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## our covers

The front cover of this issue shows color variations of *Homalocantha anatomica* (Perry), these specimens from Japan and are in the collection of the Of Sea and Shore Museum, obtained from Saichiro Akita.

Our rear cover features a series of slides by Richard Hammer. Top row: left is a color series of *Asaphis deflorata* (Linne) from the Caribbean area; on the right is *Apollon perca* (Perry), the Maple Leaf shell on a maple (tree) leaf. Middle row: left, *Vexillum (Pusia) dermestinum* (Lamarck), specimen collected by Dr. Richard S. Houbrick on *Thalassia* in a lagoon off Carrie Bow Cay, Belize; right, *Hemitoma emarginata* (Blainville) also from Carrie Bow Bay. Bottom row, left is *Smaragdia viridis* (Linne), the Emerald Nerite, from Carrie Bow Cay; right, *Calliostoma annulatum* (Lightfoot) from the west coast of North America.

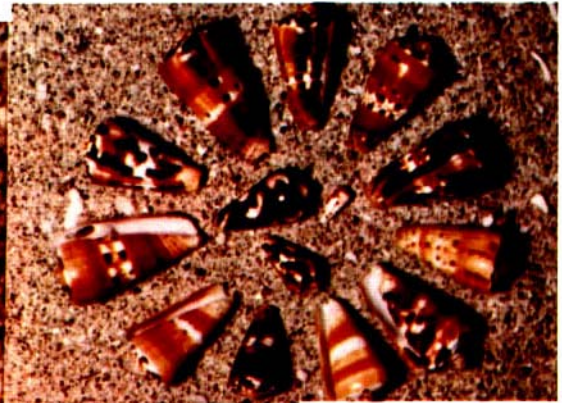
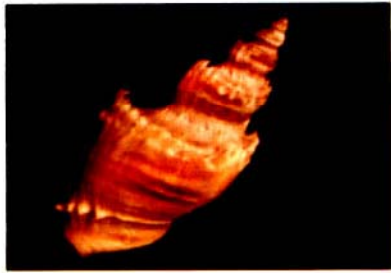


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Editor: THOMAS C. RICE

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## ALLYN G. SMITH



Allyn Goodwin Smith was born in Hartford, Connecticut, June 4, 1893 and died at his home in Berkeley, California on August 18, 1976, after a brief illness. During his 83 years he led a full, rich life. He was a man of unusual ability, wide knowledge and extraordinary energy. Even in his last years, his step was quick, his handshake firm and he had the appearance and bearing of a much younger man. He was always busy, but never too busy to stop and chat with a friend; and his friends were legion.

Allyn came with his parents to Redlands, California, while he was still in grade school, received his secondary education there and attended the University of California at Berkeley, from which he graduated in 1916 with the degree of Bachelor of Science in Electrical Engineering. He worked a year with the Southern California Edison Company, when his career was interrupted by World War I.

He served in the U.S. Army from 1917-20 as a radio operator, and as an observer on Army planes. He seldom referred to his Army service, but it was not uneventful. He once remarked to this writer, "Those were the days when one literally flew by the seat of his pants".

On his return from the Army, he married Katherine Isabel Tapscott; and obtained a position with the University of California at Berk-

ley as Chairman of the Technical Department of University Extension. In 1925 he accepted appointment with the Pacific Telephone and Telegraph Company as Administrative Superintendent of Personnel, a position he held until his retirement in 1954.

It may truthfully be said that he followed two careers, with equal success in each. He had been interested in natural history since boyhood, and presently began collecting and identifying shells, first as a hobby, then as an expert, who gained wide recognition in this field (Malacology). He served as President of the Institute of Malacology, a Director and Vice-President of the California Malacozoological Society, President of the American Malacological Union and was active in other organizations in this field.

He became a member of the California Academy of Sciences in 1936, a Life Member in 1943, and a Fellow in 1952. Identification of fossil shells being important to geologists, he was appointed a parttime Research Associate in Geology at the Academy in 1952, on recommendation of the late Dr. G. Dallas Hanna, then Head of the Department.

In 1954, Mr. Smith took an early retirement from the Telephone Company, in order to devote fulltime to work at the Academy. From 1955 to 1960 he served as Resident Malacologist and as Assistant to the Director of the Academy. In 1960 he was appointed Associate Curator of the Department of Invertebrate Zoology, and in 1963 Chairman of the Department. He was a member of the Galapagos International Scientific Project of 1964, sponsored by the University of California.

