is south of Caicos.



Exploring the pristine waters which are protected from the ocean by rugged limestone barriers. South Caicos.

On other days we beachcombed on the ocean side where there were no footprints. We fished in deep holes to put meat on the table and had a delightful bone fishing trip. A few fresh young conchs were taken in the grassy shallows, but before the animals were cut into bait, the guide would carefully "slurp down" the gelatinous-like penis and smile. I know now why bone fish are so admired as game fish. They fight to utter exhaustion. No flapping around when boated, these streamlined beauties are totally spent. To our surprise, the bone fish were served for dinner. The meat was snow white and tasty, but to retrieve it from the multitude of bones made it somewhat of a chore.

There are hundreds of caves throughout the islands, many unexplored. Some have yielded vast amounts of Arawak Indian artifacts, and possibly, some could have house plunder hidden by pirates. Shipwrecks are numerous in the area for the treasure hunters and many messages with dates can be found, carved on prominent headlands jutting out from the islands, made by shipwreck survivors.

A leisurely flight over the islands at 1000' altitude is a scenic delight. To see hundreds of pink flamingoes rising in flight from the salinas is a breathtaking experience. I shall never forgive the processing people for losing my roll of film with this photograph! Waters in some shallows were so still and clear that the sea floor looked like a desert, though several feet deep. Every shade of blue, turquoise and green water graced the virgin white beaches,

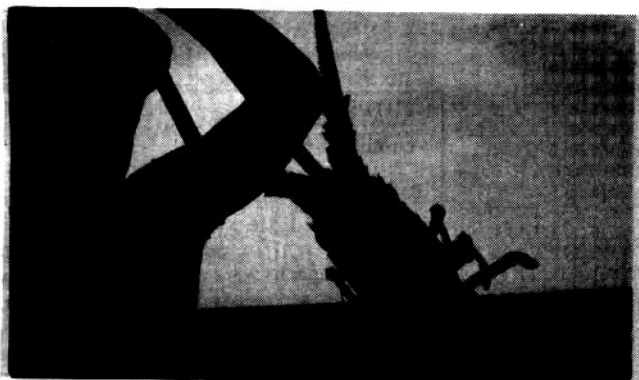
lagoons and craggy yellow limestone cliffs. Pink and mauve ponds were noted just inland, some with ancient windmills. Tiny green cays were scattered about. Pleasingly absent were modern buildings, TV antennas, golf courses and smokestacks.

One day we flew over to Grand Turk for supplies for the Inn. Among the needed items were soft drinks for the bar, which had been depleted down to bitter lemon which becomes monotonous after a few days. Water is not a particularly desirable mixer, as on occasion loose animals have been noted ambling through the catch basins. On contacting the tower at the N.A.S.A. tracking station, I was denied permission to land on their spacious paved strip, as my previously requested clearance from Patrick A.F.B. had not come through. Having been forewarned of this I had been informed that light aircraft occasionally landed on a street in the village. Upon asking the tower contact if he knew where it was, he promptly answered, "Roger, sir, but do you?" He then described its location, bounded by a jail at one end and a cemetery at the other. The street ran straight east and west for about 2000 feet. I was advised to buzz it first to clear it of children. After an uneventful landing into the easterly winds, we were promptly surrounded by curious black youngsters, followed by a speeding police vehicle. We were greeted politely and, upon asking to see their chief, who was a friend, we were escorted to him in their Land Rover paddy wagon. He graciously gave us a tour of the town and is-

land before taking us to a large warehouse for our needs. Supplies arriving by ship for Grand Turk have to be unloaded at a lengthy pier stretching out to deep water, as it lacks the harbor of South Caicos.

On a recent commercial flight I came across an article, "The Turks & Caicos", in Aloft Magazine, published at 2025 Ponce de Leon Blvd., Coral Gables, Florida, written by Raymond Villwock. He wrote, "The coral reefs are spectacular, unspoiled. ... Reefs start only a few yards from the beaches, offering fabulous skindiving. ... The fishing, as would be expected, is terrific - when you can get a bait past the barracuda. I particularly enjoyed that which these islands don't have. No night-clubs, TV, busy ports, shopping bazaars, casinos, huge hotels, glass-bottom boat tours. No newspapers, billboards, noise, traffic or panhandlers. This is my place for escape. Obviously the Turks and Caicos are not for everyone. They are for those looking for peace and quiet. For uncrowded and spectacular fishing and diving, for dreamland weather and water. ... This is my escape, my Shangri-La." I feel the same and selfishly hope that the inevitable changes brought on by tourist influx will be at an ever so slow pace. Fortunately, as stated in a recent folder for tourists, "There's no rush to the islands - and no rush on them."

While boating one day, far out from the main island of South Caicos, we noticed a wisp of smoke coming from a tiny isolated cay. Continued page 20, column 3, bottom.



Our dinner "on the hoof", a live spiny lobster. photos by the author

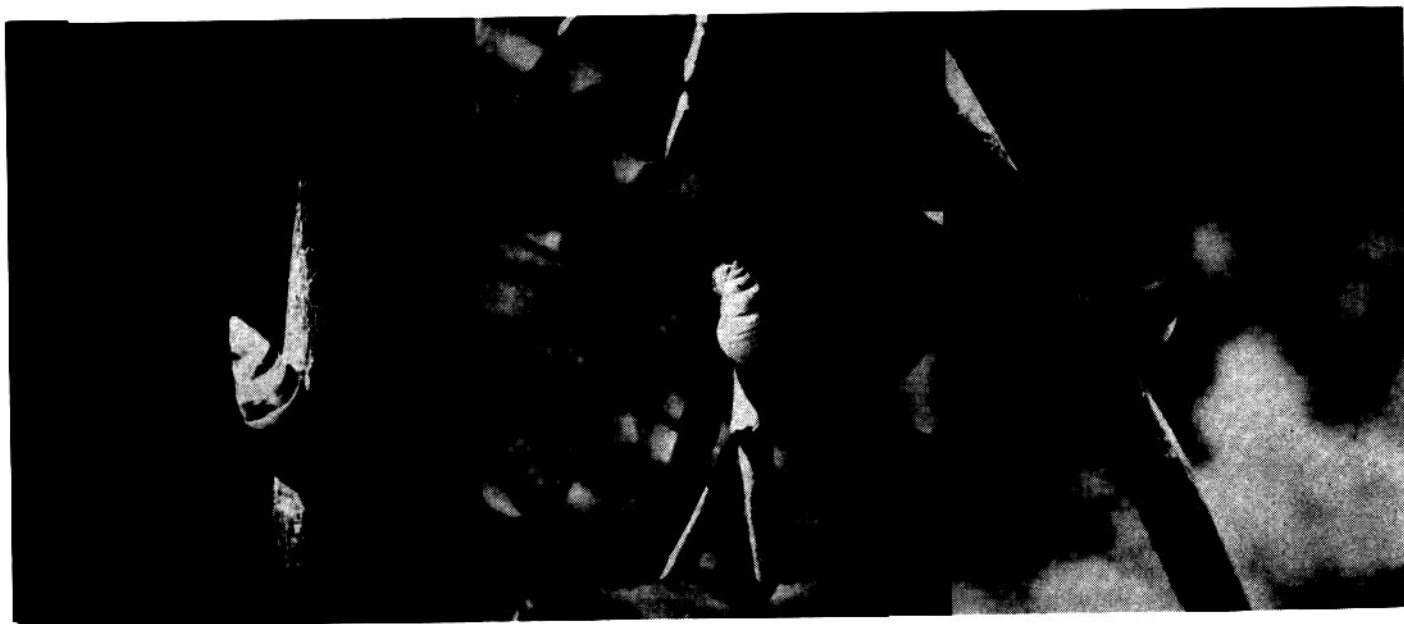


A "welcoming committee" greets us after our street landing on Grand Turk Island.



## The U.S.'s Only True Tree Snail

By RICHARD F. MODLIN\*



In the 1800's *Liguus fasciatus* Muller inhabited the islands of Cuba and Haiti. It could also be found in great numbers in the Florida Keys - Key Biscayne to Key West. Back then it was even reported as far north as Naples, Florida on the Gulf coast. Within its limited range it could be found in the many warm, moist hardwood hammocks that dotted the interior of the larger Keys.

Binney (1885) suggested that *L. fasciatus* evolved in Cuba and Haiti and was introduced into the Florida Keys by the Gulf Stream. The Gulf Stream washes the northern shores of Cuba just before it swings past the Keys. The tree snails would have little trouble floating from Cuba to Florida on a log or branch. Many of the color combinations found in Cuba can also be found in Florida. This also tends to indicate that the tree snail originated in Cuba or Haiti and was dispersed by the Gulf Stream.

The fascinating quality of *Liguus fasciatus* is that it possesses, probably, the most colorful shell of any gastropod found in the United States. Unlike many of the marine shells, which are limited only to one or two color combinations, the *L. fasciatus* shell can have three or even four color combinations. The rather simple shell is about 2½" long, thick, with a shining surface that is variegated by entire or interrupted bands of color. The colored bands, which, depending on the race, can be bold brown, pin-striped green, red or pink, or they can be broadly diffused or bold yellow or any combination of the above patterns. All the bands are on a white background and the apex of the shell can be tipped in white or pink. Fifty-two different color varieties have been reported to be found in the Florida Keys.

The evolution of the many color combinations may be the result of the isolation of particular populations in a given hammock. *Liguus fasciatus* does not wander very far from a tree. For that matter, the only time the snail comes to the ground is to breed.

Apparently, it is very specific for hardwood trees. It has even been suggested that it prefers the smooth bark of the gumbo-limbo tree. In my observations it appeared that the majority of the snails were found on the gumbo-limbos, but I also found the tree snails on other smooth barked hardwood trees. Pine forests, asphalt or gravel roads and grassy areas are barriers to the tree snails.

In the fall the snails come to the ground and lay their eggs under the fallen leaves. Many of the adults die after egg laying. Others quickly return to the trees. The eggs remain throughout the winter and hatch in the spring. The young immediately move up onto the trees.

Lichens and algae that grow on the bark of the trees are the food of *L. fasciatus*. Feeding usually takes place at night. Shortly after the sun sets the snail emerges from the shell and begins to search for food. This nocturnal behavior must be instinctive. Several snails I kept under artificial light after the sun set began their night's migration in the light. Consequently, the absence of light does not necessarily stimulate them to emerge.

During the day the snails can be found on the more shaded side of the trees. To remain attached to the tree and keep from becoming desiccated, they secrete a thin, transparent epiphragm which glues the aperture of the shell

to the tree. In the colder months the snails hibernate and secrete a thicker epiphragm. During this time they are so strongly attached that attempts to remove them usually results in the removal of considerable bark or a crushed shell. The spring rains dissolve this glue and the snail is able to detach itself.

It is unfortunate that here in the 1970's the only place that one can observe *L. fasciatus* in its natural habitat is in the forests at the eastern end of Key Largo, Florida and, here, it is also quite rare. Since tree snail habitats are located on prime real estate, it is rapidly being devoured by the bulldozer. Within its limited range *Liguus fasciatus* is being pushed into extinction. However, with the foresight of the National Park Service, many tree snails have been transplanted to the hardwood hammocks that dot the Everglades. About fifty of the color combinations of our country's only

(Continued on page 52, column two.)

\*Marine Research Laboratory  
Univ. Connecticut, Noank

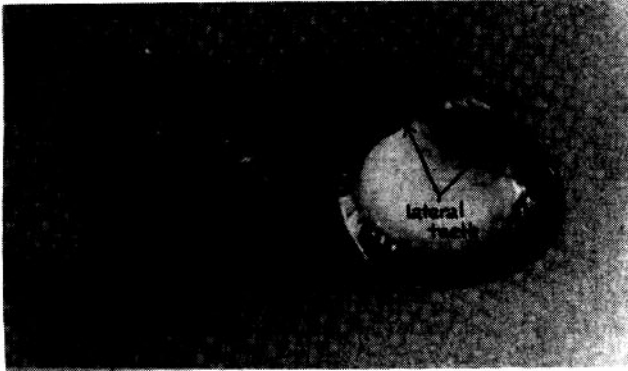
### VACATION ESCAPE continued from page 19

We curiously approached and found a native lolling on a little sheltered beach, brewing something in a tin can over a driftwood fire. A rack of conchs were drying on a crude frame behind him, and a small piece of canvas afforded him a few feet of shade. I queried our guide as to what he might be doing there alone on this remote dot in the ocean, without even a boat. His smiling answer, "Boss, I reckon he just wanted to get away from it all for awhile". Escape is relative! (Dr. Zeigler is co-author of Olive Shells of the World.)

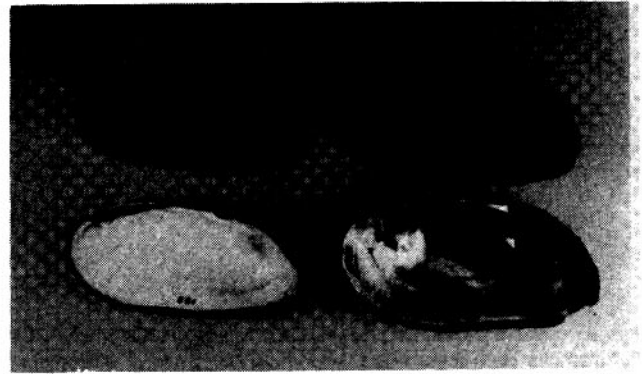
## Naiad Collecting in the Clear Fork Creek

(MOHICAN STATE PARK, OHIO)

By JOHN & SANDY VEVERKA\*



*Corbicula* sp. a true freshwater clam. Note the two lateral teeth. This specimen about 1 inch in width.



*Elliptio dilatatus* (Raf., 1820). This species has wide distribution and has varied color forms. The specimen on the left has a white interior and the one on the right has a purple interior.

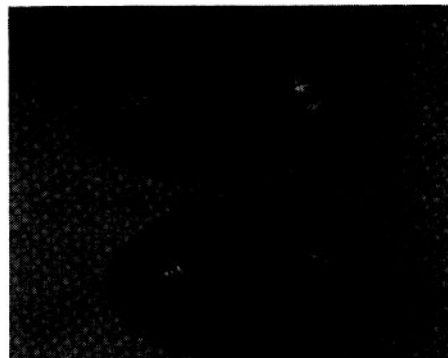
A naiad, by another name, would simply be a freshwater pearly-nacred bivalved mollusk. Frequently called freshwater clams or freshwater mussels, they are distinctly different from these bivalved relatives in several important ways noted below.

Those who believe that naiads lack the color and variety of their marine counterparts have much to learn. They are invaluable as indicators of pollution in our streams and rivers, as well as being scientifically intriguing because so little is known of their complex life cycles.

Our interest in naiads was kindled shortly after we began to work at the Ohio State University Museum of Zoology with its Director and Curator of Bivalve Mollusks, Dr. David H. Stansberry. We found that, not only are these mollusks easily obtained by fervent collecting excursions, but are scientifically worthy of intense study, owing to their contribution to our knowledge of aquatic ecology and for better understanding of the biology of life. Thus, as the endangered species list increases almost daily (already including over 130 species of naiads!), it seems that these creatures warrant much more attention from both scientists and laymen.

During the summer months of 1973, while John served as a naturalist at Mohican State Park, we were afforded the opportunity to study the naiads of the Clear Fork Creek which flows through the park. Samples of the population were made to determine the number of species present and specimens were deposited at the Ohio State University Museum of Zoology for future study. It should be mentioned that most state parks prohibit the collecting of wildlife of any kind, so park and local officials should be contacted before attempting any wildlife collecting within park boundaries.

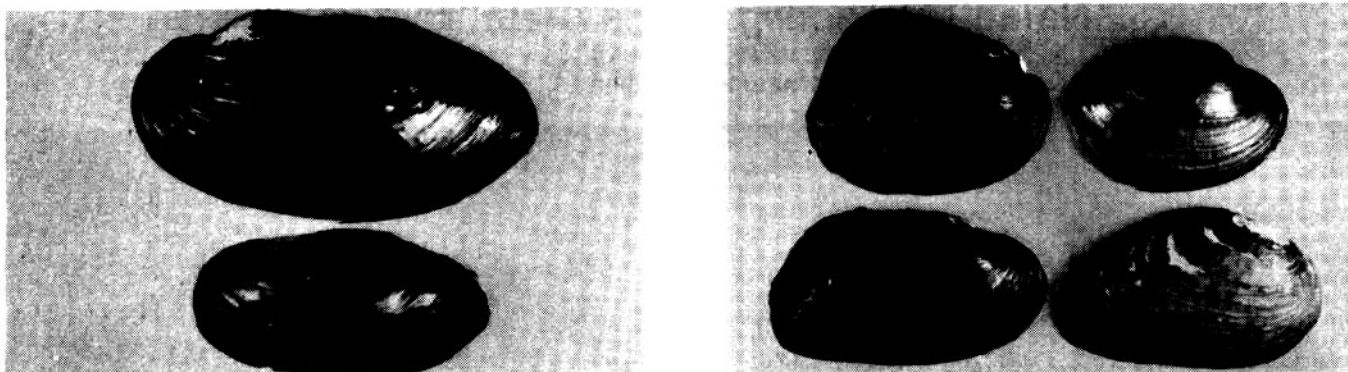
The question arises as to what the difference is between naiads and other freshwater (or marine) bivalve mollusks. In simplified terms, a naiad undergoes a parasitic stage during part of its microscopic larval development. The microscopic glochidial stage, upon being released from the parent into the water, must attach to a specific fish in order to continue their normal development. Should the glochidia not attach itself to a fish or if not to the proper host fish, it will die. Development of the glochidia on the fishes' gill filaments or on their fins leads to the juvenile stage. This stage eventually leaves the fish as a near-microscopic juvenile naiad, will settle to the bottom of the river or stream and if all goes well, grow to an adult. Freshwater clams (such as *Sphaerium* sp. or *Corbicula* sp., see Fig. 1) or freshwater mussels (such as *Dreissena* sp. or *Congeria* sp.) do not have a parasitic stage in their life cycles. Also, freshwater clams have lateral teeth on both sides of the cardinal teeth as opposed to one side in naiads. In reality, most people have never seen a true freshwater clam -- what they have observed has most probably been a naiad.



*Lampsilis radiata luteola* (Lmk., 1819)  
male left; female right  
\*Columbus, Ohio

Collecting naiads is a relatively simple process, since they do not flee readily from their collectors. However, depending upon their habitats, naiads can be completely hidden from view and require much searching in the stream bottom in order to be found. The Clear Fork Creek has a sandy/gravel-like bottom which usually provides a good habitat for naiads. Some of the specimens we found were almost totally buried in the sand while some shells could be seen completely exposed on the stream's bottom. Tools of the trade include waders (if the water's cold), a sharp pair of eyes and collecting intuition. Many collecting areas are in shallow water and easily accessible. By careful searching, many streams such as the Clear Fork Creek, may yield many naiad species (depending on pollution content of the stream, etc.) and will prove to be an enjoyable experience.

Although a collection such as this may not be particularly as exotic as marine collecting, or of great economic value, the scientific worth of such a collection is immense. Scientifically speaking, the single most important aspect is locality data. A specimen (whether marine, freshwater or land, broken or whole) is virtually worthless without accurate locale data. This should include who did the collecting as well as when and where (specifically) the collection was made. Oftentimes rivers and streams are dammed, which usually has an adverse effect on the aquatic life in that stream. Specimens collected prior to the building of the dam can tell us much about the effects of the dam on their particular populations. For example, noting the number and species of naiads that were present in many of our rivers and streams 50 years ago (or longer) and comparing that list with the list of the species now found in these same rivers, after a dam has been built across it, we see that there are many species that are no longer found there. In fact, the



4. Top: *Anodonta grandis grandis* (Say, 1817)  
Bottom: *Anodonta imbecillis* (Say, 1829)

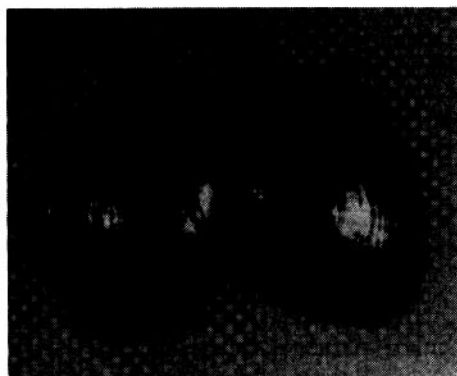
Fig. 6. Top, left: *Amblema plicata plicata* (Say, 1817); right: *Lampsilis ventricosa* (Barnes, 1823)  
Bottom, left: *Lasmigona costata* (Raf., 1820); right: *Ptychobranthus fasciolaris* (Rafinesque, 1820)

number of species of naiads always declines after a dam has been constructed across a river or stream. Without having the information given us by collections that were made years ago, observations, such as the example given, could not easily be made.

The total number of species we collected in the Clear Fork Creek was fifteen, however, we are certain that further collecting will yield more species. The accompanying photographs show nine of the species we collected. Fig. 2 pictures *Elliptiodilatatus* (Rafinesque, 1820) a naiad which has a wide distribution throughout Ohio, with varied nacre color forms. The specimen on the left has a white interior, while the specimen on the right has a purple interior.

Figure 3 shows two specimens of *Lampsilis radiata luteola* (Lamarck, 1819). This is an interesting specimen in that it shows the sexual dimorphism of this species. The specimen at the right is a female (with a rounded posterior), while the specimen at the left is a male - with an elongate posterior.

Figure 4 shows specimens of *Anodonta grandis grandis* (Say, 1817) (top) and *Anodonta imbecillis* (Say, 1829) (bottom) which are common species found in many aquatic habitats in Ohio and are able to withstand a variety of ecological conditions.



*Lampsilis fasciola* (Rafinesque, 1820)

In Figure 5 we show a young specimen of *Lampsilis fasciola* (Rafinesque, 1820). The shell is yellow-brown with green rays. As the animal gets older the periostracum (outer covering of the shell) erodes and the rays become less visible.

Four species are pictured in Figure 6. These are: *Amblema plicata plicata* (Say, 1817), top left; *Lampsilis ventricosa* (Barnes, 1828), top left; *Lasmigona costata* (Rafinesque, 1820) bottom left; *Ptychobranthus fasciolaris* (Raf., 1820), bottom right. All of these naiads are common in the Clear Fork Creek.

It is indeed ironic that, while most shell collectors are so much involved in purchasing marine specimens, freshwater species that are virtually in our own backyards are left by the wayside and slowly are being eliminated by pollution and commercial exploitation of our free-flowing streams and rivers. There is also a sense of satisfaction in making a collection of naiads. You will have a collection that usually cannot be purchased from any dealer and that is of great scientific worth. The collector can learn much about the environment too, by observing the variety of wildlife and plants in and around the streams and rivers.

Precautions should be taken to limit collecting of live specimens, since over-collecting in a single area could have adverse effects on the mollusk populations. In many instances, dead shells may be collected that are in very good condition. One place to look for dead shells is in areas along the edge of a stream or island where there are muskrats. The muskrats feed on mollusks and after finishing a meal conveniently leave the remains in middens (piles of shells around their feeding places). These middens often contain very fresh shells and usually several species. In this way the collector obtains shells suitable for a collection with little effort on his part and also helps to preserve the naiad populations in the stream by not having to take live specimens.

We hope that this brief article may stimulate more interest in the collection, preservation

and study of these fascinating mollusks, and to engender further concern for our vanishing free-flowing and unpolluted rivers and streams.

#### ACKNOWLEDGEMENTS

We would like to thank the following people from the Ohio State University Museum of Zoology for their advice and comments concerning this article: Dr. David H. Stansberry, Kathy G. Borror, John Condit, Eugene Keferl and John Fredericks, Jr.

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## A U.S. Shell Stamp?

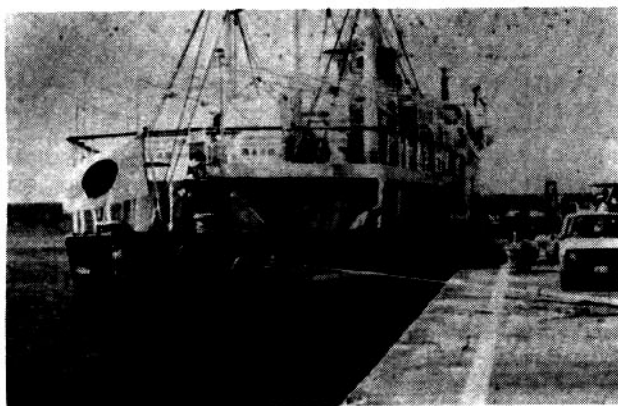
The Pacific Shell Club, Inc. of Los Angeles, California, is spearheading a campaign to promote the issuance of a United States postage stamp honoring the Conchological Clubs and Shell Clubs of America. The P.S.C. hopes to enlist the assistance of all American shell clubs. While a deadline of March 31, 1975 has been set for individual clubs and their officers to write the "Citizens' Stamp Advisory Committee" we feel that letters after that date may still help. If you'd like to see a new U.S. stamp honoring shells write to Mary Margaret Jamieson, Executive Secretary; Citizens' Stamp Advisory Committee; United States Postal Service; Washington, D.C. 20260. Or contact the Pacific Shell Club's committee at 10352 Mallison Avenue; South Gate, California 90280. Get you club active in this effort.

We have received word that John Strohbeen, well known west coast conchologist, has been hospitalized. We know that he'd enjoy hearing from his friends in the shell world. You can drop him a line at the Hacienda Convalescent Hospital; 1425 Woodside Drive; San Luis Obispo, California 93401.

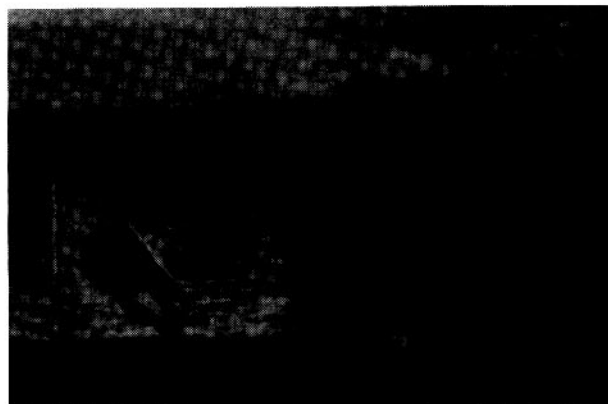


## A Shell Collecting Trip To Oshima Island, Japan

By CHARLES CARDIN\*



A "ferry" out of Tokyo.



Leaving Atami for Oshima.

As my assignment at Vandenberg Air Base came to a close, I received my new assignment to Yokota Air Base, Fussa City, Japan. Immediately visions of Cypraea guttata and Murex loebbeckii danced in my head.

For me there is nothing more exciting than shelling in a new location. Upon arrival in Japan I quickly planned a trip to Oshima Island which is the first and largest of several islands at the mouth of Sagami Bay.

I always read the articles in Hawaiian Shell News and Of Sea and Shore magazines about shelling trips to remote and exotic places. They are read with great envy for those that have the time and finances available to make such trips. I have written this article for those, like myself, with limited time and limited financial resources. Many of the articles I read have left me with many questions as to how, where, how much and what to take. I want to answer all these questions so that if you ever plan a shelling trip to Japan you'll know better what to expect when you arrive.

Most of the areas visited here are not easily accessible and scuba equipment is almost a must. However, I plan to travel around Japan and find areas shellable without scuba and when they are found I will write another article of this type of shelling.

Japan has strict laws and several shells and shellfish that have commercial value, such as abalone and lobster, are off limits. Spear-fishing is also illegal and if you do take animals of commercial value or spearfish you could find yourself spending your shelling money to pay the fine. Turbo cornutus is abundant and you might be tempted to take many. They are of commercial value so you will be at the mercy of the law if you take one. Live coral is scarce and is also illegal to collect.

\*TSgt., U.S. Army

Many of the stories you have heard about Japan being very crowded and expensive are true. Getting around is difficult for anyone, especially a visitor. Driving a car here can be both tricky and dangerous, as Japanese use the left side of the road and most signs are in Japanese. Some signs are in Roman letters, but even then finding your way around by car takes practice.

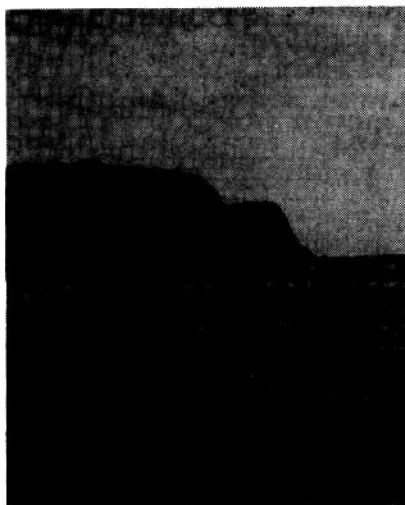
If you wish to shell at Oshima Island and you arrive by plane at Haneda Airport, Tokyo, I suggest not staying in Tokyo. You will pay more for the same accommodations you can get at Atami, a resort city on the beach (\$25 to \$35 a day and up!). A reservation will be needed as this city is full of tourists. You can catch the ferry to transport you to the island from both cities, but staying in Atami will be more enjoyable because it is closer to Mt. Fuji and the area is most beautiful. You can always take the express train to Tokyo (twenty minutes for \$5.00) and spend some

time touring and return to Atami later that evening.

The ferry ride is pleasant and the boat leaves Atami for Oshima Island at 9:30 am and again at 1:30 pm. It returns to Atami at 11:50 am and again at 4:00 pm. The cost is \$5.00 round trip - a ride of one hour forty-five minutes. The only bad thing about the ferry schedule is that you can not get to the island, shell and return in one day. So, consequently, you will have to stay at a hotel on the island. The hotel I stayed at was the Kon Koso Hotel and they cater to scuba divers and will take you to one of several spots, unload your gear, note the time you want to return, leave and return promptly. A room here will cost \$10.00 a day for each person and this includes two Japanese-style meals - breakfast and supper. We stayed for ten days and, next to the shells found, the hotel stay was the most enjoyable part of the trip.

The Kon Koso is strictly Japanese style, including room and bath. You'll love sleeping on the fairly comfortable floor and you'll also enjoy the Japanese style bath (learn what a lobster feels like). My group traveled to the island from Atami and included Douglas Hayhurst (certified scuba instructor with six years experience), two other friends with twenty years underwater experience between them and me (a certified instructor with twelve years experience) and all of us serious shell collectors.

The best time to plan a trip to Oshima is May or late in September. The vacation period here is in mid-summer and the beaches and all water areas are extremely crowded. Upon arrival at Oshima, if you have made a previous reservation and notified the hotel when you will arrive, they will pick you up at the dock in a van and take you to this wonderful, hidden away, very simple place that probably will not resemble any visions of a hotel you've ever had. The owners are very friendly and helpful



A point of Oshima, Island

and you'll make friends with them easily. All of the rooms at the hotel have sliding rice-paper doors and windows and they will be spotlessly clean. The bed will be folded up and stored in a closet and when you retire for the night you will find it made up for you and with a Japanese style robe neatly placed there for your use. Dinner will be eaten from a table just twelve inches from the floor. The meals will consist of fish, rice, soup, vegetables and tea. Sometimes the fish will be cooked and sometimes not (sushi). But all of it is prepared very carefully and is very clean. But, if you do not care for this type of food you can do as I did, go across the street and buy a bag of cookies and a grape soda and a banana to stop those hunger pains. Or, you can take a short bus ride to the main part of town and have curry rice or other fancy dishes.

One of my favorite dive spots on the island is just a five minute drive from the hotel over a road that I'll never forget. The driver took us right up to the water and all we had to do was walk ten feet and jump into fifteen feet of crystal clear water with about 50 feet visibility. The island is of volcanic origin, so we find plenty of rocks to turn over. The bottom has a little sand in shallow areas and you'll find sand patches between rocks that will yield *Conus fulmen* in all its color varieties. Under the rocks were *Cypraea gracilis japonicus* and *C. artuffeli*. To one side of some huge rocks there is a drop-off to 100+ feet, and it is only thirty feet from shore! Out of every rock crevice stuck a pair of antenna belonging to marine crayfish (or spiny lobster). Large moray eels could be seen peering from their holes and stone fish and zebra fish were plentiful. Small colorful fish abound and anemones, clown fish and small schools of other species were here and there.

In the shallower water *Murex fourneri* were plentiful on rocks and *Murex asianus* was found on the sides of rocks in about thirty feet. We found some *Cypraea vitellus* and *C. limicina*, *C. boivinii*, *C. arabica* and *Conus fulgetrum*. Cowries were found under rocks in depths of ten to one hundred feet. A list of most species found follows this article.

We found no sign of *Pecten nobilis*, *Murex elongatus*, *Murex troscheli* or any other of the better-known Japanese shells, within my 130 foot diving limit. There was a lot of natural beauty and I found my attention fixed on angel fish and large schools of fish that crossed my path. Small ripples of water from the surface made the light bounce from one place to another and on one occasion I was spellbound by the sight of my exhaust bubbles floating through a school of fish. It is hard to get any shelling done this way, so we decided to go again that night.

Night dives have always astounded me. The whole personality of the ocean changes at night. The shells seen at night are the ones you have to dig for during the day. *Conus fulmen* and *Cypraea vitellus* were just sliding around

on rocks with proboscis extended or hanging on weeds swaying in the currents. I was surprised to see a very large moray eel swimming freely - usually they are tucked away in their holes and only show their head and open mouths to you as you pass quickly by. When the water is clear your light is able to penetrate as much as fifteen feet ahead and when it shines upon large schools of silvery fish it seems as though the ocean is sprinkled with sparkling stones. Sea hares and large catfish eels were everywhere. Also, large octopus, out on their nightly prowls, will amuse you every now and then. One interesting observation made by one of our collectors should be noted here: a large, and I must say a beautiful, specimen of *Conus fulmen* was collected at night and it had already partly engulfed a very tiny squid. The squid was noticed when the collector looked into the aperture and noticed some activity. The shell shaken and the animal escaped, swimming off in a sluggish manner, as though drugged. It is interesting to note that at least one specimen of *Conus fulmen* catches baby squid for supper. The shell was a deep purple-violet, void of the usual black markings and with the whitish band barely visible.

The surprise of the trip was the fresh dead specimen of *Cypraea cernica*. It was a fine, but dead, specimen, found between rocks at forty feet. Another four am trip was cancelled due to fatigue and a very slight breeze. Collecting along the shore at low tide with lights at night was very disappointing. We found very little activity, which was surprising. Without scuba diving as your tool here you'll find little or nothing.

Shell collectors who are physically able to scuba should learn. Although diving can be expensive at first, once all equipment is purchased, all you need is a \$2 air-fill, a good spot and some time. If traveling from the U.S. or any other long distance to Japan, it is not recommended to take the added trouble and weight of your tanks. You can rent a tank and backpack for \$5 daily with one air fill included. Other equipment, such as a wet suit, should be brought along and booties with hard soles are a necessity in Japan and its islands - very rocky here. Air fills at the Kon Koso will cost \$2 and any transportation to a spot is \$1.25 per person, round trip. Small outboards are accessible for \$5 per dive, only if you convince the hotel driver that you are strictly looking for small shells. Otherwise it will cost \$100 a day for a large fishing boat. No boat renters will take the chance of going against the local fishermen and take divers out who break the laws pertaining to commercial shells and fish.

I have been diving in many parts of the Western Pacific during my Air Force career and I will say, without qualification, that Oshima Island offers diving and shell collecting that rivals that of many South Pacific Islands. The lack of hard corals (in abundance) in the only thing you may miss. The life around the island is unique in that it harbors both the

northern and southern varieties of shells. Many currents cross the island's shores and diving on one side differs considerably from diving on the others. It would take six months to dive the whole island and collect all the species that could be found within scuba range. I would estimate at least 300 species could be found.

Hopefully I'll soon be able to report on another shell collecting trip. Mr. Akita of Kyoto has invited me to accompany him to the shelling areas at Wakayama. This will be a real highlight of my tour here. I have always wanted to go shelling with one of the "greats".

The following is a list of the species found at Oshima Island, Sagami Bay, Kanagawa, Japan during the last two weeks of August, 1974:

- Trochus unicus* Dunker; shallow, in rock crevices (common)
  - Turbo cornutus* Sol.; 5-60 ft. in rocks (abundant)
  - Astrarium haematragum* Menke; shallow, on rocks (abundant)
  - Cypraea labrolineata* Gaskoin; 35 feet, under rocks (uncommon)
  - Cypraea artuffeli* Jousseaume; 15-50 feet, under rocks (uncommon)
  - Cypraea gracilis japonicus* Schilder; under rocks and at night (common)
  - Cypraea boivinii* Schilder; one live, night (very uncommon)
  - Cypraea vitellus* Linne; under rocks and at night (common)
  - Cypraea limacina* Lamarck; 60 feet, under large rocks (common)
  - Cypraea arabica* Linne; shallow, in rock caves (common)
  - Charonia sauliae* Reeve; 30+ feet on and in-between rocks (common)
  - Bursa bufo* Röding; between rocks (uncommon)
  - Murex asianus* Kuroda; sides of rocks, 30+ feet (fairly common)
  - Thais clavigera* Dus.; on rocks, shallow (common)
  - Murex fourneri* Crosse; shallow, on rocks (abundant)
  - Nassarius sufflatus* Gould; in sand patches, 45 feet (common)
  - Pleuroploca trapezium audouini* Jonas; in rocks and sand (common)
  - Conus fulmen* Reeve; in sand between rocks, never less than 25 feet deep. (common)  
It is a mystery as to why we found none in shallow water.
  - Conus fulgetrum* Sowerby; same as *C. fulmen*, but from 10 feet (abundant)
  - Drupa granulata* Duclos; on rocks, shallow (abundant)
  - Cypraea cernica* Sowerby; one dead found, between rocks, 40 feet (rare)
  - Euhadra eaagulicki*; in hotel garden (abundant)
  - Hydatina physis*; 25 feet, in sand between rocks, pairs, (uncommon)
  - Fusinus nicobaricus* ?; found in same area as last species (uncommon).
- Many others were also found, but not yet identified. Most of these were very common rock shells.

# Land Snail Chatter - 3



Near the Del Rio Air Force Base gate the Rabdotus snails were so thickly attached to Johnson Grass, that it looked as if a feather pillow had been ripped apart.

## COLLECTING

### Rabdotus

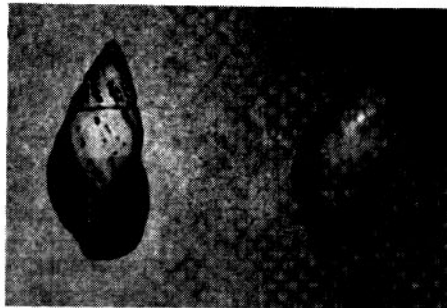
### SNAILS

By NAWONA A. GARY\*

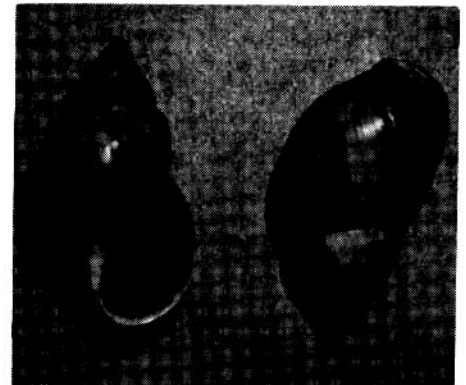
Photograph by Roger Morgan

\*San Marcos, Texas

I have always said that to find any kind of mollusk one has to learn "to think like one". With this in mind I write down a set of known facts and then think where the animal would be living that meet these environmental conditions. For instance, for a nerite I would say, "I have an operculum that fits so tightly I can survive for several months as I exclude air and water from the body tissue. I like to eat algae. I like it warmer than the regular sea around me, so I bask in sunlit areas. Where would I live?" In the splash zone would be the proper conclusion.



Rabdotus schiedeanaus pecosensis (Pilsbry & Ferris, 1906); Falcon Lake State Park Aug. 30, 1967; R.T. Gary family coll.



Rabdotus alternatus (Say); Alice, Texas, Jim Wells County; Rev. & Mrs. F. G. Butler coll.; June, 1969.

Hunting for Rabdotus snails (formerly known as Bulimulus), I come up with this set of facts: "I am light colored so I reflect the heat from the sunlight. I feed on treebark, humus or other cellulose. I drown easily, so I stay off the ground except when feeding or hibernating. I do not have an operculum, so am easy prey to a number of small predators. I am likely to estivate (sleep) for long periods of very dry and hot weather forming a celophane-like estivation membrane, so prefer to stick onto something smooth above ground level from one to two feet high. Now, where would I be?" This kind of reasoning may work for some snails, but the Rabdotus are totally unpredictable in different colonies, areas and regions where I have collected them.

For the past eighteen months Thacher and I have concentrated on the Rabdotus of Texas, traveling throughout the state to collect them. Usually one can learn where a particular land snail lives, and find them in similar places throughout their range. Not so with the Rabdotus. Perhaps this adaptability accounts for their wide spread distribution even into arid areas.

Around Langtry and Del Rio we found them hiding in the rough bark on mesquite trees. I did not blame them for hiding as it was a very dry and hot August. We have not found them on mesquite in other areas. Pilsbry said to look on prickly pear cactus, so for years I have

looked on prickly pears with very poor results. Up at Lake Whitney (out from Waco) this summer, we finally found a colony that did live on prickly pears, in unbelievable quantities during their juvenile period.

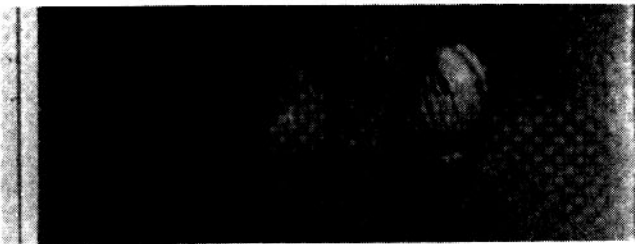
Recently, while hunting specimens at Lampasas, we found them living under things such as large cardboard boxes, flattened out by the weather, under wooden two-by-six boards, under flattened-out five-gallon metal cans, in colonies along with Otala, Polygyra and Helicina. This is the only place we have found them under things on the ground.

Continued on the next page.





*Rabdotus dealbatus* (Say); Smithville, Texas; Collector: N.A. Gary; February 1967



*Rabdotus schiedeanus* (Pfeiffer); Boca Chica Historical Marker, near Brownsville; on shrubs after shower; R.T. Gary family; 8/28/67.

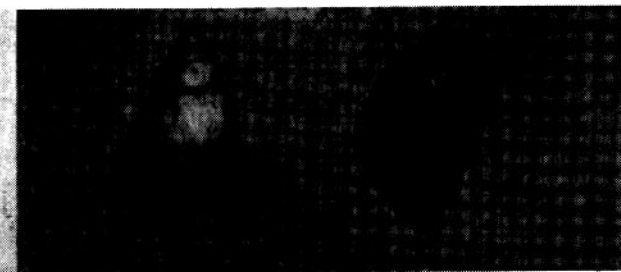
In our San Marcos area, at Goliad and around Falcon Lake, they crawl up the sides of buildings made of wood, concrete blocks or stone and attach themselves there to estivate. They may occur from a foot to ten feet off the ground, but seem to prefer getting under something such as a window sill, porch rail, overhanging roofs, etc., preferring sunny areas and seeming to hang with the apex pointing downward.

in sight. They were so plentiful that it looked as if someone had ripped a feather pillow and spilled the feathers over the vegetation. After a hot, hard day's work with nothing, this seemed like "snail heaven" to a collector.

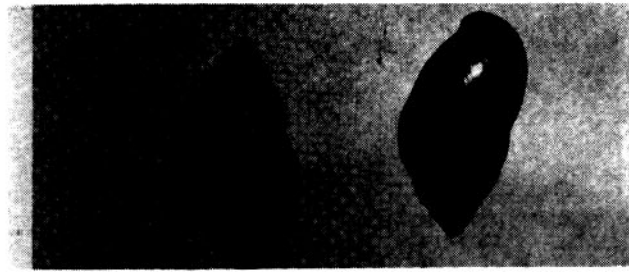
At Camp Kiawa, beyond Five-Mile Dam on the Blanco River, near San Marcos, the *Rabdotus dealbatus dealbatus* can always be found

When Thacher and I are out collecting, we first examine the ground, especially areas where debris has washed, to see if there are any dead shells. If so, we then try to locate where they are hiding. If we find no dead shells we might as well move on.

Our only conclusion, after collecting *Rabdotus* for several years, is that they are where



*Rabdotus dealbatus mooreanus* (Pfeiffer, 1868); Wonderland, San Marcos, Texas; Collector, N.A. Gary; Spring, 1964.



*Rabdotus alternatus mariae* (Albers, 1850); Boca Chica Historical Marker near Brownsville, Texas; R.T. Gary family; Aug. 1967

During a shower I found the snails crawling on any type of shrubbery available at Boca Chica Park, near Brownsville. Months later, in the winter when it was cool, I could find none there. Pilsbry stated that *Rabdotus* probably wintered-over in the soil or humus. They may do this to a certain extent. I dug every place that seemed likely, but found none at Boca Chica. Determined to find them, I started thinking like a snail, "Where would I go in a place that is painfully cold at times and very wet (often standing in water) much of the winter?" Suddenly the answer came - under the "skirts" (dead leaves hanging downward) of the yucca growing in the area would be just perfect. The "skirt" would shed the water and give about six inches of insulation against the few cold spells. With a careful examination (and I do mean careful, as each leaf of the yucca has a very sharp point), we were able to find two to ten under each "skirt".

during the warm months attached to a delicate multi-branching plant less than two feet high, commonly called broomweed. This is in the river bottom area. Atop a bank, from fifteen to twenty feet higher, adjoining this, begins the habitat of the *Rabdotus moorianus*, which can be found attached there to the walls of wooden buildings and around fence posts in large numbers. They have both been able to not only survive here, but in large numbers, over a period of at least twenty years despite at least one Girl Scout nature study collecting trip of nearly one hundred girls each summer. I have also often taken shell club members from many parts of Texas to that area to collect.

We have found the snails in several locations on Johnson Grass; in other areas deep down in the humus; on willows; on crepe myrtles; on century (agave) plants; and on Bois d'Arc trees. Once, while collecting, we were on a road dump in south Texas leading to a bridge, when I looked down into the river bottom land and saw white spots all over the fence posts, thirty feet below. I told Thacher, who turned the car around as soon as we found a suitable spot and we returned to investigate. The white spots were *Rabdotus*, as we had hoped. The posts were loaded with them, yet we found none anywhere else in the area. This made us dub them *Rabdotus* "fenceposti"!

you find them. Each colony seems to have its own set of characters that allow it to survive where it lives.

Elsie M. Chace

Austin W. Cheever

E. Flynn Ford

Florence E. LaFayette

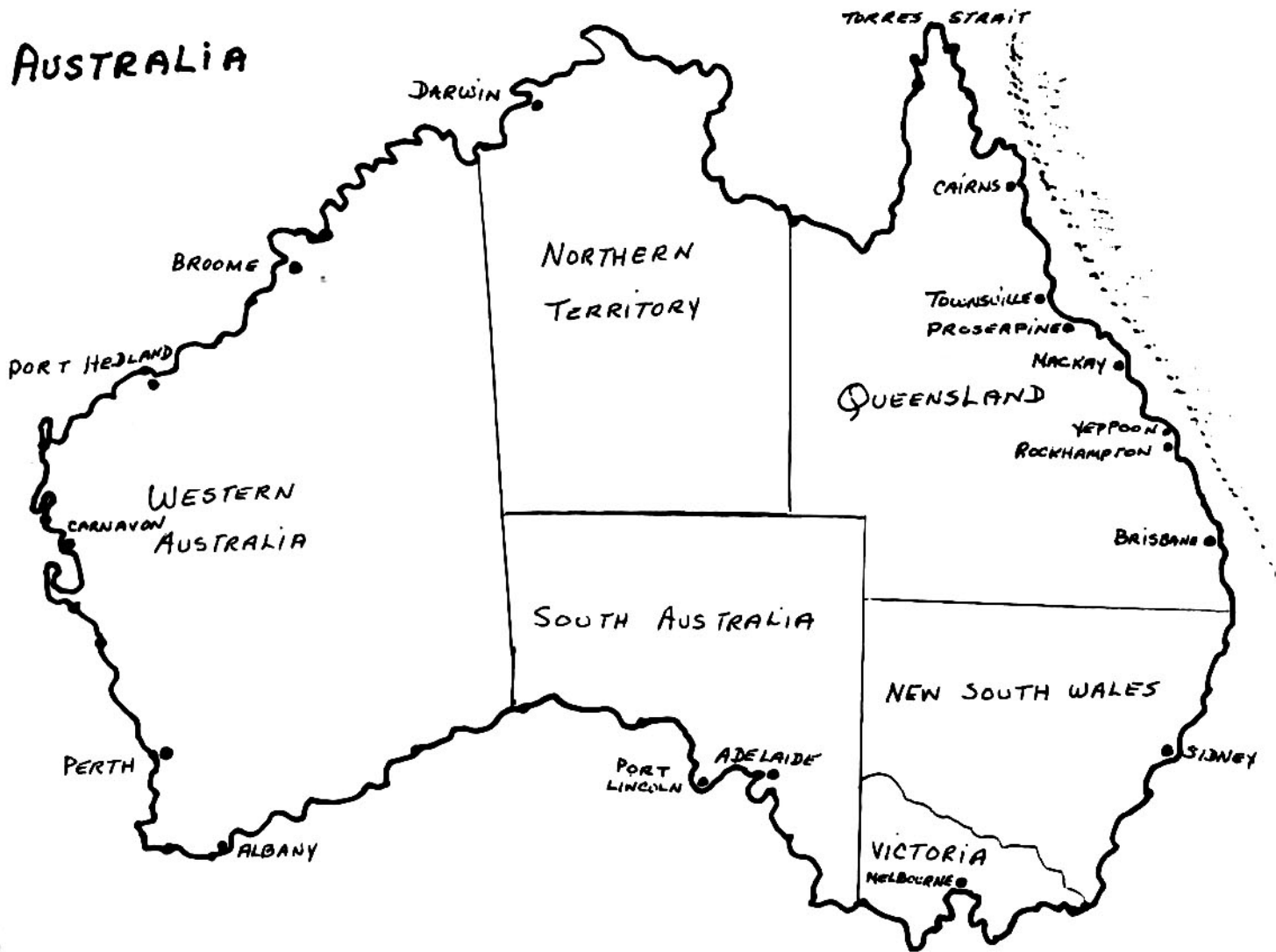
Marguerite Stix

**IN MEMORIAM**

After a hard day of looking for snails without success, I asked some teen-agers at the pool in the park at Del Rio if they knew where we could find them. I find that youngsters are often quite observant. One young man said they were plentiful out by the Del Rio Air Force Base gate. How right he was! They were stacked up on the plants like mesquite trees, Johnson Grass, prickly ash and anything else

# Let's Go Shelling I (5)

## AUSTRALIA



**JAPAN** (Continued from Summer 1974)

Locality: Sagami Bay, Honshu Island

To reach there: car, air, train

Best collecting months: April, May, October, November - avoid June to September

Climate: dry, cool, 50°-70°

Getting around while there: car, taxi, guide, tours

Accommodations: many hotels

Type of collecting: day, night, beach, scuba, shallow-water, snorkeling

Available for hire: guides, boats and motors, car, snorkel and scuba equipment

Things not available: everything available, but prices are high

Shell shops: at Kamakura

Special shells to look for in area: many common species; best shells are trawled in deep water and you must buy them.

Would you recommend this area to others: not really, suggest areas to south or at south end of Kyushu Island.

General information: shells are very popular here, many shops and dealers. Many species are part of the cuisine and may be found in restaurants, fish markets and from fishermen along the coast. Most all of Japan is overcrowded - in the summer months the beaches and reefs are jammed. The water is cold and wet suits are needed for scuba diving.

## AUSTRALIA

Locality: Cairns, Queensland

To reach there: car, boat, air, train, bus

Best collecting months: dry cool winter, April to October; hot wet summer, November to

March.

Getting around while there: car, taxi, guides, tours

Accommodations: many hotels

Type of collecting: day, night, beach, shallow water, snorkeling, scuba, dredging, flats, reef

License required: yes, \$4.00

Available for hire: boats and motors, cars, snorkel and scuba equipment, shelling trips

Things not available: nothing - travel light

Shell club & shops: both locally

Special shells to look for in area: *Conus*, *Cypraea*, *Voluta*; all Indo-Pacific varieties

General information: a number of boats are available for hire for shelling trips during suitable weather, \$100 and up per day.

Locality: Orpheus Island, near Townsville, Queensland

To reach there: boat

Accommodations: there is a hotel resort

Type of collecting: day, beach, shallow-water rocks, guided trips

License required: no

Available for hire: guides, shell trips

Things not available: all personal collecting gear and equipment

General Information: island is small and you can hike to the bays for the low tide collecting. Hotel hosts will take collectors around by boat.

Locality: Mackay, Queensland

To reach there: car, air, bus, train

Best collecting months: anytime, better in the winter, April to October

Getting around while there: car, taxi

Accommodations: many hotels

Type of collecting: day, night, beach, reef, shallow-water

Available for hire: shelling trips thru the local shell club, cars

Things not available: bring all personal gear

Special shells to look for in area: *Cypraea*, allied cowries, *Murex*

Locality: Yeppoon, Keppel Bay, Queensland

To reach there: car, air, bus, train

Best collecting months: May to October (Nov. to April is hot, humid; insects and sea pests abound)

Getting around while there: car

Accommodations: several hotels and motels

Type of collecting: beach, shallow-water

Available for hire: car, boats and motors

Shell clubs and shops: both located here

Special shells to look for in the area: most volutes must be purchased, some species are becoming scarce.

General Information: a car, boat and motor are necessary for most collecting. There are some good beaches a few miles out of town

Hints for Reef Visitors (from the book, "Guide to Australia" by Osmer Hill, McGraw-Hill publishers).

"December to early April is the cyclone season and, in spite of what the travel brochures say, this is not a good time for people unacclimatized to the tropics to visit the reef. Insect pests are at their worst and the incidence of dangerous marine creatures such as sea-wasps, stonefish and Portuguese men-o'-war is higher than at other times of the year,

"Personal equipment should include light leather or canvas boots with a fairly stout sole for walking on coral. Light slacks and long-sleeved shirts offer some protection against coral cuts and grazes which can occur as a result of an accidental fall. Such injuries are painful and infect easily. Gloves should be worn by shell collectors.

"Dress at tourist centres is casual - beach wear or swim suits during the day, with a change to light tropical clothing during the evening. A light woolen pullover or cardigan and a light raincoat are useful items. Tropical showers can be sudden and chilly."