After his "second retirement" in 1972, he divided his time between the Academy and working at home on scientific projects.

He is the author of numerous papers on Mollusks, including "Amphineura" (in Moore's *Treatise on Invertebrate Paleontology*); *The Marine Mollusks and Brachiopods of Monterey Bay, California* (with Mackenzie Gordon, Jr.); and *Land Snails of the Galapagos*. His field of scientific work as listed in "American Men of Science" reads: "Classification, taxonomy, distribution and ecology of land, freshwater and marine Mollusca of the Pacific Coast of North America; Chitons, worldwide, recent and fossil".

Through the years since his affiliation with the Academy, he has been a generous donor of malacological material to its collection, the total number of specimens certainly being well over 10,000. He has also contributed a valuable

Continued on page 171

## From the Editor's Desk

The time between each issue seems to become shorter and shorter and I become more and more thankful to those who help get each issue out on time by sending in material to fill our pages. Without the continued contributions of our readers OS&S would become impossibly difficult to produce - a special thanks to three people who have contributed numerous articles since the inception of the magazine: Corinne E. Edwards, Vivian Abreu and Robert R. Talmadge.

This has been a summer of sadness and joy. Sadness at the loss of good friends and fellow shell-enthusiasts such as Allyn G. Smith and young Eric Scheidt. Joy at meeting the many shellers and subscribers who have stopped by our Museum to say hello - hope to see more of you during the next twelve months.

Hope you'll enjoy the contents of this issue and will let us know your ideas on things of interest to you that you'd like to see contained in OS&S. After all, it's your magazine.

Tom Rice, Editor

## IN MEMORIAM

ERIC SCHEIDT

Bremerton, Washington (age 14)

DELIGHT MCGILL

Palo Alto, California

DOROTHY MATCHETT

Chicago, Illinois

## The Summer Cover

The cover of our Summer 1976 issue was resplendent in various *Olividae*. Dr. Rowland F. Zeigler has been kind enough to identify them for us and the following are his identifications:

Top row (left to right): *Oliva carneola* (2 shells) Indo-Pacific; *Oliva oliva* (forma *oriola*) (2 shells); *Oliva episcopalis* (2 shells) Indo-Pacific.

Second row (left to right): *Olivancillaria urceus* (synonym: *braziliana*) (1 shell); *Oliva mustellina* (1 shell) Indo-Pacific; *Oliva rufula* (2 shells) Indo-Pacific.

Third row: *Oliva annulata* (forma *carnicolor*) (2 shells) Indo-Pacific and *Oliva spicata* (color form) (3 shells) West Americas.

Fourth row: *Oliva incrassata* (2 shells) West Americas; *Agaronia subulata* (1 shell) Indo-Pacific and *Ancilla velesiana* (1 shell) southern Australia. Thank you Dr. Zeigler!



# Drilling & Feeding Habits of some California Carnivorous Gastropods

By LORALYNN WILLIAMS\*

## Editor's Note

The following article is a report of a science project that won, for young author Loralynn Williams, the first grand prize in her school's science fair and First Place in the 8th grade division Biological Sciences Division of the Los Angeles County (California) Science Fair. Loralynn also received a Savings Bond prize from the Society of Photographic Scientists and Engineers for her use of photographs in her prize-winning display. Congratulations Loralynn and we're very pleased to have your article in OS&S!

Photographs are by the author.

\* Rancho Palos Verdes, California

## INTRODUCTION

In the fossil beds and at the beaches along San Pedro and the Palos Verdes Peninsula, shells are found with round holes in them - holes that appear to have been drilled. It is known that some gastropods and octopuses drill holes in mollusks in order to get through the hard shell so they can get into the meat of the animal. I have observed some of the southern California gastropods in an aquarium to determine which ones drill holes. I then wanted to find out if it is possible to tell what species of gastropod (or possibly an octopus) drilled the hole by the shape, size and appearance of the hole. I compared the holes drilled in the shells that were in the aquarium to the holes in shells found at the beaches and in the fossil beds.