Locality: Albany, Western Australia

To reach there: air, car, train, bus

Best collecting months: September to December

Climate: cool, 60° to 70°

Getting around while there: car

Accommodations: yes, several

Type of collecting: Day, beach, snorkeling, reef, shallow water, scuba

Available for hire: cars

Things not available: all diving equipment, rubber boots

Shell shop: yes

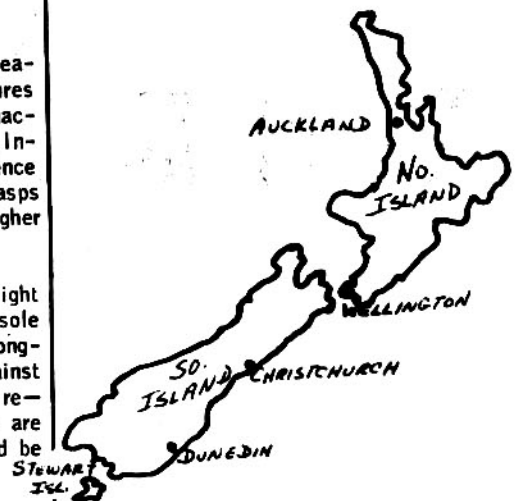
Special shells to look for in the area: *Cypraea*, *Cassis*, *Conus*, *Cymatium*, *Voluta*, *Haliotis* and many good bivalves.

General Information

The south coast is a difficult shelling area; very rugged and has few areas with shallow water coastal fringe. The help of a local collector would be advisable. After winter storms (June to August) good shells can often be found in a few areas. Abalone divers sometimes collect good deep water species. No dredges or trawlers operate around here. Local collectors welcome visiting collectors and are interested in exchange of specimens, so take along your good extras.

Do you have information on these or other collecting areas? Let us know about them!

## NEW ZEALAND



### NEW ZEALAND

Locality: Queen Charlotte Sounds, Picton, South Island, New Zealand

To reach there: car, train

Best collecting months: December, January, February

Climate: dry, warm, 85°

Getting around while there: boat

Accommodations: in Picton

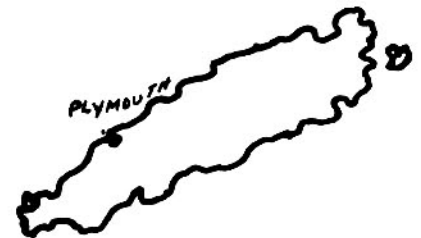
Type of collecting: dredging, flats, reef

Available for hire: dredging trips, shelling trips

Things not available: bucket and knives

Special shells to look for in the area: *Pecten*, *Astraea heliotropium*, *Tellina* (some quite rare).

### TOBAGO ISL.



Locality: Tobago Island off Trinidad, West Indies

To reach there: air, boat

Best collecting months: February and March

(Continued in our next issue.)



# WHALES NEED YOUR HELP



## Here are 7 ways YOU can save whales from extinction

- 1) Refuse to buy Japanese and Russian goods until these countries' whaling practices end.
- 2) Explain to merchants and dealers the reasons why you are boycotting.
- 3) Telephone store managers, distributors, embassies, consuls, and foreign missions and politely enlist their help in trying to influence the Japanese and Russian governments on whaling.
- 4) Write letters expressing your views on whale conservation to the editors of newspapers, periodicals, and newsletters.
- 5) Wear a whale button (available from us—\$1 donation, please) to show your concern.
- 6) Circulate a boycott petition (we'll supply them) at your office, school, club, or in a public gathering place.
- 7) Write the following companies explaining your views on the boycott:

**HONDA**  
American Honda Motor Corp.  
100 W. Alondra  
P. O. Box 50  
Gardena, CA 90247

**JAPAN AIR LINES**  
655 Fifth Avenue  
New York, NY 10022

**NIKON**  
Nippon Kogaku  
623 Stewart Avenue  
Garden City, NY 11530

**PANASONIC**  
200 Park Avenue  
New York, NY 10017

**CANON**  
10 Nevada Drive  
Lake Success, NY 11040

**DATSUN**  
Nissan Motor Corp.  
560 Sylvan Avenue  
Englewood Cliffs, NJ 07632

**GEISHA BRAND (tuna, clams)**  
Nozaki Associates, Inc.  
1 World Trade Center  
New York, NY 10048

**AEROFLOT SOVIET AIRLINES**  
545 Fifth Avenue  
New York, NY 10017

**HITACHI**  
437 Madison Avenue  
New York, NY 10022

**SEIKO TIME CORP.**  
640 Fifth Avenue  
New York, NY 10019

**SONY**  
9 West 57th Street  
New York, NY 10019

.....  
**PLEASE HELP US MAKE THE BOYCOTT EFFECTIVE—  
THE MORE YOU DO, THE FASTER WHALE PROTECTION  
WILL BE REALIZED, AND WE CAN CALL OFF THE BOYCOTT**  
.....

Let us know if we can supply you with additional information  
**RARE ANIMAL RELIEF EFFORT, INC. 950 Third Ave., N.Y., N.Y. 10022**  
(a tax-exempt, nonprofit organization devoted to endangered wildlife)

## The Poets' Page

### A TRUE SHELLERS CREED

H - obbies are for fun, we should all agree  
 A - nd you find many exciting beauties, down by the sea  
 P - icking up a sea shell as we go strolling by  
 P - utting them in buckets  
 Y - ou'll catch another "sheller's" eye.

N - some collect for beauty, take just a few for trade  
 E - at all the goody meat they give  
 W - ith caution - pollution - does invade.

Y - ou should select with great care  
 E - ven tho you see a lot  
 A - lways leave the damaged ones  
 R - egardless of what you've got.

MINNIE LEE CAMPBELL

### BALLAD

May your hobby always bring you  
 Memories that sweeter grow  
 Bring the joys that heart will treasure  
 Through the years that come and go,  
 May your hours be filled with gladness  
 And - when evening shadows fall,  
 May you say, that each new species,  
 Was the finest one of all.

J. B. HENRARD

### SHELL POETRY

If only there were words to tell  
 The way I feel about a shell -  
 Whose intricately sculptured mask  
 Imposes such a human task  
 To reconcile this Master Plan -  
 With amateur attempts of Man -  
 How can we still be unaware  
 Of God's great understanding care!

VIVA FAYE RICHARDSON

### SEA SHORE

Your pounding, vicious, rolling wave  
 Has sent many a sailor to his grave  
 And yet you can so gentle be  
 Glistening in the sunlight, oh mighty sea.  
 I see the fury of your pounding power  
 As I watch you by the lonely hour  
 And I see the gentleness of your wave  
 Telling me of seamen ever so brave.  
 I see the creatures you give life and home  
 As through the watery world they roam  
 And sharks live in perfect harmony  
 With starfish and the sea anemone.  
 You are as unpredictable as a mermaid,  
 Sometimes hot, sometimes a shade  
 But always changing in your mood,  
 Be it gentle, powerful or crude.  
 As I watch you, bolsterous rolling sea  
 I wonder if you have a lesson for me?  
 Are you like the paths of my life  
 Sometimes gentle, sometimes strife?  
 Tell me the secrets that I may be  
 Rough, tender, or tranquil as the sea  
 and through your example I may find  
 My rightful place in all mankind.

SHERMAN LEE POMPEY

### A SHELL

Out of the Sea which gave it birth  
 To cast it's beauty on the earth -  
 This tiny Artisian of Time,  
 Building with patience, sand and lime,  
 Tier upon tier, it's precious home  
 Of slender spire - or vaulted dome,  
 With inner chamber lined with pearl  
 In multicolored rainbow whirl.  
 Now I, who walk upon the sand,  
 Holding perfection in my hand,  
 It matters not if poor I be,  
 Part of the world belongs to me,  
 I reach -- and touch Eternity

MARIE RATHBUN

### LA MER

The calm and beautiful -  
 The enormous vastness, yet wild and turbulent  
 All these can be La Mer  
 There is something in her call that beckons me  
 to come  
 I hear her song - splashing up against the rocks  
 then ebbing the shore  
 I know her tenderness when my feet sink into the  
 sand and feel the gentle rippling  
 waves over them  
 The next big wave caress me as it softly  
 kisses my face  
 La Mer - delightful - charming - serene  
 Beneath the surface are the gardens of the deep  
 Where deadly, lovely and unique creatures  
 thrive  
 Where the shy octopi hide  
 The intricate and iridescent beauty of mollusks  
 The nudibranchs grace - like a bal lerina,  
 dance on in this paradise  
 La Mer - with all its enchantment,  
 Soft breaking waves in the distance  
 Then exploding white froth - mingled with the  
 purple, blue-green of its waters  
 La Mer.

JOSEPHINE YOUNG

## Tide Bits

### JANTHINA

While walking along the beach last December near Westport, Washington, Alan Rammer came across a large number of the jellyfish Vellela. These had been driven ashore by an onshore wind. Amongst the Vellela Alan was surprised to find specimens of Janthina. This is quite far north for these usually tropical snails, but they have been reported from this area previously, though not in recent years. So keep your eyes open for unexpected treasure when you walk the beach.

### AN INTRIGUING STATUE

While watching the Miss Universe Pageant last July (1974), something of interest to shell collectors occurred. The new Miss Universe was presented a gift, from the Philippine Travel Department, of a statue made from some 3,000 seashells. Willie Antonowitz of Charlotte, North Carolina brought this to our attention and we're both wondering if any of our readers have more information of the statue.

### GUAM SPECIES LISTS

Following the article on collecting in Guam which appeared in our last issue, we received a letter from Alex Roth who has been interested in the shells of that island for some time. In 1969 Alex put out a 16 page list of species found on the island and he would like to expand the list and bring it up-to-date. So if you've collected on Guam how about sending Alex the list of your finds. Write him c/o Tucor Services Inc.; P.O. Box 6128; Tamuning, Guam 96911 and get your discoveries noted.

## From the Low and the Meek to the High and the Mighty

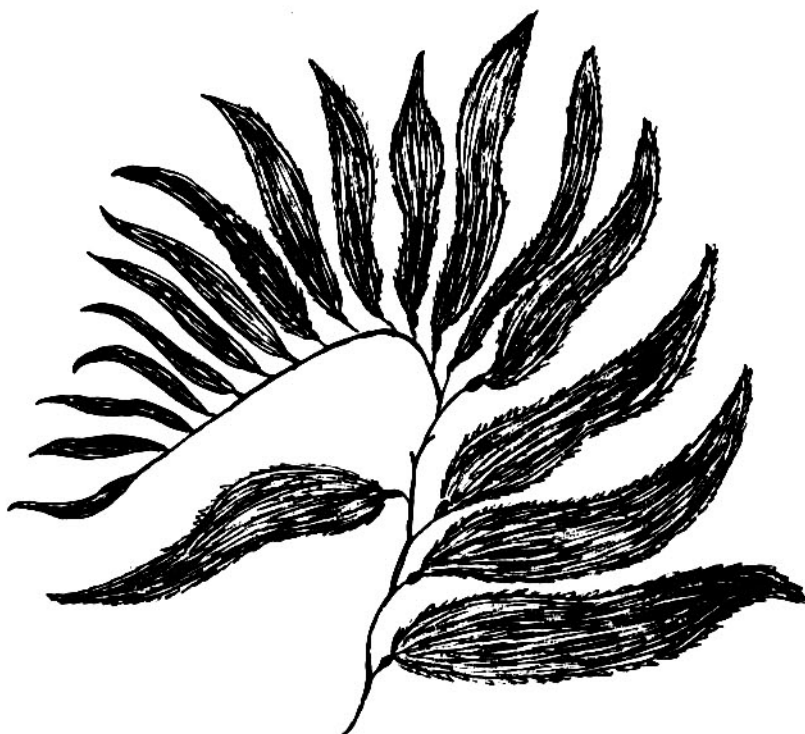
By VIVIAN ABREU\*

Before the first man walked on earth, primitive ancestors of the seaweeds we know today already flourished in ancient seas. The marine algae have altered with the passage of hundreds of millions of years, but even so, some of the primitive plants have changed very little and are found living in the oceans of the world at the present time. Included among the marine algae are seaweeds, found throughout the oceans of our planet, from the equator to very near the poles.

There are four groups of seaweeds: the red, brown, green and blue-green species - the latter being very small organisms and the least common in salt water. Along coastlines where the sea is constantly in motion and the tides mix the runoff waters of the land with salt water are the most favorable areas for seaweeds. Mineral salts from the land runoff waters are filtered and spread into the sea's shallow waters and warm rays of sunlight are able to penetrate to the sea's floor above the continental shelves that are offshore from the land. These conditions combine to create a near perfect environment for plant life to thrive in the ocean. Although algae have special habits and demand certain climates and seasons for growth, different species grow in areas from extreme high-water lines down to depths of fifty fathoms or more, being most abundant along rocky shores.

Several thousand species of seaweed are known and classified, assuming a great variety of forms. They vary in size from one one-thousandth of an inch in diameter to species that grow several hundred feet in length and form dense submarine forests. Within the four color groups, interesting species occur that have distinctive characteristics. One minute organism, *Pyrocystis noctiluca*, is luminous and believed to produce some beautiful phosphorescent effects often seen in tropical waters. Blue-green algae contain, in addition to their normal chlorophyll, a blue substance. This substance will dissolve in water when released from the plant's cells, so when algae plants of this species die in large numbers, the seawater in the immediate area will turn a dark blue color. The same process occurs in the little algae, *Trichodesmium*, that periodically stains the seawater where it grows and dies with a red color. This natural process is said to have been the reason for naming the Red Sea. (SANDERS)

In the area between the Canary and Cape Verde Islands, a vast growth of yellowish brown seaweed covers as much acreage as the continent of Europe and is called the Sargasso Sea. The undulating seaweed composing the thick island-like masses is *Sargassum bacciferum*, commonly known as gulfweed. The plant



MACROCYSTIS PYRIFERA - BULL KELP

is the most highly differentiated of any seaweed, and approaches the nearest to true leaf and stem form.

One giant of the waters of the northwest American coastline is *Nereocystis luteana*. It has a stalk, sometimes in excess of three hundred feet long, which bears a barrel-shaped air bladder, six or seven feet long, on the end of the stalk. From the surface of the air bladder, a tuft of fifty or more forked "leaves" grow to a length of thirty or forty feet. The stem which anchors this immense frond is so small that it is used for fishing lines by the Aleutian Indians.

The longest of all algae is *Macrocystis pyrifera*, found on the Pacific coast of North America. It has a thin, bare stem which seldom exceeds one-quarter of an inch in diameter, but grows to more than seven hundred feet in length and terminates with a "leaf cluster" fifty feet in length.

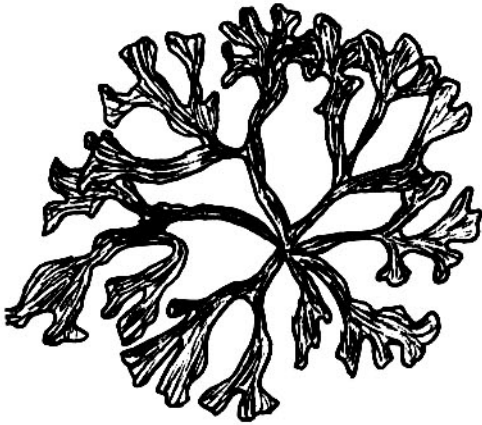
In every kind of marine animals there are species which derive all or part of their nourishment from seaweeds. In the giant kelp beds of the Pacific and the Sargasso Sea of the Atlantic, millions of living creatures make their home. This fact alone is enough to show how valuable seaweeds are for marine environments that benefit humans, and seaweeds are also of great value and importance in almost every other aspect of human needs.

The red seaweed species are very numerous, have a wide variety in their fronds, a delicate texture and colors that range from pink to purple, making them the most attractive in appearance of all seaweeds. They have attained the highest development of marine algae because of their mode of reproduction which resembles that of flowering plants. They are not as large as species of the brown group and do not have the forms that so closely resemble stems and leaves. Red seaweeds grow from just below low tide line down to the greatest depths possible for plant life. They are plentiful off the coasts



SARGASSUM BACCIFERUM





AN INDIVIDUAL FROND OF IRISH MOSS

of Florida and California in warm waters where they are often found washed ashore. As higher forms of marine algae, the red group of seaweeds reproduce by spores, formed and thrown off into the sea to sink or drift to favorable positions where they germinate and begin a new cycle of life. Most of the spores begin their growth immediately, without regard to seasons, so new generations of the species are forever present.

*Chondrus crispus* is a perennial red seaweed commonly known as Irish Moss or Carrageen. Shallow tidal pools and shaded locations in deep, cool water are preferred by the plants and they are abundant in areas all around the world, being especially plentiful around the coast of Ireland. The seaweed is edible and, in Ireland, people have harvested and eaten it for more than 600 years, giving it the common name of Irish Moss. Gatherers of the algae were known as "mossers" and most of them came from the Carrageen area in southeast Ireland, hence the other common name Carrageen.

The plants of *C. crispus* grow from holdfasts at the base of the plants. A holdfast is simply a part of the plant that does just what the name implies, holds fast to any submerged material and acts as roots for the security of position only. Seaweeds are nourished by the substances contained in the water surrounding them.

From the holdfasts of Irish Moss, compressed or flattened stems gradually expand in forked, fan-like manner into branched fronds. The plants vary greatly in size and color, according to the conditions of their habitations. In shallow water the plants are pale colored and stunted in size, but in deeper, cool water, they grow in dense masses and are reddish green or purplish red in color. The plants are beautiful and, as perennials, rest during cold winter months. During this time all that can be seen of the plants are the holdfasts.

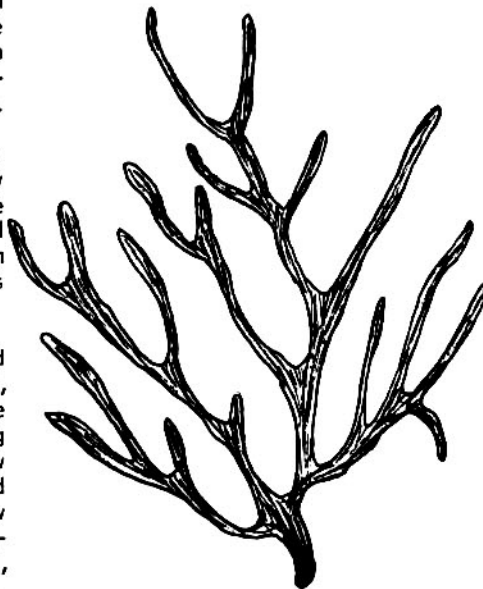
Hundreds of years ago, the people of the British Isles used the seaweed in many ways. It was dried and boiled and used as the basis

of delicious pudding somewhat like blanc mange, and it was used to make jelly. When mixed with lemon juice the dried seaweed was used as cough medicine. Later on, a substance derived from the seaweeds became known as carrageenan, an extract that made possible the continual expansion of the seaweed's use to mankind.

*C. crispus* is not difficult to harvest unless the weather makes rough seas. The plants are either raked or picked by hand from their beds in the sea. After storms, great quantities of Irish Moss are washed ashore where it can be gathered up with a minimum of effort.

Irish-Americans exploring the coastline of Massachusetts 140 years ago, discovered a seaweed which was the same as the Irish Moss of their homeland. The discovery of the abundant seaweed launched a profitable industry in Massachusetts that was the foundation for the modern industry of today. The hazards of harvesting are the same as 140 years ago and the industry is essentially unchanged except that the carrageenan produced from the seaweed is more refined. Today, the carrageenan produced in the United States is blended with Irish Moss products from many other countries, producing varying properties for different uses. Basically carrageenan is a form of gel and different products require different gels.

Carrageenan is what makes ice-cream melt evenly, ink flow smoothly, toothpaste and gelatin gel, makes firm pie fillings, gives paint spreadability and enables it to flow evenly, helps pet food to come out of cans cleanly and easily, imparts a gloss to hair when added to shampoo, and produces a substance used for the fine grinding of optical lenses.

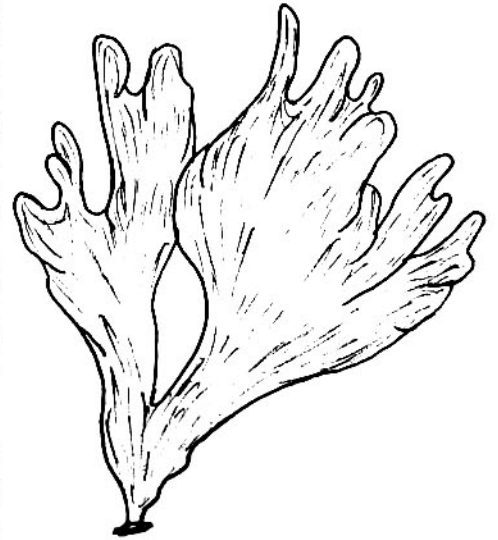


GRACILARIA

Several other species of red seaweeds are of impressive monetary value because of the numerous derived products used in manufacturing

non-food items in addition to a long list of food stuffs. One of the more important products of the red seaweed *Gracilaria lichenoides*, a species that grows in the seas of the Far East, is agar-agar, a preparation used in many food items and also for bacteriological, medicinal and dental purposes.

In the caves on the shoreline of Java and the islands of the Indian Archipelago, thousands of birds make their nests with the red seaweed, *Gracilaria spinosa*. The natives of the areas gather the edible nests and export them to China where they are used in making the well-known Chinese Bird's Nest Soup.



DULSE

Another red seaweed that was, and still is, moderately popular as food is *Rhodymenia palmata*, commonly known as Dulse. The plant grows in tufts, like grass, to a height of ten to twelve inches from its disk-shaped holdfast. Dulse grows on rocks and other seaweeds in cooler waters below the low tide line. The edible seaweed is gathered along the coasts of Ireland and Scotland and other coastal areas. It is eaten fresh from the sea in salads and relishes. Because of the high content of vitamins and minerals, especially when uncooked, Dulse has nourished many generations of humans. It is used as a thickening agent for sauces, gravies and soups; also, it is considered to be an excellent panacea for the after effects of sea sickness.

In the British Isles and in Norway, sheep and cattle come down to the shore at low tide and graze on the fronds of Dulse growing there, so in those countries, it is known as the sheep's weed. The Irish people gather Dulse and, after washing the plants and letting them dry thoroughly, use them as a form of chewing tobacco known as dillisc.

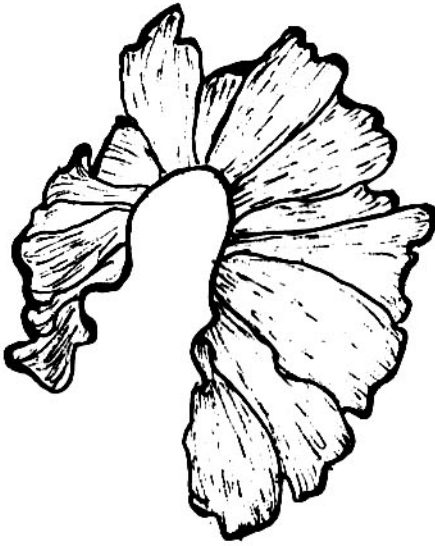
The earliest use of seaweeds was probably as food for primitive people and beasts. The pre-historic Chinese ate seaweed and used it

in other ways. Ancient Polynesians, usually living very near the sea, cultivated seagardens of edible algae. For more than three hundred years the Japanese have cultivated seaweeds and in present-day Japan the cultivation of seaweeds for food is still extensively practiced.

and wavy, while others have narrow, ribbon-like fronds. The plants are found everywhere and grow throughout the entire year.

Among the brown and olive-green seaweeds a wide diversity of plant forms are found. They vary in size from very small fronds to immense giants. The rockweeds are included in this remarkable group.

Found in tropical seas, *Taonia atomaria*, also of the brown seaweed group, has spreading fan-shaped fronds on which spores are arranged in dark wavy lines, imparting a mottled appearance and beautiful graduation of color to the plant. Another of the brown seaweeds with



PURPLE LAVER

Within the red seaweed group are various species of *Porphyra* which have high protein content and are very rich in vitamins B and C, making the algae valuable as food and well worth the effort of cultivation. The plants are also known as Laver. The Japanese *Porphyra* farmers of times past stuck bundles of bamboo poles into the bottoms of shallow bays where spores of the mature *Porphyra* plants could settle on them. Soon the bundles of bamboo poles were covered with tiny *Porphyra* plants, and when they were sufficiently developed, the bundles, with plants growing on them, were pulled up, separated and reset in estuaries where the water was less saline. The *Porphyra* continued to grow on the bamboo until ready for harvest. The same basic method of cultivation is still used except that the bamboo poles are often replaced by nets.

When the *Porphyra* plants are harvested they are washed, chopped and set on trays to dry. The resulting product is used in many food items and especially in one of the favorite oriental dishes which consists of boiled rice, formed into soft balls that are then rolled in chopped *Porphyra*. The Chinese make a *Porphyra* soup with rice balls dropped into the finished broth.

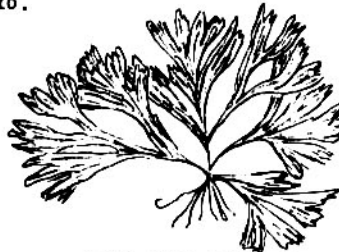
In England *Porphyra* is boiled to produce a kind of jelly which is formed into cakes and covered with oatmeal. The cakes are then fried resulting in the delicious and well-known "Laver Bread" of that country. The same food is made in Ireland, sometimes sold in shops and known as "Sloke".

*Porphyra* plants are of various shades of purple, some having broad fronds that are thin



LEATHESIA

One common species of brown seaweed, *Leathesia difformis* or *L. tuberiformis*, is found on every coast during the summer months, growing in bunches on other algae or sand-covered rocks. It has a singular form, resembling a tuber and cannot be mistaken for any other plant. The fronds of *Leathesia* are gelatinous, fleshy balls, one-half of an inch to two inches in diameter, being solid at first and becoming lobed and hollow later. It is called the Sea Potato.



DICTYOTA DICHOTOMA

A seaweed often seen on southern shores is *Dictyota dichotoma*. Growing in tidal pools of warmer waters, the plants have fronds of olive brown that are forked into many divisions, forming tufts that are six to ten inches long.

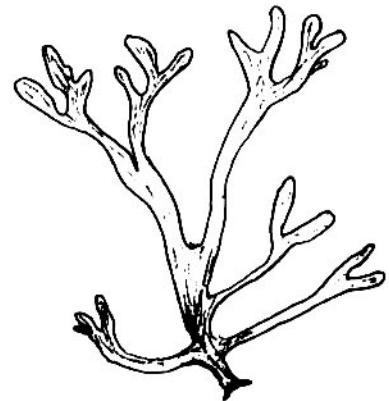


TAONIA ATOMARIA



PADINA PAVONIA  
THE PEACOCK'S TAIL

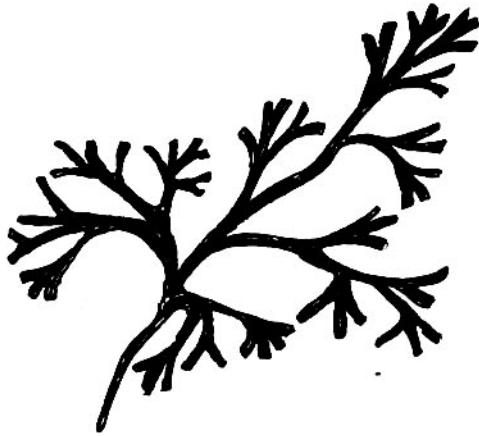
broad fan-shaped fronds is *Padina pavonia*. In this plant, several "leaflets" grow from a stalk like base and each is fan-shaped, growing in overlapping positions. This is a lovely algae and is called "the Peacock's Tail", being very similar in appearance to the tail of that regal fowl. *P. pavonia* grows on stones at low tide line and is common on southern shores, attaining luxuriant growth in tropical seas.