I started by setting up two saltwater aquariums, one of 15 gallon size, the other a ten gallon size. The aquaria are glass and plastic with both undersand and outside filters and I use salt water from the ocean. In the aquarium is sand, rocks and seaweed, simulating an environment similar to that in which the species being examined is found. I provided living clams, mussels, barnacles, worm tubes and other gastropods for the snails to eat. The aquariums were kept outdoors and water temperature ranged from 35° to 70°F. When the water temperatures ranged from 65° to 70°F ice packs were used to cool the water.

I kept daily records on the activities of the different inhabitants in the aquariums. The following information was taken from my daily notes from July 1975 through April 1976.

## OBSERVATIONS

I was able to obtain nine species of gastropods and one octopus which drill holes in the shells in the aquarium. Each species of gastropod and the octopus drill a hole that has its own characteristics, but the holes can not always be identified as to the driller.

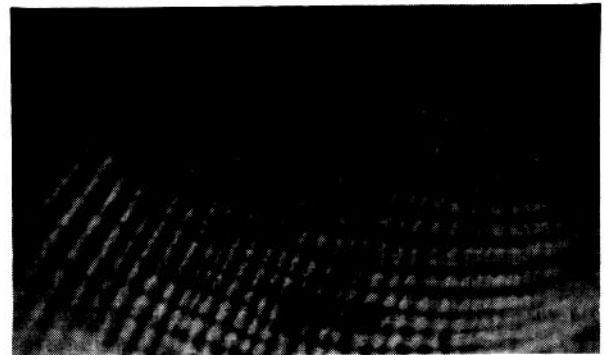
When the gastropods were observed drilling all that could actually be observed was the gastropod staying on its prey with very little movement for periods of days. They keep their shell close to the shell of the prey and not much of the animal is visible. When the gastropods

finished drilling and eating they move off the prey and there is a hole and part, or all, of the prey are gone. Besides the drilling gastropods I observed other tidepool inhabitants in my aquariums, trying to find out the feeding habits and behavior of each species.

### Murex (Forreria) belcheri Hinds, 1843



Snail in drilling position.



Hole drilled by M. (F.) belcheri (10X)

I have one M. belcheri, which measured 34mm in length in March of 1976. In June it had reached a length of 47mm and grown an addition of 3½ new knobs on the body whorl. When I first had the M. belcheri it moved onto a shell inhabited by a hermit crab. This appeared to bother the hermit crab - in fact the crab was so upset it moved out of the shell and into other shells and back again into its original home. Maybe the M. belcheri was too heavy for the hermit to move. I took the M. belcheri off the hermit's shell and found a completed hole. Six days later I took the M. belcheri off a clam valve that was dead and had algae covering the inside. Murex belcheri

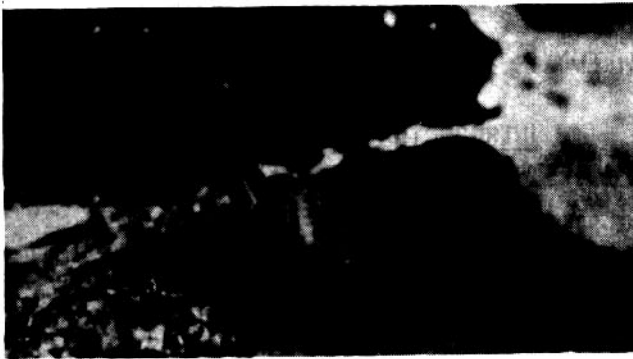
had drilled a hole in the valve. The next day M. belcheri moved onto a live clam. An Acanthina spirata moved onto the opposite valve of the same clam! Murex belcheri drilled through the clam and ate part of the animal in ten days. About one week later M. belcheri moved onto a live mussel. I moved the mussels and M. belcheri fell off. It moved to another area on the same mussel. It stayed at the second spot for 19 days and drilled a complete hole and ate about 3/4 of the mussel.