HALISERIS POLYPODIOIDES

The Sea-Endive, *Haliseris polypodioides*, grows along the Atlantic coasts of North and South Carolina, all the way down into the Florida Keys where it is abundant. Of olive green color, the fronds are flat, forked, notched on the lower parts and grow in tufts.

*Fucus vesiculosus* is one of the two species of rockweed that is common on the Atlantic coast north of New York. The plant has tough, leathery fronds that grow up to two feet long on forked branches. The terminal branches have receptacles which are swollen and filled with gelatinous matter. It grows in thick bunches attached to rocks between the tide lines. *F. vesiculosus* produces a product that is used in medicine for the treatment of obesity. (See illustration at top of next page.)



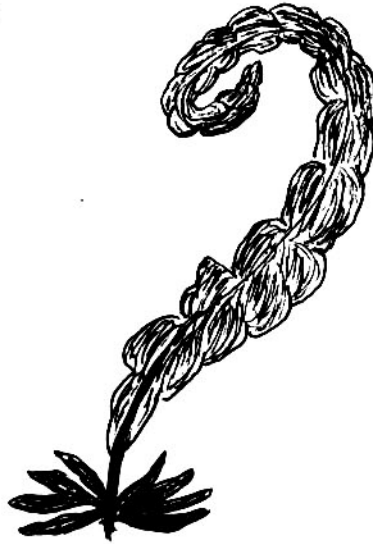
FUCUS VESICULOSUS

Of particular interest, *Sargassum bacciferum*, the yellowish brown seaweed which forms the floating islands of vegetation in the well known Sargasso Sea, grows attached on the Florida Keys and in the West Indies. Quite often the ocean currents bring pieces of *Sargassum* northward where it is washed ashore. The fronds are long, narrow and sharply toothed. Air-vessels, resembling berries or bunches of small grapes growing on short stalks, form on the branches of the plants. In the Sargasso Sea the plants flourish and in a watery jungle of the seaweeds, millions of living creatures make their home and reproduce their species. In these lush underwater jungles, nature's food chain is complete. The Sargasso Sea is a natural wonder to navigators and scientists because the immense mass of seaweed is held in a huge eddy by the ocean's currents.

In the Order Laminariaceae, another of the brown seaweeds form great masses of cylindrical fronds which look like meadows of waving grass under the surface of cold northern seas. *Chorda filum* plants grow a holdfast to an unusual length of from one to twelve feet, but sometimes attains the length of forty feet. When the fronds are young they are covered with fine, transparent hairs, turning dark brown and leathery as they grow older.

A sub-Arctic seaweed grows on rocky shores in the cold waters of the Atlantic. Frequently found north of Cape Cod and along shorelines in Scotland and Ireland, the plant is known as Winged Kelp because of its growth form. A cluster of small "leaflets" grow out of the stalk at the base of a large main frond on both sides of the plant's stem, looking just like feathery wings. The main frond grows to ten feet in length and from two to ten inches wide. The "leaf" is often torn and ragged with a wavy margin and a distinct midrib which is lacking in the smaller "leaflet" wings. The Winged Kelp, *Alaria esculenta*, is an edible alga and used as food in Scotland and Ireland, where it is known as Henware, Badderlocks or Murlins. (see illus. top of page, next column)

Giants among seaweeds, the genus *Laminaria* have a wide geographical range and are more numerous in species than any other of the Order Laminariaceae. Some have intriguing

ALARIA  
SUB-ARTIC  
WINGED KELP

common names such as Oarweeds, Tangles, Devil's Aprons, Sole Leather and Ribbon Kelp. *Laminaria saccharina*, the Sea Tangles, have short, solid stems and narrow ribbon-like fronds of three to thirty feet long and six to eighteen inches wide. The fronds are semi-transparent with wavy margins and a central band of depressed spots. The olive green seaweed derives its name from the saccharine matter called mannite that is present in its chemical composition. The Sea Tangles live on northern shores of both the Atlantic and Pacific Oceans.

*Laminaria digitata* is named from the hand-like form of its fronds. The stems, thick, solid and round, are one to five feet long and bear smooth, leathery, brown fronds. The stem of this plant is sometimes used by fishermen for knife handles. The sharp knife blades are fitted with sections of the seaweed stem when it is fresh from the ocean and as the stem sections dry, they contract and become solid, fitting the blades firmly, making lightweight but efficient handles.

Along the Pacific coasts of Canada, the United States and Baja California, the largest seaweeds of all form dense, shadowy forests that shelter countless marine animals. The Giant Kelp, *Macrocystis pyrifera*, grows faster than any other plant in the world, sometimes adding more than two feet to its canopy of "leaves" in a single day. One frond may measure more than 200 feet long from the base to the tip. The monstrous plants are anchored by root-like clumps of pencil-sized strands that cling to rock crevices and the sea bottom with most tenacious grips. In calm waters, the holdfasts sometimes grow to four or five feet in height and eight to ten feet thick. *Macrocystis* is commonly known as Bull-Kelp and forms underwater forests that cover miles of the ocean's bottom. At low tide the upper fronds of the towering plants float like a brown blanket



UPPER FROND OF BLADDER KELP

on the surface of the sea. The main stalk branches into several long, smaller stalks, and each of the smaller stalks bears a number of leafy blades, one to two feet long, which have air-bladders at their bases. The gas-filled bladders are called pneumatocysts and grow to golf ball size, supporting the massive stalks and keeping the fronds afloat in the cool ocean water.

In the sun spangled waters off Baja California, the towering kelp forests furnish both food and shelter to a teeming population of marine creatures. Kelp crabs, well camouflaged, and top snails graze along the fronds of the plants. Multitudes of rock scallops, abalone, spiny lobsters, sea urchins, worms, crustaceans of many sorts, eels, anemones, sea slugs, sea stars, hydroids and brightly colored, exotic looking fish inhabit kelp forests. Sea otters dive down into the kelp fronds to capture sea urchins. When the otters pick up an urchin, they pick up a flat stone at the same time, then, rising to the sea's surface, the otters float on their backs, using their chests as tables, and break open the urchins against the flat stones and eat the flesh.

The prickly sea urchins munch on the kelp holdfasts, chewing through the seaweed's base, causing the buoyant fronds to float away on the ocean currents. Then the animals, deprived of the kelp forests' shade, safety and food supply, drift away too, and soon the teeming world of creatures and the forests begin to vanish.

Up until about twenty years ago there was no concern that the kelp forests would ever die out completely. In fact, most people considered kelp as a nuisance that blighted beaches with tons of broken and tangled fronds, especially after storms had torn the plants loose from their moorings on the sea's bottom. Fishermen cursed the seaweed for fouling their fish-



lines and nets, but to other people kelp was a profitable crop, to be harvested and sold.

Originally, kelp was harvested simply by gathering up the loose fronds that washed ashore. The plants were a good source of potash that was needed for many commercial purposes. Iodine is obtained from kelp plants also and the demand for these natural products turned the gatherers on the beaches into harvesters who went out in boats to cut the fronds with knives attached to long poles. From the massive forests off the shoreline of the San Diego area, 75,000 tons of kelp was harvested every year during the early part of this century and the years of World War I. The giant seaweeds were found to be the source of an unusual chemical called algin. When extracted from the kelp, algin has extraordinary powers and has become a commercial product of great importance. Algin is used in many foods to make them smoother and more solid, to bind oils and watery fluids together and to prevent separation in containers. The seaweed extract is used in items such as paints, cosmetics, paper and rubber products, textiles, fertilizers, pharmaceutical and chemical products. And, the harvesters with the poles soon gave way to ships pushing huge cutting racks through the water, mowing and hacking swaths of twenty feet wide and loading the kelp aboard on conveyors. Gradually the kelp beds started to deteriorate and, finally, the fact became apparent that the underwater forests were in serious trouble.

No single reason was found to explain the vanishing kelp beds, so scientists went to work to find out why. Overcutting was harmful, but not the only culprit connected with the mystery of the vanishing kelp forests. Pollution of coastal waters shared the blame, however, the scientists regulated the kelp cutting and found that Giant Kelp often flourishes near sewer outfalls. Further investigation revealed that humans had indeed contributed to the decline of the kelp forests, but were not the direct cause. The crime mankind had committed was the almost complete extermination of the shy and loveable sea otters.

Sea otters find the spiny urchins of the kelp forests delicious treats and devour them with gusto. The urchins were once kept in check by the otters, and could do little harm to the kelp forests. During the 1800's fur hunters almost killed out the total sea otter population. Without the otters to devour urchins, the creatures had multiplied rapidly, and in the areas where there was sewer waste, the urchin populations were unusually large. Protected from most predators by their prickly armor, the sea urchins had munched away on the kelp's holdfasts unmolested, eating the anchors of the giant seaweeds and severing fronds that drifted away and washed ashore. And so, the true culprits of the kelp mystery were the little creatures that resemble pincushions.

There were not enough otters left alive to keep the urchins under control, so caustic

quicklime was spread over the kelp forests. The quicklime particles settled on the urchins, burning and killing them by the thousands without harming the living kelp plants. It was not long before the kelp beds began to restore themselves. Today the forests have reestablished their ecological stability and have grown into great submarine kelp beds almost as large as those of sixty years ago.

Harvesting was resumed under strict regulations and 155,560 tons of kelp were cut in 1973 off the coast of California. The fish and other sea creatures have returned too, indicating that algin is not the only thing of value to be found in a kelp forest. (Editor's Note: sea otters have also been reintroduced into the kelp forests of California's coast and are doing splendidly)

Another genus of brown seaweed is *Lessonia*. This plant grows erect to a great height and has a stem like the trunk of a tree. The stem branches, fronds of two or three feet in length hang down, giving the plant the appearance of a submerged palm tree.

A fascinating group of plants are the green algae, most widely diffused of plant forms. They grow practically everywhere and include species of freshwater, land and sea. They are more simple in structure and lower in order than the red or brown algae, many of them being minute single cells. The plants of the Order Ulvaceae show the earliest type of an expanded leaf and all are mostly colored a brilliant green. They grow attached by small holdfasts to rocks and stones in almost every body of salt water. They are commonly known as Green Laver.

The largest of the green seaweeds is *Ulva lactuca*, the Sea Lettuce. It is very common and is usually found in rock pools between the tide lines, especially in water that is polluted by sewage discharge. It consists of a thin, bright green, upright growth, very much like a lettuce leaf, attached at one end to a stone or the rock wall of a tidal pool. At one time, the edible plant was used as a substitute for purple laver, *Porphyra umbilicalis*, and appeared at dinner parties in the salad bowls. It is collected by Chinese fishermen and sold not only as food, but also as a medicine to combat fevers. *Ulva* is a purely marine genus, but it is very tolerant of variations in the salinity of the water in which it is growing and, sometimes, it may grow in estuaries that have brackish rather than salt water.

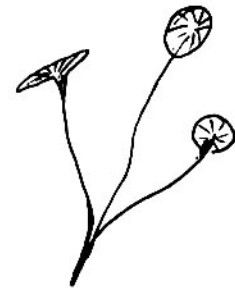
*Enteromorpha intestinalis* is another very common green seaweed belonging to the same family as *Ulva*. The plant grows in an upright form of a tube, about one half of an inch or so in diameter, which alternately bulges and compresses, giving the fancied resemblance to an intestine. *Enteromorpha* is often found growing in the upper part of the zone between the high and low tide lines, being particularly common in places where streams of freshwater dash down cliffs and wander over the rocks to the sea. Limpets are very fond of the plant which covers the rocks like soft felt, and they will

eat most of the growth in any one area of habitation.

In China and Japan the green laver is very often eaten, but its use as food has not been acceptable in western culture.

*Enteromorpha compressa* has long, slender, branched fronds with tufts and is bright green in color. This is a beautiful plant and is very useful as well as attractive in salt water aquariums.

Found only in tropical or sub-tropical seas, growing on sandy bottoms and coral, *Chamaedoris annulata* reaches a height of two or three inches and produces a dense tufted head about one and one-half of an inch in diameter. The small seaweed is bright green, rather rigid and tough with a holdfast of tufted fibers. When mature the seaweed is thinly coated with a limey covering. The species lives in the waters around the Florida Keys and is a native of the West Indies.



ACETABULARIA CRENULATA  
THE MERMAID'S WINE GLASS

Another charming member of the green seaweed group grows on the Florida reefs among rocks and coral. The little plant consists of a slender stalk which bears on its tip a ring of branches joined together, forming a cap, creating the appearance of a small toadstool or mushroom. When full grown the plant is only two or three inches tall and the cap only one half of an inch in diameter. The younger plants may reach only a fraction of an inch tall. *Acetabularia crenulata* is the plant's name and it is called the Mermaid's Wineglass by the romantic minded. *A. crenulata* has also been found in the waters of the Mediterranean Sea.



PENICILLUS DUMENTOSUS  
THE MERMAN'S SHAVING BRUSH



CODIUM TOMENTOSUM

In order not to discriminate in the matter of sex, the Merman's Shaving Vrush, *Penicillus dummentosus*, must be mentioned. This interesting seaweed has a much branched holdfast that penetrates deep into the coral reef or sand where it grows. The stem is short, thick, sometimes hollow, and has a velvety covering. From the top of the stem, a loosely spreading tuft of soft filaments grow up to four or five inches long, giving it the shaving brush appearance. The plants are deep green in color and as they grow old, they become encrusted with a thin layer of lime. (See illustration on previous page.)

The commonest seaweed in the world is *Codium tomentosum*. Though it is abundant in every latitude, it does not grow on the Atlantic coast of North America. Both the Gulf Coast of Florida and the Pacific Coast of the United States have many of the sponge-like plants growing in the sea. The fronds are circular, about as thick as a pencil, and covered with fine hair-like filaments, giving them a soft texture. The plants have a much branched form of growth and attach by holdfasts to rocks. When seen uncovered at low tide, the plants hang down from the rocks with a wilted look, but when the tide returns and the sea water covers them again, the plants float up and out into the water for twelve or more inches. *Codium* plants are the favorite food of the seaslug, *Elysia viridis*, and the dark green animals are often seen browsing on the seaweeds.

Growing luxuriantly in tropical seas, *Caulerpa mexicana* extends over large areas. The plants have prostrate, creeping forms of stems, with holdfasts below and leafy fronds above. Each plant is composed of a single cell, no matter how much it may extend or spread out into branches. The species is extremely abundant around the Florida Keys and sea turtles favor them as their chief food.

*Chlorella* is an important member of the green seaweed group. The unicellular green alga is interesting for several reasons. It is one of the algae that have been used in efforts to produce food material for people in the underdeveloped parts of the world. In recent years much attention has been given to the possibility of growing *Chlorella* on a scale that would make it useful

as a source of high grade protein, and *Chlorella* farms have been established on a small scale in various countries for this purpose.

Scientists believe that the idea of growing *Chlorella* in bulk, for human consumption, has distinct possibilities. A lot of research work on the idea was begun during the Second World War and is being continued in America and Britain. The research shows that the mass culture of *Chlorella* would produce a great deal of high grade protein, perfectly satisfactory for food, but, unfortunately, the capital required to cultivate the plant on a large scale is prohibitive. *Chlorella* is also important because it has been shown that the growth of the plants in shallow tanks is remarkably efficient in purifying sewage effluents.

The green seaweeds all share one feature that is significant to the history of the plant world. It seems reasonably certain, in the opinion of most scientists, that it is from the Chlorophyceae subclass of algae that the higher plants have sprung. They were the remote ancestors of all the liverworts and mosses, the ferns and their allies, the conifers and flowering plants that successfully left the water and colonized the land. There are no fossil records of how that colonization may have taken place, but we do know that it did happen, a very, very long time ago, and that the green algae are the forerunners of our garden plants of today.

Blue-green algae, Cyanophyceae, are a very primitive group and may have been living in the seas of the earth five hundred million years ago. This very ancient group is widely distributed with some species living in the soil, others in the sea and most living in fresh water. Many species have changed but little, if at all, since pre-Cambrian times. Most of the marine Cyanophyceae are found in the intertidal zone, usually growing on, and sometimes inside, other algae. A few are free-living forms, but all are of microscopic size.

Seaweeds have been much studied and a great deal of information has been obtained about them that is of vital importance to mankind. Apart from their actual nutritional values,

seaweeds produce by-products that are very useful to our modern civilization. The ancient plants are the most harmless plants in the world and, instead of being only a nuisance, as some people consider them, they may hold the answer to some of our present day problems and prove to be very beneficial to future generations.

(drawings by the author)

#### IN REVIEW

Continued from page 56

duplicates in sizes and colors. I remember when she talked to our South Florida Shell Club in 1965, gave a fascinating and hilarious program, and gained many helpful friends. Mrs. Sheets should also publish her "Adventure Story" and illustrate it with her own snapshots taken along the way.

In her home in Merkle, Indiana, visitors have thrilled to hear talks as she displayed some of her material. Everything was stored in carefully labelled clear plastic containers for ready reference. A well-lighted museum, a Nature Colorama, with dust proof cases, was a must. In her dedication to have an inland museum, Elva journeyed all over the world - to Fiji, Alaska, India, Australia and more. In the meantime, so as to reach more people who longed to know about sea life and shells, but were too far away or found books too technical, she wrote this book. The book is sub-titled: "Circling the Globe for the Wild Seashell" and it is written in language understandable for ordinary nonscientific people.

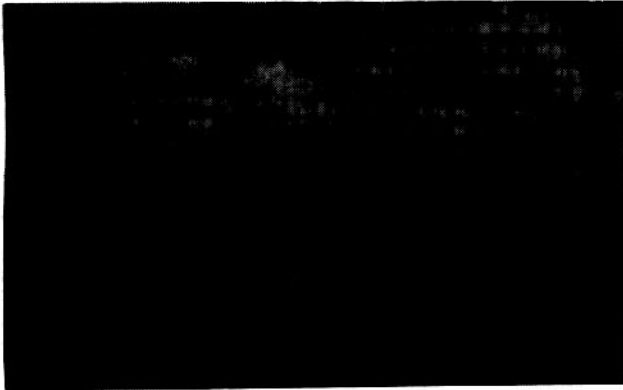
Here she tells about waves, sponges, jelly-fish, coral, sand dollars, tides, crabs, turtles, sea beans, odd shallow fish and, of course, shells. This information is well put together in a most interesting, well indexed book: "The Fascinating World of the Sea". Only last night someone showed me a mysterious white "thing" they had brought, but knew nothing about. I found two pictures in this book, a pleasing, vivid and detailed story about their "Venus' Flower Basket Sponge". We found its scientific name, its common names, how it lived, how marvelously it was made and how it was revered in Japan. My friends were thrilled to have so much fascinating information.

There is a full page foreword by the well known author of shell books, Dr. R. Tucker Abbott, in praise of this great effort. There is a listing of well known scientists who helped Elva work over her manuscripts to be sure all was correct. One whole page in the front of the book was written by the editor enthusing over Elva's beautiful shell creations. One gigantic circular design is seven feet in diameter. Two beautiful shell pictures are five feet tall. These perfections, like frosting on a rich birthday cake, took months of planning to work out the pattern, sort bushels of shells and arrange them in symmetrical, graduated rows, curves, scrolls and flower shapes. The three illustra-

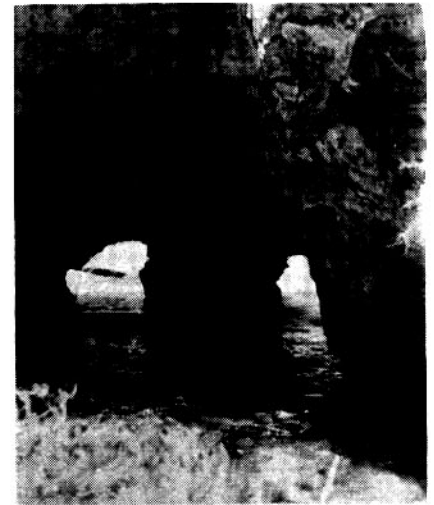
Continued on page 58, bottom right.

## Shelling on Saint Martin (Netherlands Antilles)

By EMILIO GARCIA\*



The author seated atop a mountain, the bay to the left in the background proved to be a very prolific collecting area.



The arches on Pointe du Bluff near "La Belle Creole", Saint Martin.

Good O! Father Kemps. It is so nice to arrive in a foreign land and have somebody waiting for you at the airport! He has lived on the island of Saint Martin for twenty years and not only does he know it like the palm of his hand, but he has even written a song that is sort of the "National Anthem" of the island.

My good friend Mike Lee and I had been thinking about this shell collecting trip for several months. We were fascinated with the topography of the island - so full of mountains and bays. And here we were! And with an expert to guide us!

Father Kemps had made arrangements for us to stay at a boarding house in the village of Grand Case, in the French section of the island and, after a wild drive through the mountains in his VW, there we were meeting Madame Chance, our hostess. Her fantastic Creole cooking has made her famous throughout the island and no wonder: stewed conch, broiled lobster, stewed *Cittarium pica*, stuffed local species of crab, stuffed Kingfish, etc., and all this accompanied with delicious French wines!

When we arrived in Saint Martin neither Mike nor I had the slightest idea of where to begin collecting. All the bays looked very promising, on the map - so we decided to go along with Father Kemps, who wanted to show us the whole island. After a beautiful tour and some investigating with mask and snorkel we scratched out a couple of bays in the southeast and decided to start in Philipsburg, the capital of the Dutch side of the island, but it was a bad start: some of the more common limpets and a slight sunburn was all we got.

\*University of Southwestern Louisiana  
Lafayette, Louisiana

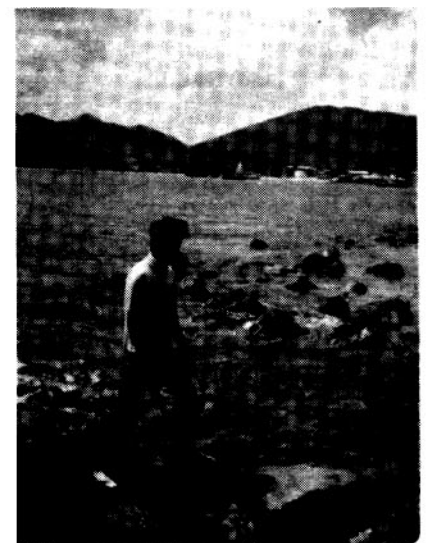
We were not having better luck along the southern coast when we arrived at Point du Bluff. In this peninsula of the island, several years ago, they had started to build a fabulous resort called La Belle Creole, which was to be a replica of a Mediterranean fishing village of the 18th century, but after spending about eight million dollars they ran out of money and La Belle Creole stays unfinished; and there it was, lonely, deserted, overlooking Marigot Bay and surrounded by a beautiful seascape. The area was very rich in chitons, some of which we had never collected before and, also some *Littorina*, *Thais* and *Astraea*. While snorkeling we also collected very heavily spotted *Conus spurius*.

Every day we would go collecting in the morning; then Father Kemps would pick us up around eleven and take us to Marigot (the capital of the French side) where he would have lunch with other Fathers in the Rectory. This gave us an opportunity to investigate Marigot and its surroundings very well, and in that area we found some beautiful, very large, *Astraea tuber*, two *Turbo canaliculatus* Hermann (the most beautiful and one of the least common of the Atlantic turbans), *Cymatium muricinum* Röding, *Murex pomum* Gmelin and *Fasciolaria tulipa* Gmelin. In the tide pools around the northeast point of the bay, we found a number of smaller species such as *Tegula lividomaculata*, of a beautiful bright orange color, *Columbella*, *Nitidella* and a live specimen of *Chlamys ornata* under a rock.

Although we spent a good deal of time trying to collect around Grand Case, it wasn't very productive. We did find, however, some very beautiful, clean, large and colorful *Murex pomum* Gmelin, as well as *Ptereria*, *Isognomon* and limpets.

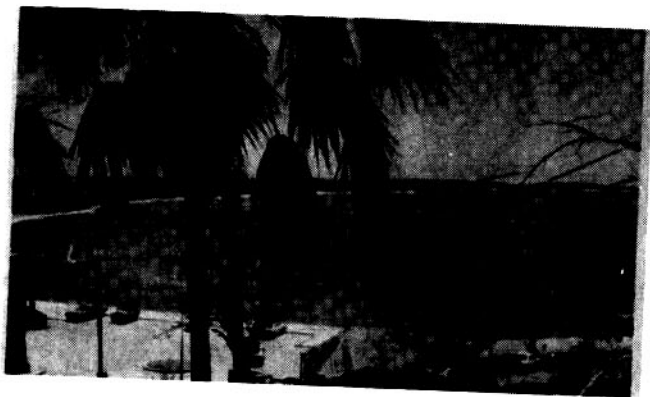
(photos by Mike Lee & Emilio Garcia)

After several days on the island we found out, through the natives, that the Baie Oriental, on the northeast side, was a productive area for mollusks, so we made arrangements to rent a small boat in French Cul de Sac and explore the bay. The coastal portion of the bay was too rough for us to do any kind of collecting, so we started to deeper water. After half an hour of frustrating search we found an area, in about 15 feet of water, that seemed very promising and it wasn't long before Mike found a *Strombus gallus*. Several *Fasciolaria*, *Strombus* and *Turbo*. Later, I dove for what I took to be a *Conus spurius*; I was shell-shocked when I realized that it was a dead, but perfect, *Conus centurio*. Later yet Mike found another one, also dead, but larger. That was all, but that was plenty. We rejoiced all the way back to Grand Case.

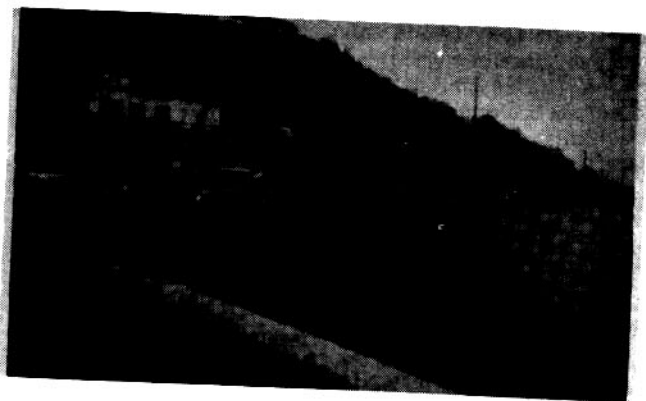


Mike Lee goes collecting near Philipsburg.





Marigot, Saint Martin



Marigot Bay, Saint Martin

Every time we "flew" past a certain little road (with Father Kemps at the wheel of his VW), the Father would point at the road and tell us that it lead to a bay on the other side of the mountains. He said nobody ever visited that bay and that it probably was very good a very good collecting spot. Two days before we left the island we decided to investigate the bay. After getting up earlier than usual, putting on some comfortable walking shoes, walking shorts and grabbing our snorkeling gear, we started on our expeditions.

Father Kemps dropped us where the road began and we started climbing. And we climbed. And we climbed. - "Mike, I think we are lost." - "There is the bay! Waaaay down there!"

We had taken the wrong turn and, from the top of the mountain, we could see the road we should have taken. We really didn't care that

much about missing the turn because the view was breathtaking. We cut across and in half an hour we were on the right road and, 15 minutes more, in the bay itself.

The bay turned out to be the most productive area in the island. Corals and gorgonians grew just a few feet from shore and the seafans were full of *Cyphoma*. In the sand pockets around grassy areas we found very dark *Cassia tuberosa* Linn. and in the grass itself, a few *Cymatium femorale*. In that same area we found *Calliostoma jujubinum*, *Tonna maculosa* Dillwyn (buried in the sand), *Murex pomum* Gmelin (again), *Charonia variegata* Lamarck (in deeper water) and lots of *Cittarium pica* on rocks on the rougher side of the bay.

The walk back through the mountains was a real pleasure. As a matter of fact, the only disturbing experience in this adventure was

the fact that Mike had lost some money he had in his pockets, but even that didn't last long because seven hours after the beginning of our trip, as we walked down the mountain road near the end of our journey, we started picking up bills along the road: a five-dollar bill here, a one there. More ones - "Here's the ten!". Only one dollar bill was missing!

The day of departure came. It was time to say good-bye to the island. It seemed that we had known Father Kemps and Madame Chance for many years. And Monsieur Larmony, the lobster fisherman who went out of his way to keep shells for us. And the New China Bar, where we drank Heiniken every night for fifty cents a bottle. And the pier where we sat at night and admired the beautiful starry nights of Saint Martin.

### Exchanges Wanted

Would like to trade Angel Wings (*Cyrtopleura costata*), 5 1/2" minimum size, for worldwide specimen shells. Other Florida self-collected shells also available with data. EDWARD NIEBURGER; 3530 SW 24th Ave., #43; Gainesville, Florida 32608.

I wish to exchange shells from the Mediterranean, Orkney Islands and South Africa for shells from North and South America. PAUL VELLA; 1/6 St. Francis St.; Floriana, Malta.

Have about 300 species available for exchange from the Eastern Atlantic (Iceland to West Africa), including Mediterranean Sea. Can procure many interesting specimens such as *Neptunea despecta*, *N. antiqua*, *Colus islandicus*, *C. gracilis*, *Halia priamus*, *Volutoorbis lutosus*, *Cypraea stercoraria*, *Cymbium* sp. for uncommon items. I am interested in shells from anywhere, Gastropoda, Pelecypoda or Polyplacophora. FRANK NOLF; Neuwpoortsteenweg, 56; B-8400 Oostende, Belgium.

Have more than 300 species to exchange, mostly from Europe and North Africa, common to rare, from deep water to intertidal, new material available all the time. J. HERMANS Waterstraat 132; B-9110 Sint Amandsberg, Belgium.

Would like to exchange New Zealand Shells for American or worldwide species. Best quality and all data with my specimens. I can also offer NZ stamps and have many beautiful photographic card sets of NZ. MRS. P. VAUSE Blackbridge Rd., RD 2, Albany; Auckland, New Zealand.

We would like to exchange worldwide for gastropods and pectens. We have Mexico & Florida shallow water and deep water dredged specimens complete with data. MR. & MRS. DOUGLAS WELKER; 345 S. Monroe, #2; Decatur, IL. 62522.

I have the following shells to offer: *Voluta exoptanda*, *fulgetrum*, *verconis*, *kreuslerae*, *adcocki*; *Cypraea thersites*, *piperita*, *angus-*

*tata*; *Pecten alba*, *bifrons*, *australis*, etc. to name a few. Many species from South Australia to exchange for worldwide species from the above groups. I am also interested in *Murex*, *Spondylus* and *Xenophora*. All my shells are live taken, fine to gem quality and come with complete data. Am especially interested in obtaining volutes. CHRISTOPHER OATES; 297 Kensington Rd.; Kensington Pk. 5068, South Australia, Australia.

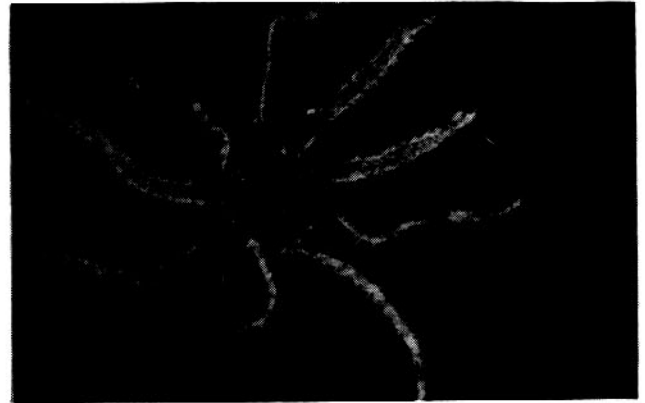
My book "Dicionario Conquilio Malacologico" in exchange for shells or books. DR. MAURY PINTO DE OLIVEIRA; Dep. Biologia - Malacologia; Univ. Federal de Juiz de Fora; Cidade Universitaria; 36100 - Juiz de Fora, MG, Brasil.

Would like to trade shells of Japan and the Western Pacific area for shells of all families from all area. CHARLES CARDIN; Box 3539 APO San Francisco, CA. 96328.

More exchange notices on page 52

## Notes on a Deep Water Sea Star

By ROBERT TALMADGE\*



Fragments of the deep water sea star, *Brisinga exilis* Fisher, 1905, are not too rare in major research collections, especially those which have access to dredged material. On several occasions I have disks and/or detached rays on the decks of some of the local dragboats fishing off the coast of northern California. Such findings usually occurred when the vessel had been making tows at a depth of at least 400 fathoms (930 meters) and on a soft mud substrate. Most of the fragments were more or less skeletal, that is only the calcareous portions remained, but in a few instances, soft tissue was present, but only as tiny bits that could not be identified as any special part of the anatomy. I had never seen a complete or fully fleshed *Brisinga* in any of the invertebrate research collections that I had visited. So it was of great interest, at least to me, when a complete and fully fleshed specimen came to light in July 1974. The preserved specimen is deposited in the "Wet Collection" in the Department of Invertebrate Zoology, California Academy of Sciences, San Francisco. There, the specimen will be available to more graduate and post-graduate students than here in northern California, but colored photographs of the specimen were retained.

Early on the evening of July 26, 1974, my wife and I were watching the dragboat "Stephanie" being unloaded at the Lazio Fisheries Dock in Eureka, California. We were chatting with the Captain, Mr. Karl Einberg, who told us that he had had very good fishing, but his tows had been made on the soft mud along the bottom of the submerged Eel Canyon, offshore and south of Eureka. He had been fishing between 500 and 550 fathoms (915 to 1000 meters) of water. As we moved to avoid a sling of fish I happened to glance down onto the fantail of the "Stephanie", and there, flattened down onto the deck, was the circular disk and nine disarticulate rays of a sea star, of a species unknown to me. I crossed the wet

and slippery deck, avoiding slings of fish and soon had the specimen in a plastic bag, which in turn was placed in some stray ice from the fish hold. Upon arrival at my home laboratory the specimen was preserved in a hardening solution of 15% Formaldehyde. Next day, color 35mm slides were taken and the specimen retained until it was learned that the slides were good. At this time the specimen was forwarded to the California Academy of Sciences.

The dorsal surface and oral surface to the edge of the ambulacral grooves is covered with a very soft, dense mat of small tubercles, about the size of a small grain of rice (3-5mm in diameter). The coloration is pink on the dorsal surface and tan to dark cream on the oral surface. The area around the mouth is

smooth and the mouth is extremely large compared to other species of the Asteroidae of a similar size. There were nine separate rays protruding from the disk. It is difficult to be certain of measurement on such a flaccid, soft specimen, but I use the measurements as: disk, 65/70 mm. in diameter; rays, 145-150 mm. in length, 20 mm. in width and 15 mm. in thickness; ambulacral groove, 10 mm. in width at the disk.

This brief note is presented to indicate the depository of the specimen, and the photographs show far better than words the differences between the genera *Brisinga*, *Solaster*, *Crossaster* and *Pycnopodia*, all multi-rayed sea stars from the deep intertidal down to subtidal depths. (photographs by the author)

\* Field Associate, Department of Invertebrate Zoology  
California Academy of Sciences, San Francisco, California

### Nautilus Newsletter

A new newsletter has been established to deal with information on the Chambered Nautilus (*Nautilus pompilius* Linne, 1758). H. K. Dugdale will be editor, with Dr. R. Tucker Abbott as consultant.

Sponsored by the Delaware Museum of Natural History, the newsletter seeks to establish a worldwide network of correspondents who are either working with *Nautilus* or are able to supply data concerning them. Readers interested in the project are asked to contact Mr. Dugdale, indicating the nature of their interest and whether they are prepared to participate. The names of others who may be interested will be welcomed.

Write to: Department of Mollusks; Delaware Museum of Natural History; Box 3937; Greenville, Delaware U.S.A. 19807.

### Naturalists' Directory

The greatly expanded 42nd Edition of the *Naturalists' Directory (International)* was published January 31, 1975. The new edition contains more than 3,500 individual listings of naturalists in all 50 states and some 60 foreign nations. In addition there are international listings of societies, museums, zoos and publications in the field.

Most listings of individuals give their discipline or speciality and whether they wish to exchange, buy, sell, collect and/or correspond. There are forty-five discipline headings, ranging from Algology to Malacology and Zoology.

The 470 pg. edition is sold for \$7.95 in North America, \$9.95 elsewhere. Brochure is available. Listings in directory are free. Postage is paid in checks or money order sent. P.O. Box 583; South Orange, N.J. 07079.

# Where Does *Fissurella fascicularis* Live ?

By Lt. Col. CORINNE E. EDWARDS\*

Various shell books and papers say of this keyhole limpet: - (1) common in Puerto Rico; (2) rather common on rocky, wave-washed shores; (3) moderately common; (4) uncommon in Florida; (5) dead specimens fairly common at Grand Cayman and South Bimini; (6) probably lives on rocks well below the low tide like; (7) difficult to find alive.

Why, in *Fissurella* (*Clypidella*) *fascicularis* Lamarck, 1822, are the front and back extremities of the shell raised? Why this structural variation, making this a wobbly limpet? Most limpets lie flat and fit exactly to the substrate for protection. If the rock is softer than the shell then that limpet grinds the rock. If the rock is harder than the shell, then that mollusk shapes its shell to fit the rock surface.

Now let us look at *Echinometra lucunter* (Linne). This rock-boring sea urchin is most abundant in areas with considerable wave action. It is found living on shallow-water ledges of rocky shores in the intertidal zone. *E. lucunter* is plentiful at Grand Cayman and South Bimini. This oval-shaped sea urchin is a dark red-brown color and, including the short, stout spines, averages about three inches. It lives in slightly larger holes and hollow crevices formed by the eroding action of the sharply pointed spines. By repeated movement of these spines, as the sea urchin grows, the rock is gradually worn, rounded and smooth, in the niche where it lives. These rock-boring sea urchins are hard to remove as they brace their spines when disturbed.

\*Coconut Grove, Florida

As an interesting aside, I mention another mollusk, *Cypræacassis testiculus* (Linne, 1758). It too favors rough reef water and feeds on *E. lucunter*, our rock-boring sea urchin. On a night trip, I have seen as many as thirteen of these Reticulated Cowry Helmets. They move about in the same vicinity as the dark-brown, short-spined urchins. This two-inch mollusk bores a neat little hole in the urchin in order to feed upon it.

Dead shells of all three of the aforementioned animals have been found quite common in the drift lines on rocky shores of Grand Cayman and South Bimini. Unlike other sea urchins, the test of the rock-borer is very strong. Even with a hole bored in it, denuded of spines and bleached white, the shell of this urchin can withstand the pounding of the waves. The tests of other sea urchins usually are broken up by rough treatment. There is another species of rock-boring urchin, *Echinometra viridis* Agassiz, lighter brown in color and not as common. Also, I may have another species of the wobbly limpet, *Fissurella punctata* Fischer, 1857, as only five of my twenty-five, live-taken, specimens are magenta in color (as the books say wobbly limpets are). Most, even dead ones, have ten dark and ten light rays of color and are white inside.

Where does *Fissurella fascicularis* live? It lives on shallow-water, rocky-shore ledges where there is considerable wave action. I find mine firmly attached to the rocks, right in the same hollows with the rock-boring sea urchin - sometimes three mollusks in one niche.

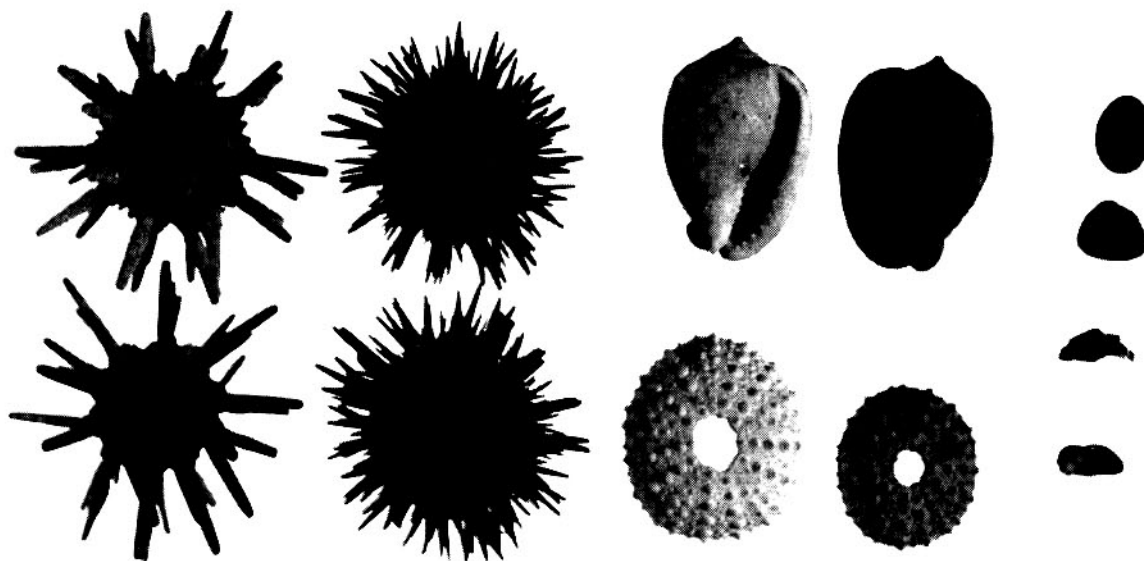
Why does this keyhole limpet tip up at both ends so that it wobbles on a flat plane? It fits tightly to the smooth, rounded hollow occupied by the rock-boring sea urchin, that is why. The soft parts are not, as one book suggests, larger than the shell. Unlike fleshy limpets, the wobbly limpet is just as difficult to dislodge as other limpets that also adhere firmly to the substrate. So it is that two species, a sea urchin and a wobbly limpet, live together. The stout spines of the urchin erode away and smooth the rock and the wobbly limpet fits snugly to the rounded area of the cavity. Try a so-called wobbly limpet in the bowl of a soup spoon - it doesn't wobble there.

Does the wobbly limpet depend on the rock-boring sea urchin for its protection? When the urchin is bored by the Reticulated Cowry Helmet (or removed from its niche), does the wobbly limpet also die? I have seen many empty, but once-occupied, niches in the rocks, yet never have I found a wobbly limpet that was not resting under or with one of these sea urchins.

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(In the photograph below, by Ellis Robinson, we see the sea urchins, some with holes bored in their shells by *Cypræacassis*. Also a few of *Fissurella fascicularis*.)





# The New Pretoria Aquarium

By ROLAND ZURICH\*



Sea Stars in new aquarium's tank.

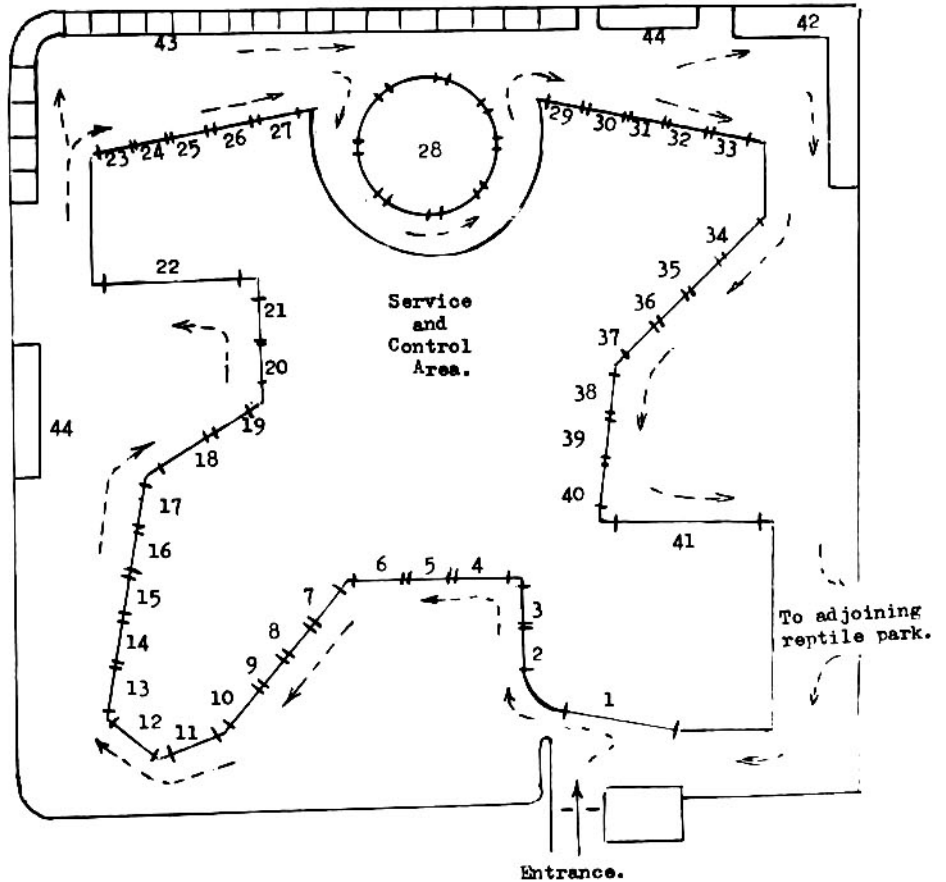
Would you like to see what happens under the sea without getting your feet wet? Well you can if you live in or near Pretoria, South Africa, even though it is nearly 350 miles from the nearest sea and 4770 feet above sea level. "Impossible", you might say, but not after seeing the unique freshwater and marine aquarium, brainchild of Dr. D. J. Brand, Director of the Pretoria Zoological Gardens. The new aquarium opened to the public on the 20th of June, 1974.

The aquarium complex comprises an unique design in that it is designed as a one-way aquarium. The norm of aquarium design around the world is the tramcar system or a large hall with the tanks displayed along its sides. This aquarium is different in that the viewing area is placed around the tank complex and laid out in a star formation so that the service area is in the centre behind the tanks. The public enters the aquarium at one end and follows the star layout in a clockwise direction until they have viewed the whole aquarium (see sketch, right).

When walking through the aquarium one cannot help but get the feeling that, because of the darkened interior, one is walking in a tunnel under the water, looking through windows into the surrounding water wonderland.

The aquarium makes provision for 65 display tanks which vary in size from 5 ft. x 3 ft. to 20 ft. long by 16 ft. high (frontal), plus 22 display cases of 42" x 24" x 9" for static shell displays. The 65 tanks include a freshwater and a marine section. Each tank is designed and laid out to form an independent

\*Pretoria, South Africa



**SKETCH OF AQUARIUM LAYOUT.**

- |  |   |
|--|---|
| 1. Cold water Entrance display.                        | 28. 20ft. diameter freshwater tank.                           |
| 2-12. Tropical freshwater tanks.                       | 29-40. Moderate and cold temperature marine tanks.            |
| 13-21. Moderate temperature and cold freshwater tanks. | 41. Tropical marine diorama tank.                             |
| 22. Tropical freshwater diorama tank.                  | 42. 24 assorted small tanks on two levels, 18"x18"x36" tanks. |
| 23-27. Tropical marine tanks.                          | 43. 22 Shell display cases.                                   |
| --> Public flow.                                       | 44. Benches   |

biological unit with its own closed-circuit circulation system and filtration unit. Behind the tanks, in the service area, are more than one hundred filtration systems, storage and seawater resting tanks, plus quarantine tanks housed on three levels.

The seawater in the marine tanks is artificially produced by means of a strict scientific formula using mineral salts and sodium chloride.

Illumination of the tanks forms part of the biological process of the aquarium and uses some 700 four-foot fluorescent tubes composed of white, blue and ultraviolet light, plus iodine quartz lamps to provide the extra lighting in the tanks. In the shell display cases use is made of special white light tubes and to date no deterioration of shell colour has been observed.

In the aquarium five major temperature ranges are used for the display of various forms of freshwater and marine life. In the tropical freshwater tanks 24°-26°C. is maintained; in the moderate temperature tanks the range varies from 20°-24°C. and in the cold water tanks 10°-14°C. The temperature of the tropical marine tanks is 26°C. with a maximum variation of 0.5°C., the cold marine tanks are 10°-14°C., these temperatures are electronically controlled by means of thermostats and thermometers.

The aquarium houses an intricate electronic control panel where, at a glance, the personnel know whether the circulation, filtration, aeration, cooling pumps and various prevailing temperatures in the individual tanks are correct or not. (continued on the next page)

Photographs by the author.



One of the famous South African rock lobsters .



Seahorses on display in new Pretoria aquarium .

Every tank, seawater and fresh, is decorated as nearly as possible to simulate the natural habitat of the fishes or marine life exhibited. Here natural materials such as water plants, tree stumps, roots, stones, sand, living and dead corals, etc. are used, but the most interesting aspect is the major background displays in the marine tanks are made of fibreglass to resemble the actual rock faces and formations found along the coast.

The aquarium was methodically planned so as to be an educational display. The displays are arranged biologically, ecologically and geographically so as to present authenticity and originality and to present the various aquatic forms as nearly as possible in their natural environment and to also give the view an ecologically representative picture.

Housed in the aquarium complex are two large diorama tanks which are approximately 20 feet long by 16 feet high. Each tank represents an ecological scene, one freshwater and the other tropical marine.

The tropical freshwater diorama is made up to represent a scene from the Amazon River, with actual lush plant growth on the river bank, which is level with the aquarium floor, the river in the foreground is sunk below the floor level and one can see lush tropical water plants and fish from the Amazon through the sides of the tank.

The marine tank is much the same in layout and design, but portrays a tropical beach with plants and sandy shore and, in the tank section, larger forms of sea fish and turtles, plus some sea plants. These tanks get direct sunlight and artificial light to stimulate maximum growth in the various plants.

The tanks are not, as one would expect, four square, but the sides taper away to the front viewing glass so that when looking into the tank one cannot see where the sides meet the front and thus it gives one the impression that it leads into the adjoining tank. The viewing glass is  $1\frac{1}{4}$ " thick. Above each tank is a

series of illuminated colour slides, 5"x4", which show the fish or animal in that particular tank and give its scientific name, popular name and geographical distribution.

At present the aquarium exhibits over 300 species of fish from all continents plus fifteen groups of invertebrates such as sea anemones, living soft corals, sea cucumbers, sea stars, seahorses, crabs, lobsters, sea urchins, etc.

On entering the aquarium one is confronted by a large display of cold water fantail fish in a tank approximately 3x8', then on to the tropical freshwater fish section where one can see, to mention but a few of the less commonly known varieties, *Channa micropeltes*, snake heads from Asia, *Protopterus annectens*, lung fish from tropical East Africa, *Electrophorus electricus*, electric eels from South America, *Labetropheus fullborni*, Fullborn's cichlid, *Pseudotropheus zebra*, blue Nyasa cichlid, *P. auratus*, Nyasa golden cichlid (the cichlids are all from Lake Malawi, formerly known as Lake Nyasa), *Serrasalmus nattereri*, or Natterer's piranha from tropical South America and many more. In some of these tanks are found amphibious animals such as frogs, small crocodiles and freshwater turtles, along with the fish.

Then there is the freshwater diorama tank previously mentioned. Then come the marine tanks. Tank 23 exhibits large sea anemones, living corals, annelid worms, anemone fish, coral fish and sea cucumbers. Tank 24 contains sea horses, shrimp fish and small red sea stars. Tank 25 has more sea anemones, of which *Stiochactis* is very active, as well as various species of anemone fish. Tank 26 contains stone fish and angler fish. 28 is the largest in the aquarium, being 20 feet in diameter and approximately 12 feet deep; it presently houses freshwater fish from South Africa. Tanks 29-33 contain coldwater invertebrates such as large sea stars, Cape crayfish and numerous varieties of sea urchins. In tanks 34-39 are coral fish such as *Pomacanthus imperator* (emperor angel fish), *Heniochus acuminatus* (coachman), *Chaetodon kleinii* (butterfly fish), *Loxovulpinus* (fox face), *Paracanthurus*

*hepatus* (blue surgeon), *Balistodes conspicuum* (waistcoat triggerfish), *Pterois radialis* (turkey fish), *Platax orbiculus* (orbiculate batfish), *Tetrasomus concatenatus* (boxfish) and many more. Tank 41 houses the Tsiksikama National Park display from the southern Cape shore (coldwater) and contains invertebrates and fish found in the park's rock pools. This tank has proved most successful as lush marine algae has established itself thus providing food for the molluscs; the sea anemones have started to multiply; the *Charonia lampas* have mated and eggs were laid and hatched and the veligers have been preserved and appear to be growing; there are also chitons, *Oxystele* and *Turbo sarmaticus* in this tank. Then follows the marine diorama and 24 smaller wall tanks on two levels and containing various marine and freshwater life.

The aquarium has no set time for feeding. It is open from 9 to 9 and the animals are fed at random during the day which enables visitors to observe the feeding habits of the various aquatic forms. Foods, such as *Daphnia*, are cultivated at the aquarium; brine shrimp, *Tubifex*, small mice, insects, mosquito larvae, flies, fingerlings and dragonflies are also used for feeding various species. Finely grated ox heart makes an excellent food for the corals, anemones and sea urchins.

The 22 shell display cases contain the following: (1) general display of approximately 36 families; (2) Cypraeidae; (3) Marginellidae and Volutidae; (4) Haliotidae; (5) Olividae, Cassidae, Triviidae, Volemidae, Columbariidae, Amphiperatidae and Xenophoridae; (6) Thaidae, Neritidae, Vasidae, Bursidae and Fissurellidae; (7) Fasciolaridae; (8) Conidae; (9) Terebridae, Scalidae (Epitoniidae), Turritidae and Mitridae; (10) Cymatiidae; (11) Strombidae; (12) Muricidae; (13) Hydatinidae, Rapidae, Littorinidae, Phasianellidae, Harpidae and Trochidae; (14) Potamididae, Turritellidae, Cerithiidae, Cancellaridae, Columbellidae and Nassidae; (15) Tonnidae and

\*word from the author: species has now been identified as *C. lampas pustulata* Euthyme.

## The Unrealized Treasures of La Romana

By NEICE SCHREIBER\*

Photography by Bill DuPriest

An underwater Nirvana thrives beneath the waters surrounding the village of La Romana in the Dominican Republic. Fire and staghorn corals flourish in such abundance it is difficult to swim among the reef thickets. Tropical fish clothed in the colors of the spectrum greet you and Hawk Wings, Queen Conchs and Helmets nestle in the soft sand floor.

La Romana is a primitive village, 50 miles to the southwest of the capital, Santo Domingo. It began as a sugar plantation in 1915. In those days the cane cutters hauled their daily bounty by oxcart to a huge balance scale called a "romana" after its ancient Roman prototype. The town got its name when the cane cutters told one another, "I'm going to La Romana".