I am wondering if this M. belcheri can't tell the difference between a live mollusk and a dead shell. Or if all M. belcheri are this way. It is possible that M. belcheri drill into every

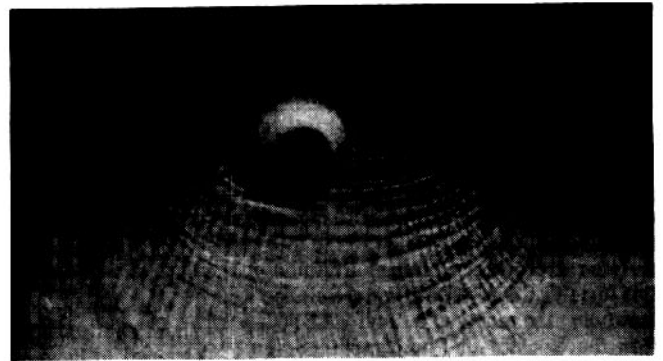
shell they find until they come across a live mollusk.

The hole drilled by M. belcheri is concave and the interior rough in appearance. The bottom of the hole appears to be chipped instead of smooth. The top of the hole is about 2mm in diameter and the bottom about 1½mm. The hole is similar to those of Murex festivus and Acanthina spirata in shape and appearance. It is difficult to distinguish holes of the three without close examination - the main difference is the concave shape of M. belcheri's hole.

Polinices reclusianus (Deshayes, 1839)



P. reclusianus in the aquarium



Hole drilled by P. reclusianus

In a separate 10 gallon aquarium with sand bottom were two Polinices reclusianus. One was there for three months and then died in September of 1975. The other one was there for 11 months and was finally eaten by a Hexaplex erythrostromus (Pink-mouth Murex) from Mexico in June 1976. There have been others, but they died within a week of capture. Polinices are very hard to observe because they burrow in the sand and stay hidden. The P. reclusianus are kept with olives, clams and

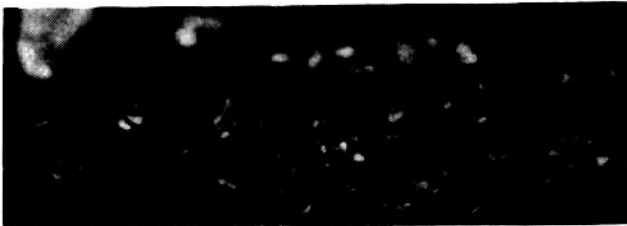
Nassarius, none of which drill.

In the aquarium I found a clam drilled and eaten. I know that it was drilled by one of the P. reclusianus, but not which one. Twenty-one days after I found the first drilled clam I found another. It appeared that a P. reclusianus started drilling on one side of the clam and then moved to the other side because there is an incomplete hole on one valve. Sixteen days later I found another clam drilled. The P.

reclusianus drilled fourteen clams in seven months, from December 1975 through June 1976.

The hole of P. reclusianus is about 4mm in diameter at the top of the hole and about 2 mm at the bottom. The hole is smooth in appearance. The hole of P. reclusianus can be distinguished from other gastropod holes, because it is larger than most and has more of a shelf at the bottom of the hole.

Murex (Maxwellia) gemma Sowerby, 1879



I have one Murex gemma, 29mm in length and it has drilled and eaten four clams. The following are the sizes of the clams in the order in which M. gemma ate them: 41mm, 42mm, 26mm, 27mm. It took M. gemma four days to drill and eat each clam. The clams

were eaten about one month apart. The snail ate the clams through the tiny hole because the hinge was not broken and the clam was still closed when M. gemma finished eating.

The hole of M. gemma has straight sides and appears to be smooth. The top of the hole

is about 1mm in diameter and the bottom of the hole is about 1mm in diameter. The hole of M. gemma is similar to that of the juvenile Ceratostoma nuttalli. It is difficult to distinguish between the holes, but it could be possible with close examination.

Ceratostoma nuttalli (Conrad, 1837)

There have been eight Ceratostoma nuttalli in the aquarium. This species appears to prefer mussels over clams; they will also eat barnacles. In some of the larger barnacles they drilled a hole through the side. A Crepidula was also drilled and eaten by C. nuttalli. It takes a C. nuttalli from 3-5 days to drill and eat a mussel. They appear to be one of the more active drillers. Twelve other mollusks have been drilled by my C. nuttalli.

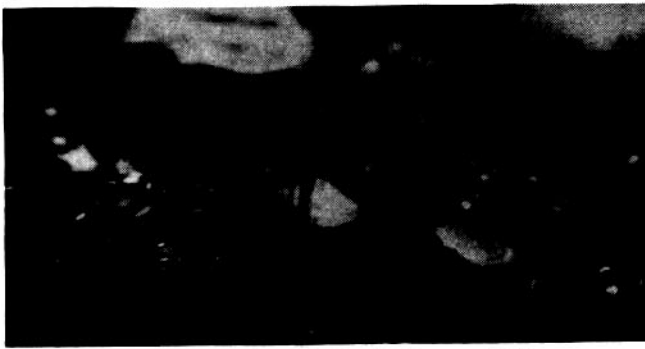
The hole of C. nuttalli ranges from about 2 to 3 mm in diameter at the top of the hole to from 1 1/2 to 1 3/4 mm diameter at the bottom. The hole appears to be rough and chipped. The hole of C. nuttalli is similar to the hole of M.



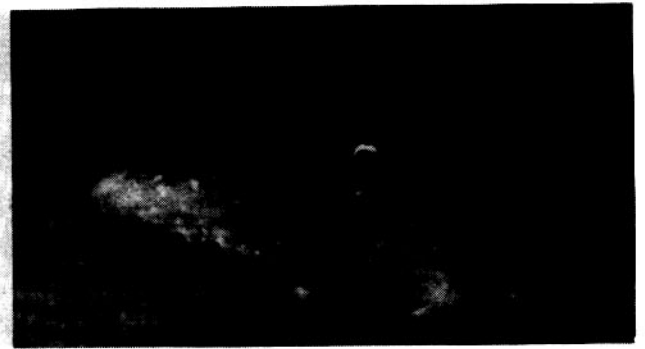
C. nuttalli on mussels



Hole in mussel shell.



juvenile Ceratostoma nuttalli



hole drilled by juvenile C. nuttalli

festivus in shape and size. Sometimes the hole of C. nuttalli is difficult to distinguish from others because of its varying appearance.

Ceratostoma nuttalli, juvenile

This specimen was identified as a juvenile Ceratostoma nuttalli by Dr. James H. McLean, Curator of Invertebrate Zoology at the Los Angeles County Museum of Natural History. I have two of these, one live the other dead. They were found off Catalina Island in California purple coral. The differences between these

two specimens and grower C. nuttalli is that these have a purple mouth and don't have a tooth.

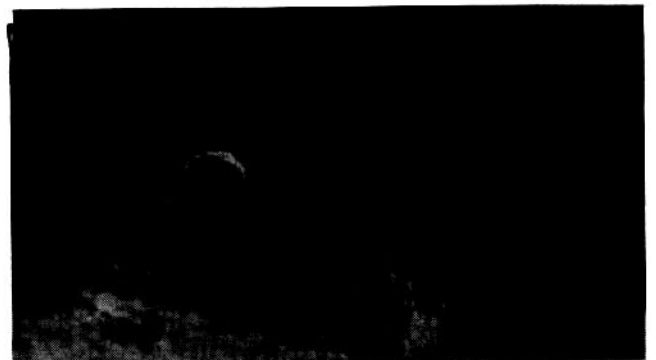
The live C. nuttalli juvenile was in the aquarium for about five months before I observed it drill. It first drilled an incomplete hole in a clam. Then it drilled and ate a mussel in about three days. Since I hadn't observed it drilling before it could have eaten some small clams I had found discarded in the aquarium. The holes in these were very similar to the hole that was observed in the mussel.

The hole of the juvenile C. nuttalli is about 1mm in diameter at the top and about 3/4mm at the bottom. The sides are slightly slanted and rough in appearance. The hole appears very similar to the holes of Murex gemma and Ocenebra circumtexta - in shape, size and appearance. The main difference is that the hole of the juvenile C. nuttalli isn't quite as round as the hole of Murex gemma and not quite as smooth as the hole of Ocenebra circumtexta.

Murex (Pteropurpura) festivus Hinds, 1844



Murex festivus drilling mussel



Hole drilled by M. festivus

There are about five Murex festivus in the aquarium. The first started drilling about one week after its introduction into the aquarium. M. festivus appear to prefer clams over mussels. They also eat barnacles. One has eaten a Tegula funebris. Twice I have observed a Murex festivus on one valve of a clam and Acanthina spirata on the other. It takes M.

festivus from 5 to 7 days to drill and eat a clam. M. festivus appear to be one of the more active drillers. There have been ten clams, one Tegula and two mussels in my aquarium drilled by M. festivus.