Today that village is the site of the world's largest producing sugar mill, and the doorway to the still-unrealized treasure-troves of ocean gems -- seashells.

I journeyed to the Dominican Republic because I wanted to experience the beauty of the oldest city in the Western Hemisphere, Santo Domingo. I wanted to see its old world ruins and modern industries, its serene countryside and bustling cities.

From the modern airport it is an hour and a half of driving through rolling hills, along beaches and tide-worn rock ledges. Once in the village of La Romana there is a choice of hotels, Casa de Campo or Hotel Romana. Included in the resort area is a golf course, dude ranch, private beach and adjacent fishing village, snook and tarpon river fishing, deep sea fishing, a full marina, tennis and other amenities.

But what lies beneath the surface of the ocean offers an incomparable experience.

I had arrived too late to make my way toward the ocean that first evening. However, there was time for cocktails in the hotel's art gallery which features the painting sculpture of Rolando Lopez Dirube. The artist, who is totally deaf, has thus far created an enduring legacy of more than one hundred monumental sculptures and murals.

One of the hotel's public relations representatives, Bill DuPriest, made arrangements for the use of a golf cart to go to the nearby coral reef beach the following morning. When he learned of my enthusiasm for shell collecting he also offered to serve as photographer and diving buddy.

By the time the sun had begun to climb into the tropical sky we were headed along the dirt pathways which lead to the beach of Las Min-



The author checks the drift line. Note the coral reef meeting the shore here.

ites. Farmers passed us on their way to the village, herding burros laden with sugar cane and other harvests.

The chill in the 6:30 AM air was not a deterrent to diving to either Bill or me. We both took to the crystal clear waters immediately.

Since I wanted to travel light and compactly, I brought along the plastic top of a stereo turntable to serve as a glass bottom bucket. The water is about hip deep for nearly a mile out and this device worked perfectly.

Pen shells studded the bottom and Queen Conchs were abundant. But most spectacular is the coral. At low tide the fire coral reaches above the water level. It has all grown untouched and unrealized for eons. The brain coral is as big as boulders, and the branch and staghorn coral form thick and colorful forests.

In fact the coral is so profuse it is virtually impossible to snorkel among its branches. One must make his way along the perimeter of each thicket.

Oddly enough one of the premium natural resources in the Dominican Republic is beach sand. And at Las Minitas there used to be a great deposit of this "white gold". So, before Gulf and Western Americas Corporation bought the beach, its white treasure was dredged out and used elsewhere on the island. As a result great mounds of dredged coral are piled up on the beach, most of the pieces too big to carry home. And what was once a soft sandy bottom is somewhat rocky.

\*Miami, Florida

The reefs themselves are so profuse that they have grown to meet the shoreline, and one need not be a swimmer to enjoy the beauty of the living reefs, bustling with colorful fish, hungry urchins and meandering mollusks. It is just a matter of carrying a glass bottom bucket and wading and looking.

At the best the beach of Las Minitas is for underwater sightseeing. The easily collectable marine life is coral, and that is obviously too heavy to carry by airplane.

Bayahibe Beach is another story. The hotel manager, Alfredo Latour, put a deep sea fishing boat at my disposal. A crew of three took me and the 65-foot yacht to the beach at the fishing village of Bayahibe. There are no roads and the only access is by boat. The village itself consists of half-a-dozen or so wooden cottages, a small wooden dock and a few children swimming nude in the tranquil harbour.

Pirates of "white gold" had not stolen the sand here and shells were to be found. The rocks forming the natural harbour are imbedded with chitons, and a wide variety of rock shells in good condition. Since conchs are a major part of the diet, dead Queen Conchs lie in mounds along the shoreline. At Bayahibe the staghorn coral is still more spectacular since the water is deep and the area more desolate.

But the problems in shell collecting in the virgin part of the Dominican Republic are singular -- the shell beds have not yet been located. That is also its positive quality, for once an ideal spot has been identified it is the equivalent to a Solomon's mine of the ocean.

(Continued on the next page.)



The crewmen followed me in a dinghy as I drifted through this idyllic underwater world. Although the verbal language is Spanish, we easily communicated in the international language of understanding and they fulfilled every request I had, whether it was for snorkeling gear, a drink of water, or assistance in climbing aboard the yacht.

The waters of La Romana are for the exploring shell collectors. Certainly picas can be scooped up at night by the bucketsfull along the perilous rock ledges called "dentientes de perros" (teeth of the dogs). And chitóns, periwinkles, limpets, etc. ....

I did not feel it paid to carry home Strombus gigas, since I am a South Florida resident. At the same time I did not feel I am experienced enough a swimmer to dive among those marvelous coral reefs. I did see a Rooster Conch, but just wasn't able to reach him by diving with snorkel alone. There is no doubt in my mind that many precious shells were there, elusive to me in what I found to be a strange and difficult environment.

Had I been with an experienced shelling group my dives would have been bolder and my finds more bountiful. Still, I managed to lug home a potentially odorous carton of shells, coral and urchins. At Customs, when I asked the inspector if he didn't want to open the carton, all he said was, "Look lady, I know what's in there from the smell and I don't want to get sick. If you've got something good, as far as I'm concerned, you can smoke it!"

The hotel complex at Casa de Campo has a picturesque restaurant, gift shop, bar and lounge and breakfast terrace. The nearby village of La Romana is prosperous by Dominican standards, yet the poverty left a bitter mark in my memory. Shoeless children begging for handouts are everywhere. Since the village is not geared for tourism there are only two overpriced gift shops featuring tortoise shell jewelry and amber.

What was most exhilarating to me is the city of Santo Domingo. It was there that Christopher Columbus landed almost five hundred years ago, and it is there that his son built his palace; and it is in a romantic old chapel, which is still in use, that one may see the white marble

#### REPAIRING SHELLS

Most of us have had the misfortune of breaking a prized shell. Until recently my efforts to glue them back together have been clumsy and ineffective. Recently, however, I used some of this new Perma-Bond glue to repair the broken spines of a Xenophora solaris. The glue is the kind that glues your skin together and goes under a variety of names. You touch a drop of glue to one surface and hold the two pieces together for a few seconds. My Xenophora was repaired so well that, even with a



The plastic cover for a record turntable made an excellent light weight "glass bottom bucket". There was no trouble in carrying it inside a suitcase either.

tomb which cradles the body of the great explorer.

The old city of Santo Domingo lies in the boundaries of what was once a fortress. Rusty cannons still face toward the ocean from towers under restoration, and scaffolding supports workmen as they replace fallen stones in the walls of Gothic cathedrals.

The Dominican Republic is just beginning to realize its own wealth as a tourist center and for this reason just as many new hotels are under construction as old ruins are under reconstruction. Just as New Orleans restored its French Quarter, Santo Domingo is beginning to refurbish its old palatial homes as museums, hotels and restaurants.

Here, in the city, is the place to buy amber and tortoise shell jewelry (Editor's note: it is illegal to bring sea turtle products, such as jewelry made from the shell into the U.S.!). But one must be careful. The overeager tourist is frequently sold plastic instead of amber or tortoise shell. The gems are to be found in every shop and sell for less than a third of the retail price in the United States. Hence the

magnifying glass, I could not tell which spines were repaired. Just follow the directions on the

enthusiasm and expense of dollars must be mixed with a little beforehand knowledge of how to distinguish glistening amber from plastic.

The best souvenirs of all are the photographs. My most exciting momentoes are these. I stood in front of Alcazar de Colon, the palace of Diego, son of Christopher Columbus. Started in 1509, it was completed by 1,000 Indian laborers under the supervision of 22 master builders from Spain. The original plans and designs were carried out to the last detail; the result is one of the most important contributions to historical restoration found in the Americas.

I climbed the steps of St. Francis Church and Monastery. Now in ruins, it was the first monastery in the Americas and begun in 1504. Bartholomew Columbus was buried here, as was Alonso de Ojeda, the conqueror of Venezuela.

The lists of sights are extensive. However, this should be enough to tell everyone of the beauty, romance and adventure I did, and you can experience in the sea and on the shore of the tropic island of the Dominican Republic.

vial of glue, and don't let it touch your fingers. Henry Close; Atlanta, Georgia

## Sleeping at Night can be Hazardous to Your Collecting

By RICK GUEST\*

Imagine yourself somewhere off the south-east coast of Florida in sixty-five feet of water. You're about a mile off shore and drifting along a sand bottom with your diving partner while each of you are holding a small line attached to the slowly drifting anchor. You've been down for about ten minutes, and already you have collected a handful of small and medium sized cones and a Murex cabriti with fine spines.

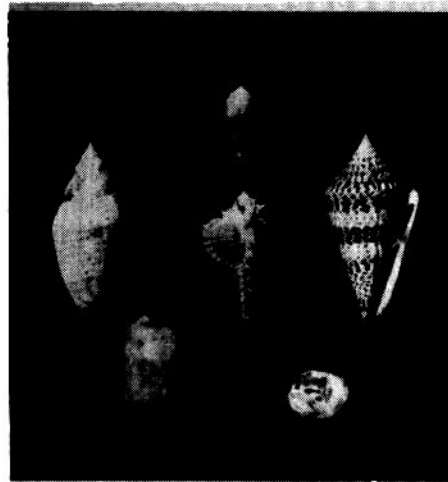
Next you pick up a nice, yellow Murex rubidus and a few standard colored ones. Then you spot a large Conus sozoni which sports a perfect lip.

So far every specimen you've collected has been live, just slowly crawling along the top of the sand. In your one hand you're carrying a Ragu Spaghetti Sauce jar half-full of your present cache of molluscs. In the other hand you have an object, without which you could not have obtained any of these specimens. You tap your diving partner, and with this object you illuminate a live Trigonostoma tenerum, which you are now holding in the palm of your hand. Of course, this mysterious object is a diving light, and of course you are using this diving light because your watch reads 11 p.m. and you started your dive at 10:30 p.m. About fifteen minutes later, after collecting some more cones, some pectens and some nice, large Bulla solida, you have about five hundred pounds of air left, so you prepare to terminate your very successful dive.

Five minutes later you and your diving partner are sitting in your twelve-foot boat in a calm, glassy sea. Each of you scrutinize the other's finds and you find that your diving partner has also found a Trigonostoma tenerum, a Murex cabriti and also a nice Colubraria lanceolata which you've been trying to find for some time now. But you are quite satisfied because the nice, large Conus sozoni is in your jar.

All of this describes just one of our better night dives. Of course, some areas are better than others, but we always come back with worthwhile specimens.

So far, my diving partner, Jim Blanz, and I have logged over forty night dives since the beginning of 1974. Other friends of ours, most of whom are members of the Broward Shell Club, have gotten into the act, sometimes collecting those "special rare specimens" that can make a person regret (sometimes) disclosing the whereabouts or methods of collecting a certain area. But most of these people are ardent conservationists and good amateur malacologists, interested mainly in the quality and not quantity of their specimens and in the activities of the molluscan animals themselves. This type of collector, I'm proud to say, is very much encouraged by the Broward Shell Club. So, all



Clockwise, from the top: Conus ustickei Miller; C. delessertii Recluz; Natica floridana Rehder; Bulla solida Gmelin; Mitra florida Gould and in the center Murex cabriti Bernardi.

of us, working together, comparing aquarium and collecting notes, can and do further the accumulation of knowledge, contributing to the fields of malacology, conchology and our own interests.

The hows and wheres of this night diving method are too extensive and involved to get into, (any time one is dealing with currents, there is much involved), but I strongly suggest starting in shallower water with low velocity currents and with adequate lights in your hands and on the surface craft.

We use the Faralite rechargeable diving light, and others have had success with other rechargeables (batteries add up if one makes as many night dives as we do).

The following is a list of most of the more uncommon or rare specimens collected by my friends and myself while night diving between Hillsboro Light and Hollywood, Florida:

Architectonica krebsi Morch  
Architectonica nobilis Roding  
Bulla solida Gmelin  
Bursa thomae d'Orbigny  
Calliostoma pulchrum C.B. Adams  
Casmaria atlantica  
Cassis madagascariensis spinella Clench (14')  
Cassis tuberosa Linne  
Cassis flammea Linne  
Charonia variegata (Lamarck)  
Colubraria lanceolata Menke  
Conus daucus Hwass  
Conus ermineus Born  
Conus flavescens Sowerby  
Conus jaspideus Gmelin  
Conus juliae Clench  
Conus regius citrinus Gmelin

Conus spurius atlanticus Clench  
Conus sozoni Bartsch  
Conus stearnsi Conrad (deep pinks and lavenders)  
Conus ustickei Miller  
Conus verrucosus Hwass  
Cymatium sarcostomum Reeve  
Cypraea spurca acicularis Gmelin  
Murex cabriti Bernardi (fine spines; up to 70 mm.)  
Murex rubidus Baker (yellows, purples, red)  
Natica canrena Linne  
Natica floridana Rehder  
Mitra florida Gmelin  
Mitra sulcata Gmelin  
Pusia histrio Reeve  
Pusia albocincta C. B. Adams  
Pusia puchella Reeve  
Phalium cicatricosum (Gmelin)  
Polystira albida (Perry)  
Prunum carneum Storer  
Prunum guttatum Dillwyn  
Tonna galea (Linne)  
Trigonostoma tenerum (Philippi)  
Turbo canaliculatus Hermann  
Umbraculum plicatum  
Xenophora conchyliophora Born

### Pelecypoda

Aequipecten gibbus (Linne)  
Aequipecten muscosus (Wood)  
Chione intrapurplea Conrad  
Echinochama cornuta Conrad (long spines)  
Eucrassatella speciosa (A. Adams)  
Macrocallista maculata (Linne)  
Pecten raveneli Dall  
Pecten ziczac Linne  
Lyropecten nodosus (Linne)  
Tellina interrupta Wood  
Spondylus ictericus Reeve

As far as I know, Conus ustickei and Bulla solida have never before been reported from as far north as Hollywood, Florida. Although C. ustickei had turned up in the Pompano Dredge Project, none were live.

Bulla solida appears to be fairly localized. Besides our specimens, the locality for all other specimens I've seen has been the lower Florida Keys. These were dredged in 160 to 250 feet of water.

And of course, not to be ignored, the live collected specimens of Mitra florida and the live Casmaria atlantica caused a considerable amount of excitement amongst collectors.

We are also coming up with a few different cone species which, so far, defy identification. Quite a few of these specimens have been sent to professional malacologists who specialize in the group.

(Continued next page, bottom col. 3)

\*Hollywood, Florida  
 Photograph by the author.

## Whelk Recipes

By ROBERT R. TALMADGE\*

A number of malacologists here in America have known that I utilize several species of marine mollusca for food, and, from time to time, they have asked me for some of my "pet" recipes; hence, this brief paper.

Actually, I grew up feasting on the local crabs, clams and the large marine snail, *Haliotis rufescens* Swainson, the Red Abalone of California. While in Europe during World War II, I ate the "whelk", both *Neptunea antiqua* (Linnaeus) and *Buccinum undatum* (Linnaeus), plus the escargot, *Helix pomatis* Linnaeus. Perhaps I am more acclimated or lean more towards marine food and do not have the gourmand taste, but I never really liked escargot.

Locally, I utilize our northern California clams, one species of whelk, one octopod and one squid, with, of course, the Red Abalone. One may obtain *Neptunea pribiloffensis humboldtiana* A.G. Smith at a depth of between 150 and 185 fathoms on a sandy substrate. This species is available only through the courtesy of the dragboat fishermen, so I substitute our local clams, and, if fresh clam is not available, canned clams will suffice. Our local clams are usually *Tresus*, *Saxidomus*, *Clinocardium* or *Siliqua*; the octopus *O. dofleini* Wülker and the squid, *Loligo opalescens* Berry, are also utilized.

The whelk and clams are steamed, the soft parts removed, cleaned, and then ground. For chowder I use a coarse grinder and for patties, etc., I use the fine grinding blades. Units of this ground meat are then placed in plastic freezer bags and what is not immediately used is frozen. Squid and octopus are cleaned, chopped into small pieces and used immediately. As I do not personally pick up the *Neptunea*, I carefully sort the specimens in a fish box or bucket, discarding all of the obviously dead specimens, then carefully clean off the shells prior to steaming. I try to pack about the same amount of ground meat into the freezer bags as is found in a can of tuna, crab, clams, or shrimp, or about 6½ ounces each. This gives me a working unit for my recipes.

### Patties, Scrambled Eggs, Omelets

With these the cook can go all out and vary each dish into several tasty variations. It all depends upon the tastes of the individual.

The most simple is one unit of clam or whelk plus two eggs mixed into the meat to bind it together for cooking. To this one may add bits of bacon or ham, onion, mushrooms, or any combination of these extra ingredients.

Whipped eggs, with some whelk or clam, (previously browned) are good, and again the other ingredients may be added for taste, but in this case eggs are the predominant food item.

Omelets, or at least mine, are similar to the scrambled eggs, but milk is added to the eggs before cooking. Both scrambled eggs and omelets may be garnished with tomato sauce, or sauce with onion and garlic added.

### Whelk On Rice

The subtitle is not totally correct, as one may use either clam or whelk, and substitute noodles or toast for the rice. But it is a nice short subtitle and is an introduction to a bit more complicated method of cooking the same items. I normally have on hand the following measurements of ingredients for each unit of clam or whelk:

1 cup, chopped celery  
1 cup, chopped onions  
1 cup, sliced mushrooms  
1 can, tomato sauce (4 oz.)  
soy sauce  
garlic or garlic powder  
curry powder (commercially prepared)  
salad oil  
water

I use one 12-inch, cast-iron skillet and one 10-inch skillet.

From our local fishermen of Mediterranean ancestry, I had learned to make a combination of clam or whelk, with garlic and tomato seasoning. At Abashiri, on the north coast of Hokkaido, Japan, I stayed at a Japanese style hotel, a Ryokan, and there the cook prepared whelk in a quite different manner, which I call the Ryokan Recipe. I showed him my method and he was delighted to swap recipes, and he then added curry powder to some, creating a third recipe within as many days.

### Ryokan Recipe

Steam the onion, celery and mushrooms until tender, then add the clam or whelk, previously browned, and add soy sauce to taste. Serve over rice, noodles or toast.

### Italian Recipe

I place the onions and celery in the large skillet, with only enough oil to begin cooking, then add water and cover. When semi-soft, I add the mushrooms. At the same time I have placed the ground meat in another frypan, with oil, chopped garlic or garlic powder (to taste), and browned the meat. This is then added to the vegetables and tomato sauce, and stirred together. Serve on rice, noodles or toast.

### Curried

Cook the vegetables and clam or whelk as above, use a lesser, or the same, amount of tomato sauce (you will have to develop your own amounts, depending on individual taste) and add curry powder (again the taste of the individual will govern the amount, on a trial and error basis). Personally, I like more curry than does my wife, so I usually cook my own

batch when she is away. Serve on rice, noodles, or toast.

At Abashiri, Japan, I ate *Neptunea polycostata* Bernardi and *N. varicifera* Dall and, at one time, we had *Buccinum striatissimum* Sowerby. In Tokyo, *N. intersculpta intersculpta* Sowerby and *N. i. frater* Pillsbury was served. Dr. Tadashige Habe discussed the use of *N. arthritica* Bernardi, which are sold in season on the streets, especially in the north. The snails are sold either from a cart or from a small kiosk, where they are kept hot. They are flavored with soy sauce, served in a paper napkin, with a toothpick, and eaten on the run as the people hurry to and from work. I was not there in the "whelk season".

**NOTE:** There have been several recorded cases of serious illness and even fatalities from eating "whelk". However, data indicates that these were persons who ate the entire body and, as yet, no conclusions have been made in Europe, England and Japan, where such were noted. Locally the mytilids are verboten during the summer months when the tiny marine protozoans accumulated and are taken in by the mytilids and accumulate in their bodies until a toxic quantity exists. This is commonly called Mussel Poisoning. A similar situation may exist in some of the *Neptunea*. I have never been ill from eating them, as I always check on the status of the soft parts and discard all discolored animals and parts.

(Editor's Note: How about sending us your favorite seafood recipe? With the price of food these days we should all make more use of the animals we collect when shelling, so why not eat them? We'll print as many as we have room for - so send us yours today!)

### SLEEPING AT NIGHT

Continued from page 45

A great number of the species listed here were, at one time, either absent from my collection or in poor condition, but that was before our night diving activities commenced. We used to dredge this sand bed area for our specimens, but now, with the night diving, we do so well in such a short time and with so little effort that we now reserve our dredging activities for deeper waters.

So you see, sleeping at night is nice; but groggily staggering out of bed in the morning, then gazing into your aquarium, which now holds last night's specimens, is well worth while. This is especially true when you realize that you have the opportunity to observe an uncommon or rare mollusc in its natural state, knowing it will later be envied by other collectors while posing gracefully in a show case.



*Art in Shell of the Ancient Americans*

By WILLIAM HENRY HOLMES

(U.S. Bureau of Ethnology, Annual Report for 1881)

(Continued from Fall, 1974 issue)

It is probable that the signification of the designs engraved upon these ornaments will remain forever a matter of conjecture. It cannot be affirmed that the cross, which occurs on the faces of most of the specimens, have any particular significance, although it may represent the points of the compass. That it may have some emblematic meaning is, however, not impossible. I have counted the number of circlets on all of the specimens with which I am acquainted. The result is shown in the following table:

	In the cross:	Longitudinal arm	Transverse arm*	In the circle, exclusive of cross	Total
No. 1 (Fig. 1) .....	10	9	23	41	
No. 2 (Fig. 3) .....	10	12	27	48	
No. 3 (Fig. 2) .....	11	9	23	42	
No. 4 (1) .....	9	9	20	37	
No. 5 (1) .....	12	11	29	51	
No. 6 (2) .....	9	9	20	37	

(1) Schoolcraft: *Notes on Iroquois*, p. 233 (2) from sketch by Mr. Beauchamp.

The central circlet having been counted with each arm of the cross, the total number of circlets in each specimen will be one less than the sum of the three columns.

These circlets may be numerals. The design may be significant of some rank, the badge of a secret order, or the totem of a clan. The general arrangement of the figures upon the face of these disks suggests an incipient calendar.

These beads are doubtless American in origin, as nothing of a similar form, so far as I can learn, occurs in European countries. The fact that they are found in widely separated localities indicates that they were probably used in trade since the advent of the whites. This is possibly some form of bead held in high esteem by tribes of the Atlantic coast when first encountered by the whites who have taken up its manufacture for purposes of trade.

BEADS AS ORNAMENTS

I have already spoken casually of the use of beads for personal ornament, but it will probably be better to enlarge a little upon the subject at this point.

Beads are generally found in the graves of ancient peoples in a loose or disconnected state, the strings on which they were secured having long since decayed. We cannot, therefore, with certainty, restore the ancient necklaces and other composite ornaments; but we can form some idea of their character by a study of the objects of which they were made and the positions held by these objects at the period of exhumation. Much can also be learned by a study of the ornaments of modern peoples in similar stages of culture.

As a rule, the combinations in the pendant ornaments of the ancient American seem to have

been quite simple. Being without glass, and practically without metals, they had few of the resources of the modern savage. Their tastes were simple and congruous, not having been disturbed by the debasing influence of foreign innovation, which is the cause of so much that is tawdry and incongruous in the art of modern barbarians.

A curious example of a modern necklace is given by Professor Haldeman, (1) who had in his possession an Abyssinian necklace "com-

posed of European beads, cowries (*Cypraea* shell), a triangular plate of glass, two small copper coins, small spheric brass buttons, cornelian, date seeds, numerous cloves pierced through the sides, a fragment of wood, a bit of cane, and an Arab phylactery".

Something can be learned of the practices of the ancient Americans in the use of beads and pendant ornaments generally, by a study of the remains of their paintings and sculptures — such, for instance, as may be found in the Goldsborough manuscripts or the superb lithographs of Waldeck, examples of which are given in Plate XLV.

In a number of cases necklaces of the mound builders have been found upon the necks of skeletons, just as they were placed at the time of burial.

Captain Atwater in describing the contents of a mound at Marietta, Ohio, makes the statement that on the breast of a skeleton "lay a stone ornament, with two perforations, one near each end, through which passed a string, by means of which it was suspended around the wearer's neck. On the string, which was made of sinew, and very much injured by time, were placed a great many beads made of ivory or bone." (2)

A similar necklace is described by Mr. Matson, in the *Ohio Centennial Report*, p. 127. It was found on the skeleton of a little girl, and was so made as to be larger in the center of the neck in front, tapering almost to a point at the middle of the back. On page 129 of the same volume much more varied uses of bead ornaments are suggested. Mr. Matson describes four skeletons, on each of which shell beads were found. In three cases they had been placed

about the neck only; in the fourth, nearly thirty yards of beads had been used. There were four strands about the neck, crossing over on the breast and back and passing down between the legs. Strings passed down the legs to the feet, and were also found along the arms and around the wrists.

The arrangement of the various parts of a necklace or string of pendants is found to be much alike the world over, consisting of a strand of beads, small toward the ends and increasing in size toward the middle, where a central bead or pendant of peculiar form or unusual size is placed.

The practices of modern barbarians in the employment of beads as ornaments are extremely varied. They are employed in dressing the hair, in head-dresses and plumes, and pendants to these; as pendants to the hair, ears, nose, and lips; as necklaces and bracelets; as belts for the waist and sashes to be thrown across the shoulders; and as anklets and pendant ornaments to all parts of the costume.

Father Rasles, writing of the Abnaki Indians of Canada in 1723, says: "If you wish to see him in all his finery, you will find he has no other ornaments but beads; these are a kind of shell or stone, which they form into the shape of little grains, some white and others black, which they string together in such a way as to represent different showy figures with great exactness. It is with these beads that our Indians bind up and plait their hair on their ears and behinds; they make of them pendants for the ears, collars, garters, large sashes of five or six inches in breadth, and on these kinds of ornaments they pride themselves much more than a European would on all his gold and jewelry." (3)

It is related of the New England Indians that more than a hundred years ago, they "hung strings of money about their necks and wrists, as also upon the necks and wrists of their wives and children. They also curiously made girdles, of one, two, three, four, and five inches thickness and more, of this money; which, sometimes, to the value of ten pounds or more, they wear about their middle, and as a scarf about their shoulders and breasts. Yea, the princes make rich caps and aprons, or small breeches of these beads, thus curiously strung into many forms and figures; their black and white finely mixed together." (4)

(4) *Collections of the Massachusetts Historical Society*, 1794, Vol. III, pp. 231, 232.

To be continued in our next issue.

(2) Atwater: *Western Antiquities*, p. 83. In the early days of mound exploration shell was usually mistaken for bone or ivory.

(3) Kip: *Jesuit Missions*, p. 25.

(1) Haldeman, in *Surveys West of the 100th Meridian*, Vol. VII, p. 263.

## With the Clubs

The PACIFIC NORTHWEST SHELL CLUB will hold a shell show in Seattle, Washington April 19th and 20th, 1975. The Eames Theater at the Pacific Science Center at Seattle Center will be site for the show. Hours will be from 11:00 a.m. to 8:00 p.m. the 19th and 11:00 a.m. to 6:00 p.m. the 20th. If you'd like to participate or get more information you can write Mrs. Elsie Marshall; 2237 NE 175th, Seattle, WA. 98155, or call Seattle, (206) 363-3219.

The PITTSBURGH SHELL CLUB will have their annual shell show at the Buhl Planetarium, Pittsburgh, Pennsylvania, from June 8 through June 29, 1975.