The hole made by M. festivus varies in size and shape from a thin-shelled prey to a thick-shelled victim. The holes range from

about 2 to 2 1/2 mm at the top of the hole and from 1 to 1 3/4 mm at the bottom. The hole appears to be smooth and is similar to that of M. belcheri, Acanthina spirata and Ceratostoma nuttalli. It is difficult to distinguish between them; the main difference is that the hole of M. festivus is sometimes a little larger and smoother than the others.

Acanthina spirata (Blainville, 1832)

There are about five Acanthina spirata in the aquarium and they were there for about three months before they started drilling. Their first victims were barnacles and then clams. It takes A. spirata about five days to drill and eat a clam.

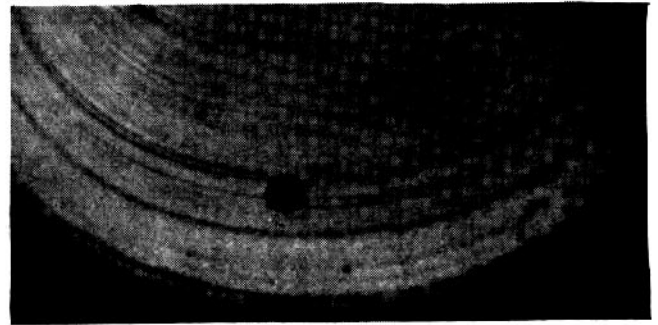
The hole of A. spirata is about 1 1/2 mm in diameter at the top and about 1mm at the bottom. The hole is smooth in appearance and similar in shape and appearance to those of

Murex festivus and Forreria belcheri. It is difficult to distinguish between them, although sometimes the hole of A. spirata is smaller than those of the others.





Acanthina spirata in aquarium



Hole drilled by A. spirata

Ocenebra circumtexta (Stearns, 1871)

There are five Ocenebra circumtexta which started eating barnacles when first placed into the aquarium. About two weeks later they started drilling mussels; it takes Ocenebra circumtexta about four days to drill and eat a mussel. One

Ocenebra poulsoni was drilled five times by O. circumtexta and three of these holes were completed.

The hole of O. circumtexta is about 1mm in diameter at the top and about 3/4mm at the

bottom. The hole appears to be smooth and is similar in shape, size and appearance to the hole of Murex gemma and the juvenile Ceratomyx nutalli. It is difficult to distinguish between them.