The NORTHERN CALIFORNIA Malacozoological Club will be holding its ninth annual Shell Show and Sale at the Hall of Flowers, Golden Gate Park, San Francisco, California on May 10th and 11th.

The Third Congress of the FRENCH MALACOLOGICAL SOCIETY in La Rochelle (Inst. Universitaire et Technique de la La Rochelle, France) on 16-22 June 1975. During this Congress an international symposium will be held about the Applied Marine Malacology.

"Our Molluscan Heritage from the Land and Sea" is the title of the show to be sponsored by the SAN MARCOS (Texas) Shell Club in Cooperation with the San Marcos Bicentennial Commission. Dates will be October 11 and 12, 1975 in San Marcos (near Austin and San Antonio) at the Austin Savings and Loan Assoc. Building; 308 E. Hopkins St. Entries from anywhere in the world are welcomed to enter any of six Divisions. For details and entry forms write: Mrs. Nawona A. Gary; Route 1, Box 327 C; San Marcos, Texas 78666.

The Georgia Shell Club, a new organization only two years old, needs people to present a program at meetings. If you are planning to be in Georgia, or pass through the state, during the next year or so, and have a program you would be willing to give at our club, please contact: Henry Close; 2808 Wendland; Atlanta, Georgia 30345.

If your club or society is planning an event of interest to others, please let us know and we'll give you some publicity. Please give us enough advanced warning though since we're a quarterly publication and we must know of upcoming events at least four months in advance to properly get them into the magazine.

### A.M.U. - W.S.M. 1975 Meeting

The eighth annual meeting of the Western Society of Malacologists and the forty-first annual meeting of the American Malacological Union will be held jointly from June 22-26, 1975, at San Diego State University, San Diego, California. The program will include contributed papers, symposia, exhibits, and study workshops on molluscan subjects.

Inquiries about the meeting should be sent no later than May 1st and should be directed to: Mr. Clifton Martin, Secretary (WSM), 324 Kennedy Lane, Oceanside, California 92054.

Applications for membership in the W.S.M. should be sent to Mr. Bertram C. Draper — Treasurer; 8511 Bleriot Ave.; Los Angeles, California 90045. Dues: regular membership: \$5.00, additional family members: \$1.00 each; student memberships: \$2.00. Regular and student members will receive the published proceedings of the meeting.

In July, 1974, the CLUB FRANCAIS DES COLLECTIONNERUS DE COQUILLAGES, was formed. This non-profit organization has as goals: to popularize malacological and conchological knowledge, to permit exchanges between its members and national and international organizations, to investigate sea animal life and to protect the seas. Every member receives a bulletin "Mappa" and there are three or four meetings each year. Dues for 1975 are 50 French francs. Contact: M. Yves Demanuele; 26 Boulevard Poissonniere; 75009 Paris, France.

## Sanibel '75

By FAYE FROST\*

The third week provided delectable, bathing-suit-strolling weather. Because of Arthur's last probable meeting there, I scurried out for shells at the crack of dawn and cracked skulls with a host of other shellers. One glanced into my pail, "Big shells", he remarked disdainfully. He had collected 500 *Epitonium* the day before. No wonder we couldn't find any. Until one morning the tide fell, a tell-tale trail. Most of these ended in baby *Donax*, but this, this led to a wee, LIVE *Epitonium*!

The old specimens strung themselves along the litter line, rather prolifically because of last week's storm. Many *Aequipecten gibbus* stuck up out of the rift like sails, however, in anemic colors. Specially prized was a small, live *Murex florifer* flung up by the waves. An elderly gentleman from Vermont handed me some attractive, pink-tipped specimens, to make a growth series -- from the dead shells

I hastily add. Then he leaned over to pick up a less usual *Diodora dysoni* with its triangular key-hole. "Here, take it." Another stranger on another beach proffered a live *Melongena corona* and strode on.

*Murex pomum* tolled all over, attractive, but medium sized. At low tide some stuck out visibly alive in the pink dawn. To save these mollusks I tossed one far out. An eagle-eyed seagull caught that very one for its breakfast.

One morning Mary Grace and I carried her inflatable rubber boat to the panting edge of a channel. We aimed to scour an isolated beach, and plopped into the boat. Sand-stuck. With heaving, shoving and a wet jump we floated into the current. It swung the raft around in circles while our paddles whipped wildly from side to side. If I hadn't been so absorbed I would have collapsed in laughter. On the lone opposite side a sheller helped tug us in. Stashing the boat, we scrambled through mangrove and fallen Australian pines into the clear with no one in sight. Hunting brought only a few bright *Pecten* valves. Then a sheller hove into view and displayed his 8" *Pleuroploca gigantea*. Envy.

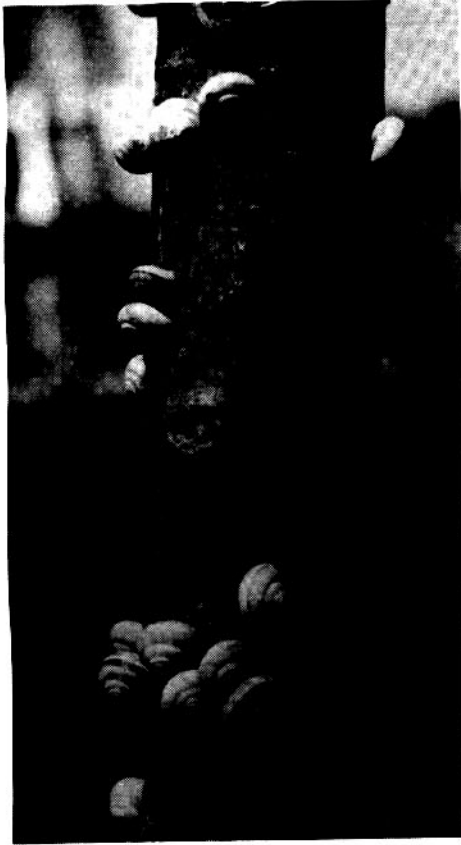
Mid-week came time for a traditional meal: fresh shrimp, jumbo-sized and yummy, which we boiled 4½ minutes and served in their shells. An avocado and citrus salad. Key lime pie. Every year I've hunted for the little, yellow, fallen limes in an abandoned and seedy grove, alert to snakes and besieged by thorns. This year only a few appeared, just enough juice to thicken the sweetened condensed milk. And this year we topped that pie with fresh strawberries.

Here at home I look over a few of my finds: 3 lip-chipped cones, *spurius*, *floridanus* and *jaspeus*. What is this inside the *Dosinia elegans*? A ¼-inch gray chiton with a dramatic blue line down its back. What's its name? Here at home I think back to that giddy, exhilarating feel of the foam. It's typified by two little elderly ladies strolling up the beach, utter strangers. One turned to me and remarked with breathless delight, "You know, I haven't a stitch on underneath!"

\* Glenview, Illinois

## Shell Murder Weapon

Youngsters, playing around an old, vacant house west of St. Augustine, Florida made a grisly find on November 4, 1974. Inside the house were two badly battered people, both of whom live for only a brief time after they were found. Evidence collected at the vacant house included a large, blood-stained conch shell (Florida Horse Conch), mounted on a cement base, which, according to investigators, is the object used to strike the fatal blows. The identity of the man and woman's assailant is still unknown.



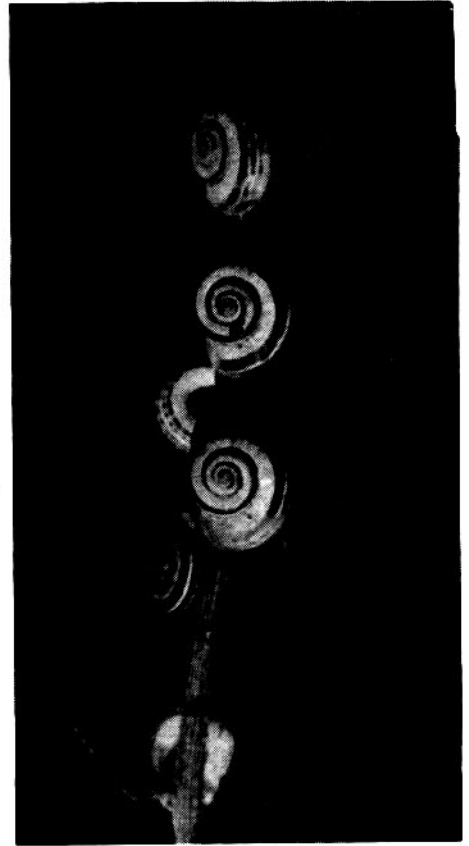
## Two Land Snails

By JAROMIR NEMEC

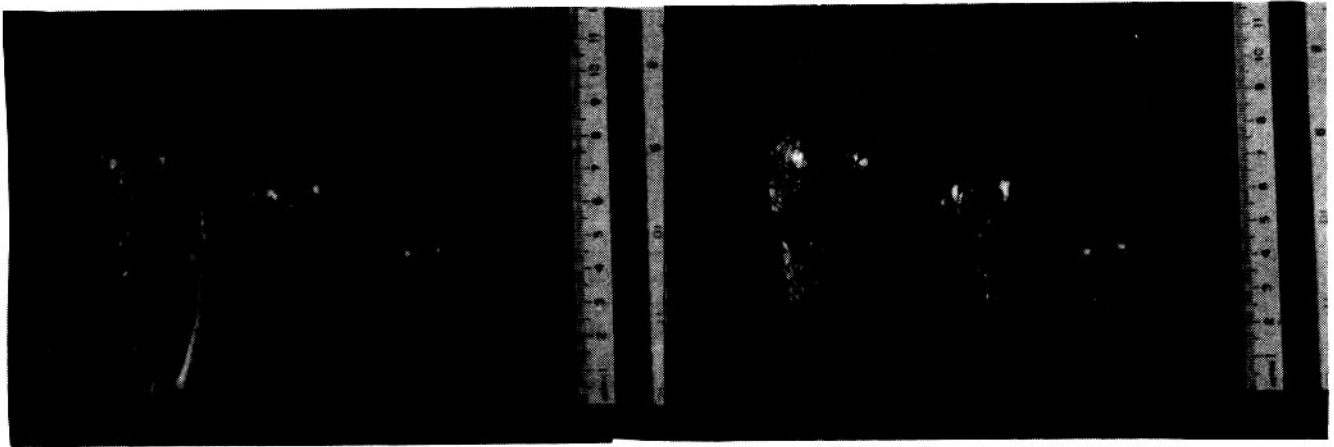
Brandys nad Labem, Czechoslovakia

*Helicella obvia* (Hartman, 1840) and *Cernuella virgata variabilis* (Draparnaud, 1805) both belong to the Family Helicidae. They occur many times in great quantity along the sea coast. *Helicella obvia* prefers rather low and middle plants; *Cernuella virgata variabilis* is found also on stems and branches of trees, but sometimes even in grass. *Cernuella virgata* especially occurs in a great amount - On a relatively small area thousands of pieces can be found. I saw this species on a concrete column and even on a wastebasket. The pictures were taken on the coast of the Black Sea, not far from Varna, in Bulgaria.

(To the left: *Cernuella virgata variabilis* and  
To the right: *Helicella obvia*)



## Conus gloriamaris Chemnitz, 1777



The Glory-of-the-Seas cone has a fantastic history. It is alleged that even murders have been committed to obtain a specimen. While the Solomon Islands have come up with some seventy live-collected specimens in the last few years, it remains one of the most sought-after shells in the world. Glowing satisfaction comes to most of the few collectors who can show one.

In the accompanying photos a growth series of four gem specimens from the personal collection of Iain Gower of Marau Sound, Guadalcanal, are shown. To see four *Conus gloriamaris*, let alone in one collection, is a surprise. This

shell remains in very limited supply, with an ever-increasing demand. These four shells were found at Lunga Sound, Guadalcanal. The larger three were found alive at fifty to seventy-five feet in muddy sand, by scuba-equipped collectors, but the small juvenile was found dead, otherwise it would not have been taken. The shells range in size from 27 to 101 mm., with the second largest being of the unique blue hue, which is restricted to specimens from the Solomon Islands. But, sadly, with time, the blue tends to fade. The *Conus gloriamaris* from the Philippines are larger, but have a tan shade, while the ones from New Guinea are of a golden color. These

from the Solomons are a dark bluish brown, with a few especially blue. All of the live specimens of the shell collected in the Solomon Islands came from Lunga Sound.

Few collectors are aware that Gower has modern facilities to accommodate visiting shell collectors and divers. Maybe our illustrious Editor should be setting up an expedition to Guadalcanal, as there are few better shelling locations in the world.

ELMER G. LEEHMAN

(Editor's note: if interested in such a tour let us know and we'll see what we can do.)

Photos by Don D. Chapman



## Salt Water Aquariums & Photography - Part 2

By CHRIS BARRAND\*

(Part one is to be found in the Fall 1974 issue of OF SEA AND SHORE.)

So far I have written only of personal experiences. With the photographs I feel the technique has been perfected as far as possible with the equipment I own, however, with the aquarium many improvements could have been made.

The keeping of saltwater aquariums is relatively a new hobby and significant advances are being made in this field in recent years. I have no hesitation in recommending the book "The Salt-Water Aquarium In The Home" by Robert P. L. Straughan for anybody wishing to study marine life. It is a comprehensive work dealing mainly with the care of marine fish in captivity, but his chapters on setting up and maintaining an aquarium are excellent for the care of all marine life. What particularly impressed me with this book is the inexpensive cost of his technique. Mr. Straughan advocates the use of a sub-sand filter, a simple, but most efficient device that keeps the aquarium in immaculate condition. It can be purchased commercially or, as I have done, home constructed.

Simply, a sub-sand filter consists of a raised piece of perforated perspex placed between the sand and the bottom of the aquarium. Air pumped through strategically placed tubes along the perapex forces a flow of air and water upwards, at the same time drawing water through the

sand which acts as a filtering medium. At present there are a number of filtering devices on the market, but none that I know of that can approach this type of device for effectiveness or cheapness. By using this filtering medium Mr. Straughan has successfully bred certain types of salt water tropical fish, something very few people have done. To the marine aquarist this ranks today as one, if not the, ultimate achievement. So the techniques of his book are proven methods and well worth following for the ability to recreate as natural a salt water environment as possible.

With my aquarium in Mombasa I was doing everything wrong: under filtering, over crowding, creating toxic and dangerous conditions throughout for all the inhabitants, yet still managing to keep the majority of cowries alive for periods of a week to over six months. There were certain exceptions: *Cypraea felina*, *C. staphylea*, *C. capurserpentis* and, most surprising of all, *C. annulus*, were reluctant to display their mantles. The hardest were *C. lynx*, *C. tigris*, *C. fimbriata*, *C. histrio* and *C. kieneri*.

In one case the sexual technique of two *Cypraea isabella* was observed. There were three instances of two *Cypraea helvola* and one *C. lynx* producing complete clusters of egg capsules, with, unfortunately, no further developments. There was also one instance where an immature *Cypraea vitellus*, which had the normal light and dark bands of a juvenile

specimen, being introduced into the aquarium and, within ten days, had adorned its dorsum with the markings of an adult specimen. These five separate events illustrate that with more knowledge and a better aquarium technique breeding may just be possible. If it has not already been done I foresee it within the next decade as being a distinct certainty.

The possibilities from this could prove damaging to the conchologist whose collection is an investment, and to the dealer whose livelihood is dependent upon buyers, but this is the only disadvantage I can see. To counteract this, the benefits to all can be immense. Initially specimens should be less expensive resulting in collectors with a limited budget amassing a far better collection.

The future? What of species of a restricted area facing extinction through over collecting, pollution, environmental changes, etc. being reintroduced, successfully, to another area or even another country? Will dealers be selling living specimens as well as just the shells? (Anyone having seen the living cowry with its mantle fully displayed can hardly fail to note that the beauty is often greater than the shell itself. And perhaps collectors applying themselves to breeding, cross-breeding, etc. - as on lines similar to freshwater fish of today - producing certain strains and different or definite patterned shells? Who knows?

\*Bexley Heath, England

(formerly of Plaisance, Mauritius)

## Nation's First Estuarine Sanctuary

By SHERMAN LEE POMPEY

A major victory for conservationists and ecologists was won 6 January 1975, when outgoing Governor Tom McCall signed an agreement between Federal and State officials making South Slough on Coos Bay, Oregon, the nation's first estuarine sanctuary. This action fulfilled the hopes and dreams of Dr. Rudy of the University of Oregon Marine Biology Station at Charleston, Oregon, who had been attempting to get the area set aside because of its unique ecological system. Prior to this time the land area was not considered large enough to be designated a Federal Wilderness Area and there were fears that the area might be stripped of timber and the ecosystem destroyed by commercial interests.

Governor McCall said that the agreement will preserve the slough and protect the watershed of the basin for long-term educational and scientific use. "A decision has been made essentially to stay man's hand from further disturbances of the estuary so that we might gain a better understanding of estuarine ecosystems."

Among those announcing the plan with Governor McCall were Mickey Moffitt, chairman of the Coos County Board of Commissioners, County Commissioner Lonnie von Ellsberg and Robert Knecht, Director of the Federal Office of Coastal Management. Their plans call for state and federal government funds to buy lands and easements surrounding the sanctuary and for the managing of it. It is expected to cost \$2,000,000, with Oregon to pay \$400,000 of this.

Coos County will take on the responsibility of adopting land-use plans and zoning ordinances to preserve this slough, which empties into the boat dock area at Charleston. They will also maintain land uses within the basin area. Nature Conservancy, a private foundation, has already acquired some land by purchase and donation, and will turn this land over to the state of Oregon.

\*Harrisburg, Oregon

The agreement calls for measures to be taken within the slough itself and on the lands extending at least a quarter of a mile from the slough. Governmental jurisdiction will prohibit timber harvesting, motor boats (except by permit), chemical or pollutant discharges, new or increased commercial activities, dredging or filling, and other alteration in the natural environment, and the removal of minerals.

Scientific and archaeological research, education and nature interpretation and low intensity recreation activity will be permitted in the area. Restricted uses will include oyster culture, which will affect one business already on the slough, existing residential use and motor vehicle activity.

This precedent-setting action gives hope to other conservation groups who were stymied as to how to improve and preserve vital ecosystems in their own local areas.

(Are you involved in preserving our nature?)

Octopus giganteus Verrill: A New Species of Cephalopod, Continued from page 10

Florida monster, it is larger than any known Pacific species.

But the question arises as to why have there not been more reports of sightings of these animals? If we do not recognize the possibility that an unknown animal may exist, reports of these animals would be regarded as being mistaken for known species of animals.

As yet, this is all that is known about these giant octopuses. For 80 years have passed since the only representative of the kind was found and examined. Perhaps the words that Dr. Webb wrote were prophetic, "It will be worthwhile to make a good deal of effort if it is the 'only one'." And it still is.

## AUTHOR ACKNOWLEDGEMENTS

I wish to thank the various persons whose help and generosity enabled this article to be completed. Foremost to Dr. Forrest G. Wood, senior scientist and consultant with the Ocean Sciences of the Naval Undersea Research and Development Laboratory at San Diego, California; Dr. Joseph F. Gennaro, Department of Biology, New York University, New York City, New York; Mrs. Jacqueline Bearden, of the St. Augustine Historical Society, St. Augustine, Florida; Dr. William D. Hartman, Curator of Invertebrate Zoology of the Peabody Museum at Yale University, New Haven, Connecticut; and to Paul and Ronald Willis of the International Fortean Organization, Arlington, Virginia.

## AUTHOR EPILOG

To any researcher who has tried to locate decades old references, much information has been lost. Inquiries to locate the original papers of Prof. Verrill at Yale, Harvard and the American Museum of Natural History, and of Hyatt Verrill at Brigham Young University, have met with failures. Two local newspapers which were published in 1897, the St. Augustine Evening Register and the St. Augustine Press have no known copies in existence. To any reader who may know the whereabouts of this and any other references on this subject of the giant octopus, the author would be grateful. 7 Arlmont St.; Milford, Connecticut 06460.

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Continued on page 52, column 1.

# Cypraea guttata

## OCTOPUS GIGANTEUS

Continued from page 51

----- "A Sea Monster Off Florida Coast". Feb. 14, 1897. New York Herald, 4th section, p. 5, N.Y., N.Y.

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(Photographs on page 189 of last issue.)

The universal dream of most serious Cypraea collectors is to own a Great Spotted Cowrie. Sadly, since shell collecting became a recognized hobby only a very few have been offered, and then at a very high price. It is a rarity to see even one in a collection, but when one person has three gems, that is news!

In the accompanying illustration, dorsum and aperture views of three perfect specimens are figured. These shells are 63mm, 62mm and 52mm in length. They are from the outstanding collection of Mr. Taizo Ninomiya of Tokyo, Japan. All three were trawled from deep water in the East China Sea and then obtained by Mr. Ninomiya, who has one of the finest, as well as most extensive, personal shell collections in Japan and, most likely, in the world. Mr. Ninomiya regularly displays his collection in large business stores in Japan.

Ninomiya has the best connections with the Japanese trawling fleet and spends endless hours in search of rare shells taken in their nets. Nine of his specimens of Cypraea guttata came from 100 to 150 fathoms near Japan,

the tenth is from the Bay of Bengal, but the data indicates only, "deep water, trawled". Most of the specimens still had the animal, or parts of the animal inside when obtained shortly after the trawlers returned to port.

Fortunately, Ninomiya has retained data and records of all these shells and the following chart renders some interesting information. The specimen which measures 70.4 mm is undoubtedly the world record for size.

(see chart below)

Lest we incite a flood of mail to Mr. Ninomiya, we must report that he presently has only two specimens of Cypraea guttata in his collection, as he had traded or sold all the others. Naturally, number nine is one he kept, as well as number seven.

We send our thanks to Mr. Ninomiya for sending and sharing this information with our readers.

ELMER G. LEEHMAN

Honolulu, Hawaii

No.	Location trawled	Condition	L.	W.	H.	No. of Teeth	w/l ratio	h/l ratio
1.	Uesturi Islands	fine, but no spots	52.4	32.8	26.5	25/25	.63	.48
2.	Uesturi Islands	fair spots	50.9	31.2	23.5	19/23	.62	.49
3.	Uesturi Islands	fair spots	63.5	36.2	30.0	24/25	.57	.44
4.	Uesturi Islands	fine spots, gem	62.8	37.5	30.0	27/27	.60	.43
5.	Danjo Islands	few spots, gem	32.4	32.4	26.4	21/23	.60	.43
6.	Danjo Islands	juvenile	58.1	39.5	31.1	22/22	.67	.38
7.	Uesturi Islands	large spots, gem	63.0	42.5	31.5	22/25	.67	.40
8.	Uesturi Islands	few spots	50.6	33.1	26.6	19/23	.65	.45
9.	Uesturi Islands	fine spots, gem	70.4	40.6	32.7	21/26	.58	.37
10.	Bay of Bengal	small spots, gem	54.2	33.0	26.4	22/27	.60	.50

### U.S.'s ONLY TRUE TREE SNAIL

Continued from page 20

true tree snail are protected in Everglades National Park.

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Voluta (Festilyria) festiva (beach, good condition), Cypraea exusta, C. marginalis, C. lentiginosa, C. erythraensis, C. gangranosa and Marginella obtusa. For exchange for Cypraea of like value. Write to GIORGIO DI MAIO; Via Teognide, 108; 00125 Roma, Italy.

Callanaitis disjecta (very fine) from my area in exchange for shells from your area. Have other local species as well. FRANK E. JONES; 14 Percy Street; Devonport, 7310, Tasmania, Australia.

## Exchanges Wanted

Have some live-collected, w/o, large Busycon contrarium that I would like to exchange with collectors in India, Sri Lanka or Fiji. I collect all marine gastropoda, but specialties are cones, cowries, murex, volutes and strombs. J. M. INCHAUSTEGUI; 2121 Grape Pl.; Gretna, Louisiana 70053.

Can exchange a dozen Perna perna, a dozen Brachidontes darwinianus and a dozen Mytella

tella guianensis, for two M. edulis chilensis and two M. edulis desolationis. JORGE FARIA VAZ; Alameda Lorena, 1919; 01424 - Sao Paulo, Brasil.

Anyone visiting Sri Lanka is invited to exchange specimens with me any morning. Have marine and land, including Conus variabilis described in OS&S Fall 1974 issue. Moon-yeen deSilva; Ja-Ela Estate, Ja-Ela, Sri Lanka 19380

HELP! Do you know of any books which teach you to carve cameos? Am also looking for specimen shark teeth, particularly those of the Great White Shark (Carcharodon carcharias), am involved in vertebrate paleontology and need modern shark teeth for comparative studies. ALDON I. B. SPENCER 124 Price St.; West Chester, Pennsylvania



## Memorandum From My Diving Log

By JIM CORDY\*

(See color illustrations on back cover)

The Sacramento Reef, which has claimed the lives of a number of vessels, lies about  $1\frac{1}{2}$  nautical miles southeast of San Geronimo Island and is approximately 190 nautical miles southeast of San Diego on the Pacific Coast of Baja California. It is directly in the path of northbound vessels keeping close to the coast. The reef is steep and covers an area that is about  $2\frac{1}{4}$  miles long by  $1\frac{1}{4}$  miles wide. The reef gained its name from a 271-foot sidewheeler, the *S.S. Sacramento*. Bound up the west coast from Panama in 1872, it ran aground on the reef and eventually broke up and sank. The 80 passengers and crew were rescued and \$1,500,000 in gold coin bound for San Francisco was salvaged. However, the sunken remains of the ship's hull is still fair game for adventurous divers willing to brave the treacherous currents around the reef. Countless other wrecks are strewn on the reef from the latter part of the 1500's onward.

My one opportunity to dive on this reef came on August 7, 1974. This was the third day of a five-day diving trip which began in San Diego on August 5. Twelve other divers and I had boarded the "Sand Dollar" a 65-foot charter dive boat about 11:00 pm on the 4th. We were underway a couple of hours later. Our immediate destination was the Todos Santos Islands, which are located about 60 miles south of San Diego. We were all rather tired, so we tried to get some rest, for the activity which we knew was coming next day.

When we awoke the next morning we were anchored in a sheltered cove at the southernmost of the two islands. We stayed here long enough for breakfast and then moved about two miles north to a shoal with a minimum depth of three fathoms. The shoal was marked by a large buoy; it was here that we made our first dive. There were many species of gastropods to be collected at this location. They included: *Bursa californica* Hinds, 1843; *Tegula regina* Stearns, 1892; *Maxwellia gemma* (Sowerby, 1870); *Maxwellia santarosana* (Dall, 1905); *Astraea gibberosa* Dillwyn, 1817; *Cypraea spadicea* Swainson, 1823; *Calliostoma annulatum* (Lightfoot, 1786); *Megathura crenulata* (Sowerby, 1825) and *Norrisia norrisi* (Sowerby, 1838), just to mention a few. I did very little collecting here as most of the species tended to be encrusted and of inferior quality.

Later in the day we moved to a quiet cove about 2-3 miles south of Punta Banda. It was here that I did some of my best collecting of the whole trip. Although we were anchored in shallow water there were some rather steep drop-offs nearby. Soon after I made my exit from the boat I dropped down to 75 feet and picked three nice *Latiaxis oldroydi* (L. Oldroyd,

1929) off a large rock. I then came upon two nice *Pteropurpura macroptera* (Deshayes, 1839) and one *P. vokesae* (Emerson, 1964), all alive and in good condition. On this dive I also collected *Calliostoma gloriosum* Dall, 1871; *Calliostoma annulatum* and a very large *Ceratostoma nuttalli* (Conrad, 1837). I saw two specimens of *Calliostoma tricolor* Gabb, 1865, but did not take them as they were both defective. This was somewhat of a disappointment as I have had much difficulty in finding this species lately. After dinner that evening we were headed for Hassler Cove at San Martin Island, about 80 miles south.

Although diving on Sacramento Reef was a new and unusual experience, the real highlight of this trip was diving on two sea mounts which are located about 2-3 miles south of San Martin Island. We dove on these two sea mounts, named "Ben's Rock" and the "Johnson Sea Mount" on August 6 and August 8, respectively. The sea mounts both rise from a depth of at least 300 feet and come to within a few feet of the surface. Both sea mounts offer a spectacular diving experience. It is deep diving at its best, but should not be attempted by a novice. The open ocean surrounding the sea mounts usually has strong currents in the vicinity and there is always the possibility of sharks being in this kind of area. We did not see any sharks, but there were numerous fish both large and small swimming around the sea mounts. I was impressed with the short time that the captain took to find the mounts and then was able to drop the anchor on top of the mount, a relatively small target to hit. While diving at 100 feet on the Johnson Sea Mount, I was able to look up and clearly see the outline of the boat above me. This would confirm that the visibility was at least 100 feet.

There were fewer species of mollusks to be found on the sea mounts than other places we dove such as Sacramento Reef. I did find one live *Latiaxis oldroydi* and four or five good dead ones with hermit crabs. My prize find on the sea mounts was *Pedicularia californica* (Newcomb, 1864). It was living on purple hydrocoral at a depth of about 70 feet and deeper. This is the first and only time I have ever collected this species. Each of the divers came back with a clump of the rare purple hydrocoral. Rather than remove clumps of the hydrocoral already growing on the side of the sea mount, we were able to take clumps which were already broken off and lying on small ledges.

While the sea mounts offered superb deep-water diving, the diving at Sacramento Reef was shallow with a maximum depth of 40 feet. With the boat anchored in 40 feet one could look over the railing and easily see the bottom.

One of the most abundant species I found on the reef was *Calliostoma gloriosum*. There are two rather interesting facts about this species that have always intrigued me. One is the two distinctive color variations that are to be found. One is an almost solid orange color and the other has light brown patches on an orange background. It is interesting to speculate that the two color variations represent the two sexes, male and female. I have examined a large population and found the two color variations to be divided approximately in half. The other property is that when found in the live state this species always has a thin coating of a slimy mucus-like material which covers the exterior of the shell. There is only one other location where I have ever collected this species in significant numbers and that is at Naples Reef in Santa Barbara County, California. I have also collected it in Monterey County, California.

The *Calliostoma gloriosum* I collected at Sacramento Reef were living under rock slabs with a yellow-orange sponge-like material on the bottom side of the slab. According to the book "Marine Shells of Southern California" by James McLean, the southern limit of the species' range is the Coronado Islands. It is rather interesting that I did not find it while diving on the Coronado Islands two days later. By increasing the southern limit of the distribution from the Coronado Islands to the Sacramento Reef, a distance of about 170 nautical miles is involved. I also collected a single specimen of *Trivia solanderi* (Sowerby, 1832) under one of the rock slabs. Other species collected at Sacramento Reef include: *Ceratostoma nuttalli*, *Calliostoma supragranosum* (Carpenter, 1864), *Megathura crenulata* and *Macronaethiops* (Reeve, 1847). It is interesting to note that the latter is the only species I collected on the whole trip which is not figured and described in Dr. McLean's book. *Cypraea spadicea* was observed, but not collected. I had heard that the *Cypraea spadicea* on Sacramento Reef were of an unusually large size, often attaining a length of 75 mm. Much to my disappointment I found them all to be the typical size of 30 to 50 mm.

On August 8, after diving at the Johnson Sea Mount, we moved in close to shore and anchored in about 30 feet of water off the small town of San Quintin. The bottom here was all sand. In the sand were numerous sand dollars. Pismo clams, *Tivela stultorum* (Mawe, 1823) were also abundant. We brought up about three dozen of the larger clams and had them for dinner that night. A few *Nassarius fossatus* (Gould, 1849) were found in the sand with the Pismo Clams. Continued next page,

\*Lompoc, California Column

# Sea Shell Mobiles

By ANNE MILLER\*

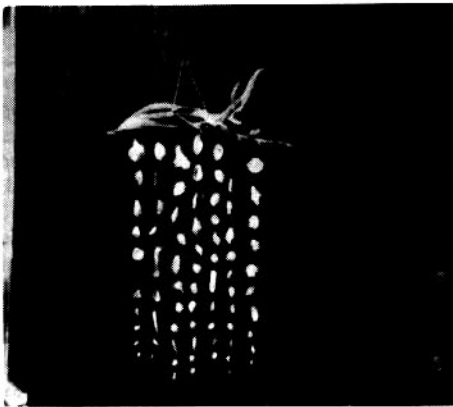


Figure 1

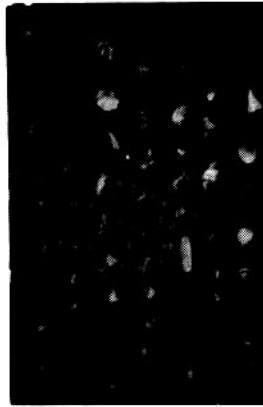


Figure 2

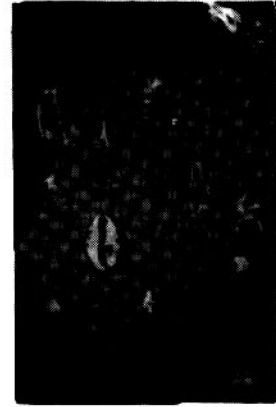


Fig. 3

One day, after several years of collecting sea shells, I realized I was running out of space and had to do something besides putting them in curio cabinets, shelves, boxes to go in the closet and under the bed. That is when I decided to spend more time organizing my collection.

And so as time went by and each shell was classified I noticed that many either were not good specimens and/or even, much more important, had no data. I found that, in many instances, I had better specimens with data to replace those "very first collected" ones.

By the time I was finished I had a very beautiful, organized and informative collection. But what to do with all those "left over" shells? I thought of different arts and crafts projects, and the idea came as to how beautiful they would look hanging from strings in some sort of a mobile. (Before I go on I must mention that within a couple of years this idea that I realized this was not an original idea, many establishments dealing with sea shells and marine life had them, or similar versions.) Anyway, they are fun to make, inexpensive and are wonderful gifts, especially for children.

The first one I made was rather large. I started by using a big piece of driftwood, so I ended up putting seven strands with ten to twelve shells per strand on the piece! (See the illustrations.)

Then, in October 1973 Manhattan Beach (the city where I live; located in Los Angeles County) was planning a Hometown Fair. Upon someone's suggestion, I had the opportunity to make several shell mobiles, ranging from as few as three strands using only tiny shells to four, five or six strands, using mainly local shells for some and world wide shells for others. Since it was near Christmas people decided they were excellent gifts. The fact that some contained only local shells really interested

people who wanted to send one to someone far away.

I was exciting to see my work so well appreciated and sold for, depending on sizes and uniqueness of driftwood, anywhere from \$7.00 to \$15.00! Since then I have made many for bazaars and various charity organizations. One particular mobile which everyone found especially interesting was one where I used a shell and its "center slice" revealing the inner structure of the shell. It is hard to find shops dealing with slices of shells, but I'm finding that more and more do carry them.

Here is what you'll need if you decide to make a shell mobile:

1. an electric drill with bits of 1/16 and 1/8 inch (have more than one of each size as you might break one or two at first).
2. clear fishing line, 2, 3 or 4 pound test size depending upon the weight of shells. (This can be purchased on rolls containing a few yards for less than 50¢.)
3. something to hang the shells from, such as an interesting branch, a stick, a large shell or driftwood, which I prefer.

Decide how many strands of shells you want, this depends, of course, on the size of the driftwood. Each strand should be four inches apart, less if small shells are used. Drill a hole in the driftwood, where each strand will be attached, with an 1/8 inch bit. Measure the approximate length you want each strand to be, cut the fishing line and pass it through the hole in the driftwood and tie securely. Select the shells in the order you want for each strand, starting with larger shells on top and smaller and smaller towards the bottom.

Now you're ready to drill holes in your shells with the 1/16" drill-bit. Choose where the hole should be, place the shell on a block of wood (so the bit doesn't go through the table!)

Continued on page 12, column three.

\*Manhattan Beach, California

## MEMORANDUM FROM DIVING LOG

Continued from page 53

After dinner that night (August 8), we began the long trip back to San Diego. We stopped the next morning and anchored in about 70-80 feet at the Coronado Islands. We made our last two dives of the trip there. I collected about 5 or 6 nice, clean *Tegula regina* and one *Calliostoma annulatum*. I saw, but did not collect, *Cypraea spadicea*, *Bursa californica*, *Kelletia kelletii* (Forbes, 1852) and *Norrisia norrisi*. I also collected about three or four *Macræne cookeana* (Dall, 1918). This was only the second occasion that I had ever collected this species. They are always encrusted on the exterior of the shell.

We finished our diving at the Coronado Islands about noon and were docked at San Diego an hour later. We then went through the process of clearing Customs. About the only things we had to declare were the many underwater photographs taken by the other divers and the shells that I had collected during the five days. We then said our good-byes to the crew and departed from the "Sand Dollar".

The Baja Sea Mount trip has been sponsored by the National Association of Underwater Instructors (NAUI) for the last two years. It is scheduled to be repeated again next year and I will make every effort to repeat the trip. The "Sand Dollar" is a diver's boat designed for the convenience of the diver. Even the crew are all experienced divers. All tanks and weights are provided at no extra cost. For the diver who is interested in the unusual the Baja Sea Mount trip should be worth investigating.

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## New Locale for an Obscure Muricid

By BARBARA SUTTON\*

Happiness to the Murex collector is finding that one of your sources has sent you a stranger: a little jewel that you've never seen before. You know, instinctively, that it is a Murex, but you cannot place the species.

What a joyous day in June it was; enclosed in a "small packet" from the British Solomon Islands was truly a stranger, complete with the question from its collector - Is this a Murex at all?

That I knew. It was indeed a Murex. And it belonged to that same obscure group that barclayanus sits in - but that was all I could say. I wrote hastily for more for study.

When several other specimens arrived, I hustled one little gem off to Jerry Harsewych in Philadelphia for his opinion. I crossed my fingers and waited for his answer which came complete with a photocopy of Crosse's original description. Murex lienardi is the identification; but we are baffled by the locale. The original



\*New York City, New York

is listed as from Mauritius; proving once again that some of the old type localities were off by a few miles!

The shell, barely an inch in length, has a rather high spire devoid of previous varices (much like bippinatus and barclayanus). The body whorl has four or five varices which are slightly shouldered and fimbriated. There is a great deal of lamellose sculpturing, composed of six major cords and minor ribbing, between the varices. The anterior canal is short and slightly recurved.

The color - ah yes, the color - is white at the spire, shading to purple brown on the body whorl. The final heavily fimbriated varix is deep purple. And the small ovate aperture, bearing four columellar plaits and six strong apertural teeth, is deep purple.

This is one of those shells you wish was at least 3" instead of just an inch. But, alas, good things do come in small packets!!

Continued from page 42

Buccinidae; (16) Turbinidae; (17) Patellidae and sea display; (18) Amphineura, Scaphopoda and Cephalopoda; (19) Pelecypoda, mainly Pectinidae; (20 & 21) Bivalvia; (22) land snails.

These shells were donations from various conchologists around South Africa, plus donations from numerous overseas shell collectors and dealers, plus a collection of shells from a deceased collector who left her collection to the Zoo.

Here I must add that this shell collection is one of the best in Southern Africa as no

museum has such a comprehensive shell display. It is constantly being brought up to date and rearranged. The display has unique background colours of blue, purple, yellow, green and other colours which are studied to produce the best display results.

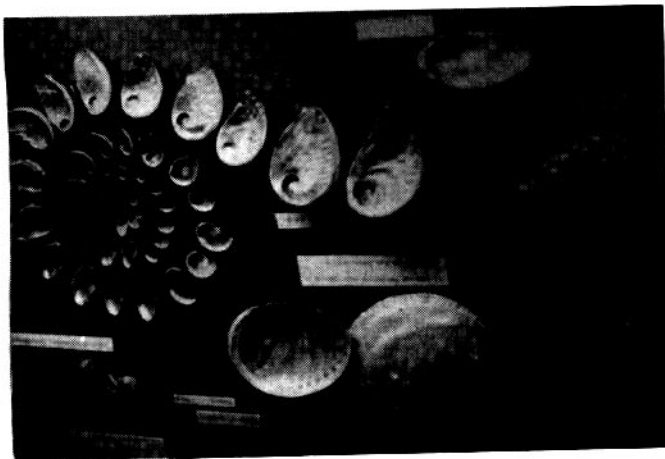
During the time that the aquarium has been operating, the losses due to deaths have been negligible and most of the fish have doubled in size thus proving that the conditions in the aquarium are most favourable for growth and development.

The aquarium caters for people in wheel

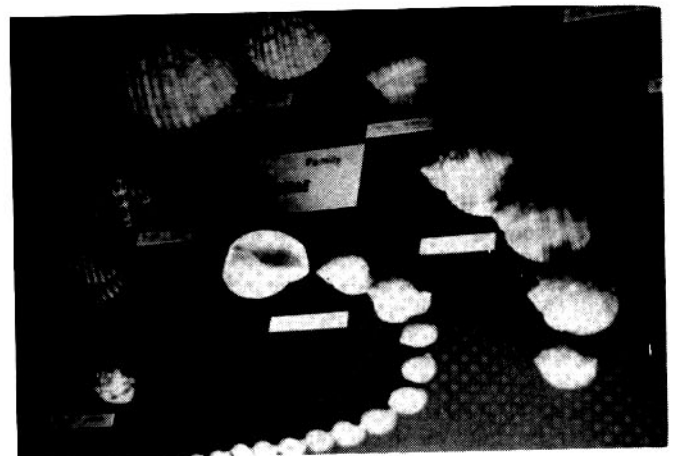
chairs and mothers with prams, no eating or smoking is allowed inside the aquarium which helps to keep the interior surprisingly clean.

Attendance figures are startling: in three months more than 6,000 scholars were taken on conducted lectures through the aquarium, the public has been passing through at the rate of approximately 50,000 a month and their comments are highly complimentary.

My grateful thanks to Mr. L. J. Smith, Chief Educational and Liason Officer of the Pretoria Zoological Gardens for his assistance with this article.



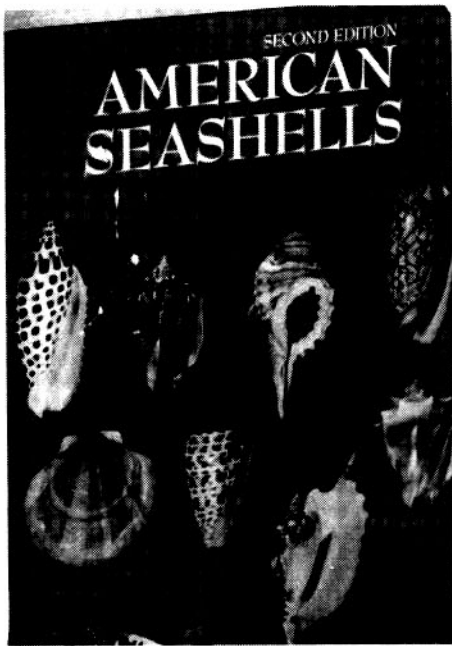
Haliotidae display in the new Pretoria Aquarium.



Tonniidae display in the new Pretoria Aquarium.



## In Review



Mrs. Elva Sheets

**AMERICAN SEASHELLS** (Second Edition)  
R. Tucker Abbott 1974  
Van Nostrand Reinhold, N.Y. \$49.50

The tremendous increase in size of this second edition of the most-used shell book in America indicates the expanded coverage given to the subject covered. In 664 pages, with 24 color plates and thousands of black and white photographs and drawings, more than 6,500 species of mollusks are listed, with details given on more than 3,500, with more than 3,000 species illustrated.

Improvements over the first edition are many. Each species is now numbered, giving an easy, quick way to refer to specific species without having to write out the scientific name. The quality of illustrations is greatly improved, including the fine color plates. The numerous illustrations of minute species are very welcome to those of us who especially enjoy working with the under 10mm species.

I suppose every book ever written will have something about it which will cause some to disallow its value. Those of us on the west coast will be disappointed in some of the treatment given species from this area in this new volume. A number of species from the Galapagos Islands and the Panama to Ecuador coast seem somewhat out of place in a book on shells of North America. But, all in all, this should prove a valuable addition to all serious collectors' libraries, with all its shortcomings.

It's the only book available which even attempts to accomplish the listing of all mollusks from the area and while it may not become the "bible" of all U.S. shell collectors, it should prove a useful tool for further study and advancement of our science. (Tom Rice)

**THE FASCINATING WORLD OF THE SEA**  
Elva D. Sheets 1974  
Crown Publishers, Inc. New York \$14.95

(The following review is reprinted from "The Original Tide-ings" edited by Arlene Hedges and the review was written by Corinne E. Edwards.)

This wide world over, shell enthusiasts, shell clubs, shell museums, shell dealers and people on the beaches must remember this dedicated, self-driven, shell collecting lady from Indiana. For 25 years she devoted herself to collecting shells, sea life and their stories. At last she has published a great book about shells and sea creatures. It is most intriguing and covers those many small shore inhabitants often met, but not understood, by shell collectors. Even if you are living inland or are not an avid shell collector you will enjoy this story of The Fascinating World of the Sea. It is not just for identifying shells. We have plenty of that type of book. It is not a picture book of shells for adorning your coffee table. It is not a hard-to-read scientific treatise on the subject of the sea and its marvelous crea-

tures. No dictionary or previous knowledge of sea life is necessary to enjoy this book about shells and seashore creatures. It is written in easy-reading, non-scientific language, almost in story form. Everyone can read, and enjoy this book. Shell collectors who already own every shell book there is will find Mrs. Sheets answers the question "What is it?" for the myriad of other miraculously God-created life associated with shell collecting.

In her 25 year quest for marine biology specimens and data, Elva made many trips. She covered 185,000 miles around this world of ours. She traveled on a shoe string. She did not live in swank hotels, sit at fancy meals, nor do much sightseeing. Friends along the way were kindred spirits and helped her greatly. This book, world-wide, will especially interest the many people who remember her. It is a most interesting book for shell and sea life lovers. It, too, is for the millions of people who cannot know the beauty and fascination of live mollusks and sea life. Even we shoreline people do not comprehend all we see, and this book brings things together. It answers the many non-technical questions we have about the wonders of God's created life in the sea. Those who have enjoyed shells just as mere objects of beauty will be fascinated to know more of the lives of the living mollusk - its habitat, reproduction, food and enemies.

Shellers and non-shellers alike will appreciate the straightforward story of the often confusing subjects of kingdom, phylum, class, order, family, genus, species and subspecies. I looked in the index and found where to look for her story on the constant name changing we shellers encounter with each newly published shell book. There is even a chapter on collecting, cleaning and storing shells. The index is great!

Twenty five years ago Elva D. Sheets had a vision - a shell and sea life museum especially for Indiana and inland people - young and old. She has worked diligently, hoping for her idea of a "Nature Colorama" museum. As soon as she could scrimp and save gas and grocery money, she set off on collecting trips. She kept notebooks to record scientific data. She visited every shell club (we have 14 in Florida alone!), shell show, museum and shell shop in each area.

She collected shells and material, bought shells, traded her extras and shipped home box after box. Shellers knew of her coming, for first she contacted them to pave the way so every day would be spent on her "dream" to bring shells and related material back to a museum for inlanders. In Hawaii they had a shower for her and donated \$1,000 worth of shells. Her identified and labeled collection numbers over 12,000 species of shells and sea life. She has, in addition, innumerable

Continued on page 36, column 3



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## Pearls From Cones and Cowries ?

It has often been reported that some cone shells have caused poisonous stings that have resulted in much suffering and, in some cases, even death to the victim. In Australia and other areas of the Pacific, death from cone stings occur nearly every year. However, I have not seen written reference to the fact that cone shells can produce pearls!

The accompanying photographs were taken by Wil Richard of Gretna, Louisiana, of a *Conus striatus* that I received in exchange from Kenya. While examining the shell I noticed that a dried piece of the animal's flesh was still inside, so I took it out. When the piece of dried flesh fell out I noticed a small piece of "something"

attached to it. Upon closer examination, it appears to be made of the same material and is the same color as part of the shell. The shell is 2½ inches long and the "pearl" is 3/16 inches long.

J.M. INCHAUSTEGUI; Gretna, Louisiana

The shell has a long, very obvious repair where it must have suffered extensive damage. Perhaps a small piece of grit got trapped between the mantle and the shell, when it was injured, and the animal secreted more shell matter around it to eliminate the irritation in the same way that a pearl oyster does.

On Saturday, January 11, 1975, a diver friend of mine, Bill French, went out on the dive boat "Kona Princess" to Santa Rosa Island off the coast of Southern California. He is not a conchologist, but he does pick up an occasional shell. When he finds something unusual, he brings it to me. On this particular trip he picked up a couple of *Cypraea spadicea* Swainson, 1823, that he found on a pinnacle in 65 feet of water. This Chestnut Cowry is the only cowry found in local waters.

His first question was, "Have you ever heard of a pearl being found in a cowry?" Of course my answer was "No!". When he brought it over and showed it to me, I had to agree that it was, indeed, a pearl.

I called my friend, Dr. James McLean, Curator of Invertebrate Zoology at the Los Angeles County Museum of Natural History. When I asked him about finding a pearl in a cowry he said that if there were such a thing ... and he was not doubting my word ... it was a "freak of nature".

Bill went to the Museum so Dr. McLean could see the "pearl". He agreed that it was a pearl and of the same material as the cowry's shell. He said that the irritation, the start of the pearl, had been in the mantle of the cowry. The cowry shell is 45 mm long and the pearl is approximately 5 mm in diameter. The aperture of the shell is 3 mm wide and so the pearl is inside to stay. The color of the pearl is tan.

ALBERTA JONES  
Burbank, California

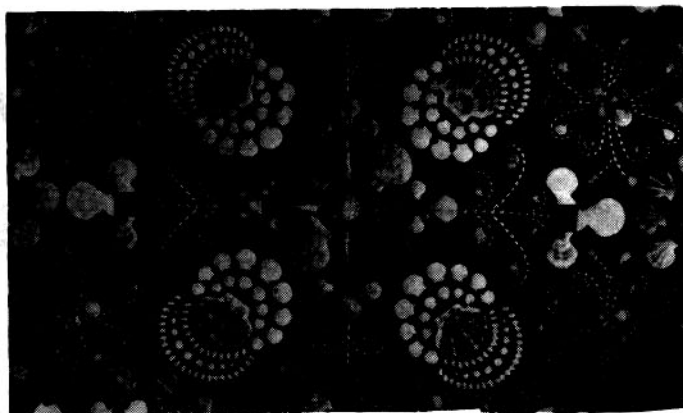
When Bill got home he cleaned his shells. He couldn't get everything out of one of the cowries. He kept shaking it and still it didn't come out so he took a close look. He saw, what he first thought was a rock, looked like a part of the shell. He couldn't believe his eyes so decided to call me.

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The First Anniversary of the Carfel Seashell Museum in Manila, Philippines, saw a Grand Raffle take place on October 28, 1974. Winners of the drawing included: 1st Prize (a *Cypraea aurantium*) to Allen Enterprises of Port Isabel, Texas (in the above photograph Mrs. Gloria Guererao accepts the prize on behalf of Betty Allen. Mr. Carlos Leobrera presents the gift.); 2nd Prize (a giant *Charonia tritonis*) to Repetto and Fontanella S. N. C. (Italy); 3rd Prize to Harry Sering of Indiana (fifty assorted Philippine land snails); ten consolation prizes of a *Spondylus regius* or *Xenophora pallidula* went to collectors in Guam, Australia, Tahiti, Thailand, the Philippines and the United States.



One of Elva Sheet's designs, all in natural shells, from her book.

### IN REVIEW

Continued from page 36  
tions in the book had to be greatly reduced, so they do not do justice to this artistic and painstaking work.

This is a book anyone, whether living near the seashore or far inland, will enjoy reading. One can skip about as fancy dictates, look up a single subject in the very detailed index and read up on it alone. Anyone can read it right through and enjoy the many facets of shells and sea life and the colorful illustrations in the book.

Libraries, Audubon groups, schools, shell clubs and individuals with a love of nature should obtain this volume. It is 10 x 7½ x 1 inch in size and has 260 pages. There are 36 gorgeous color plates and many black and white illustrations. It is priced at \$14.95, not too high a price, as prices go these days.

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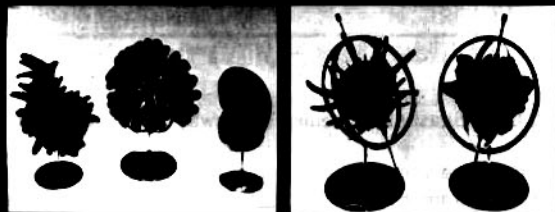
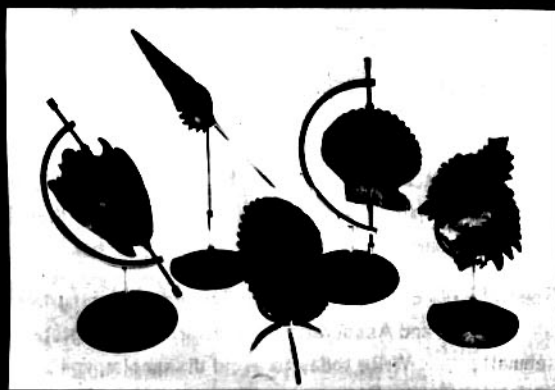
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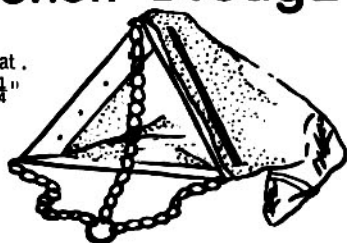
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Price lists of shells, fossils or minerals. Send stamp for each list requested. SOUTH-EASTERN MINERAL CO.; Box 2537; Lakeland, Florida 33803.

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Wanted: 1 copy of "Caribbean Seashells" by Warmke & Abbott. SALLY GRAY; 541 Willamette; Suite 202; Eugene OR. 97401.

Orange urchins from England & Ireland wanted. Submit wholesale prices. SEAPORT GALLERY P.O. Box 921; Cambria, California 93428.

## OUR BACK COVER

Our back cover features shells from the articles by Jim Cordy. The current issue has one on page 53 (see our last issue for another by Jim).

Top row left is *Calliostoma tricolor* Gabb, 1865 (see article this issue); right is *Latirus socorroensis* Hertlein and Strong, 1951 (from the Revillagigedo Islands, see article in our last issue). Center row, left, is *Calliostoma gloriosum* Dall, 1871 and to the right, *Pteropurpura vokesae* Emerson, 1964, from near Punta Banda, Baja California (see article on page 53). Bottom row, left, is *Calliostoma annulatum* (Lightfoot, 1786) and on the right is *Latiaxis oldroydi* (I. Oldroyd, 1929) also from near Punta Banda. Bottom row, center, illustrates a specimen of *Columbella socorroensis* Shasky, 1970, which was reported, and illustrated in black and white, in our last issue.

All photographs on our back cover are by Charles Cardin, who also has an article in this issue, on page 23.





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