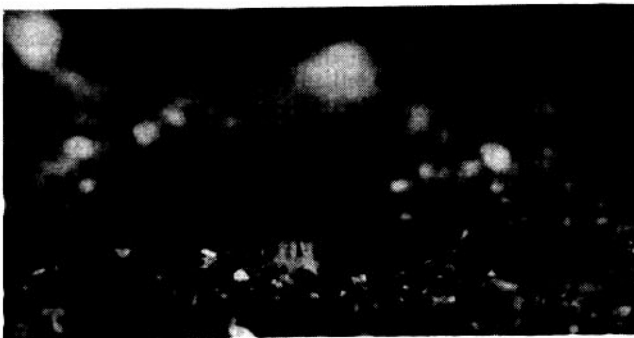


Ocenebra circumtexta in aquarium

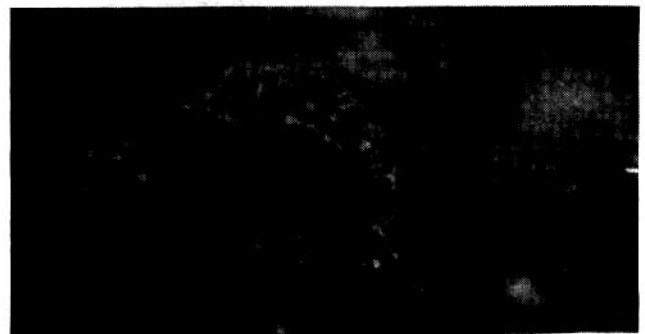


Ocenebra circumtexta's drill hole

Murex (Pteropurpura) trialata Sowerby, 1834



M. trialata in author's aquarium



Hole drilled in worm tube by M. trialata

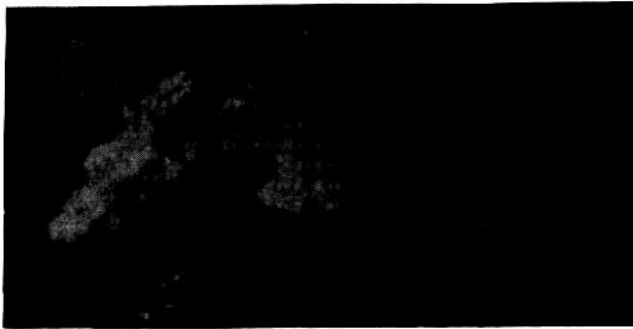
A 59mm Murex trialata resides in the aquarium. It was there for three months before it started drilling. M. trialata didn't appear to want to eat clams or mussels, but was interested in Serpulorbis squamigerus worm tubes.

M. trialata stayed on the worm tubes for about a week and when it moved off the tubes one was drilled and eaten.

The hole of M. trialata is difficult to com-

pare to other holes because of the shape of the worm tubes in which they drill. The hole of M. trialata is about 3mm in diameter at the top and about 2mm at the bottom. The hole is oval in shape and appears to slant in one direction.

Ocenebra poulsoni (Carpenter, 1864)



Ocenebra poulsoni in author's aquarium



Clam valve's edges chipped by O. poulsoni

Three Ocenebra poulsoni live in the aquarium and do not drill holes like the other Muricidae. They appear to chip away the top marginal edge of a clam or mussel, enough to get their proboscis

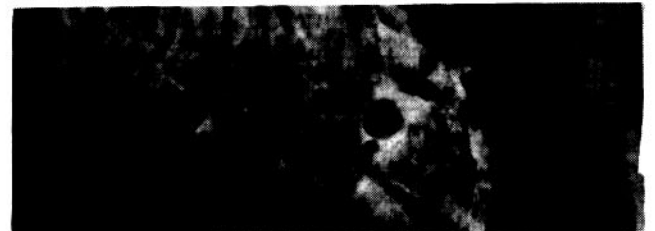
into the shell to eat the contents. This could be termed a way of drilling. Sometimes O. poulsoni appeared to smother a mussel or clam by holding the two valves together with its foot for three or four days. The mussel or

clam would open and O. poulsoni would then start to eat. They also ate barnacles. According to some information O. poulsoni do drill, but those I observed appeared only to smother or chip the edges of a bivalve.

Thais emarginata (Deshayes, 1839)



Thais emarginata on mussel shell



Hole in mussel, drilled by T. emarginata

The Thais emarginata are from the Morro Bay area, but are occasionally found in southern California. I was able to obtain some specimens from Morro Bay and when they were first put into the aquarium they started drilling mus-

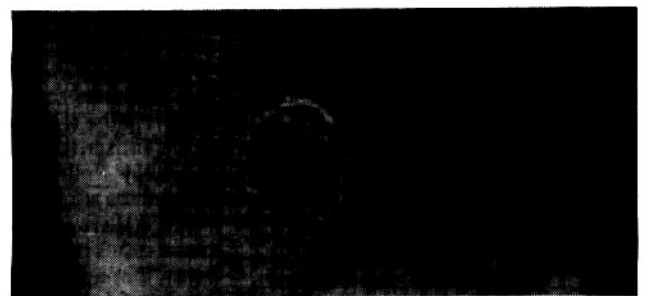
sels. But whenever the mussels were moved or handled, the T. emarginata moved off. I have observed three incomplete and two complete holes drilled by T. emarginata.

The hole of T. emarginata is about 2mm in diameter at the top and about 1½mm at the bottom. The hole is similar in shape, size and appearance to the hole of Acanthina spirata. It is difficult to distinguish between them.

Muricanthus nigrinus (Philippi, 1845)



M. nigrinus perched on mussels



M. nigrinus's hole drilled in clam

I was able to obtain two live Muricanthus nigrinus from Baja California. These have similar feeding habits to Ocenebra poulsoni. M. nigrinus will stay on the marginal edge of a bivalve for about a week. When it moves off, the clam or mussel has been devoured and the shell appears to be chipped along the marginal

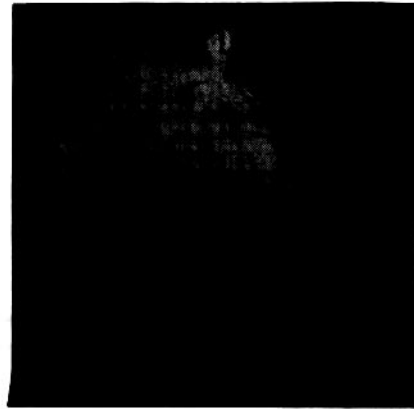
edge. At other times, M. nigrinus will stay on bivalve and appears to smother it. They will also drill. I have had four clams drilled and eaten by the M. nigrinus.

The hole of M. nigrinus is about 3mm in diameter at the top and about 1¼ to 2mm in diameter at the bottom. The hole is round on the outside of the valve and oval inside. The hole of M. nigrinus can be distinguished from holes drilled by California gastropods by this oval shape.

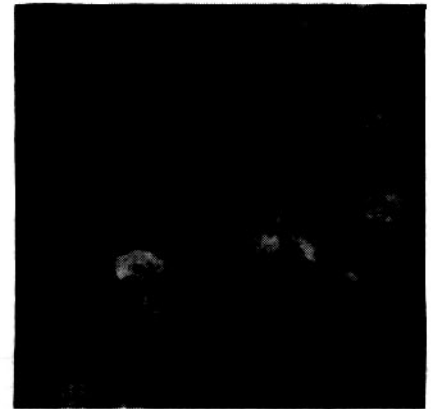
Octopus

In the aquarium there is an Octopus sp. (bimaculatus or bimaculoides ?) that is about 8 inches in spread of tentacles. It comes from southern California and lives in a Tun shell, or will burrow under a rock. It eats hermit crabs, clams, gastropods and abalone. It will eat about five hermit crabs a night. When it eats a clam, it drills a hole through the shell and then injects a venom which relaxes the adductor muscle of the clam so the octopus can open the valves and eat the meat. Besides the crabs the octopus has eaten three Norrisia norrisi, a Melongena corona from Florida and one Theodoxus luteofasciatus from Mexico. The octopus drilled only one of the Norrisia.

The hole of the octopus is about 3/4mm in diameter at the top and about 1/2mm at the bottom. The top of the hole is round and the bottom is



Octopus



Hole bored by octopus

slightly oval. The size of the hole depends upon the size of the octopus, but the bottom (or interior opening) is always about the same size. The hole of the octopus can be distinguished from

those of gastropods because of the extreme slant of the octopus hole and the very small oval interior opening.

INTERPRETATION

Of the mollusks I was able to obtain from the southern California coast, the following drill: Murex festivus, Forreria belcheri, Ceratostoma nuttalli, Polinices reclusianus, Murex gemma, M. triatala, Acanthina spirata, Ocenebra circumtexta, Thais emarginata and Octopus sp. Other mollusks were carnivorous, herbivorous or omnivorous. It took nine months to find that these nine species of gastropods drill holes. They are from the Families Muricidae, Thaisidae and Naticidae; it is possible that other species of these families also drill holes.

Ceratostoma nuttalli and Murex festivus appear to be the most active drillers. Some of the drillers prefer one kind of molluscan prey over another; others did not seem to have a preference and ate a variety of the available mollusks. They appear to prefer bivalves over univalves.

The feeding intervals differ. Some gastropods eat once a week, others eat once a month and others eat every three months. The feeding intervals also differ with the same individual depending on the size of the prey and the temperature of the water.

Sometimes there is more than one drill hole in a shell. This is because more than one predator snail drilled into the same prey shell at about the same time.

It is possible to tell if a gastropod or an octopus drilled the hole by the size, shape and appearance of the hole. It is difficult to distinguish which gastropod drilled the hole because some are very similar. The holes of Ceratostoma nuttalli, Murex festivus, Acanthina spirata, Thais emarginata and Forreria belcheri can be easily confused because of the similar shape, size and appearance. The holes of Murex gemma and Ocenebra circumtexta can be distinguished from others because of the small size, but they can possibly be confused with juveniles of other species. The holes of Polinices reclusianus can be distinguished from Murex holes because of its large hole and the wide shelf at the interior opening. The holes of all species vary in size depending upon the size of the specimen doing the drilling. There are small differences in all holes that can sometimes be identified using a thirty-power dissecting microscope.

Drill holes in shells picked up on the beach or in the fossil beds along San Pedro and the Palos Verdes Peninsula are plentiful. Some of the drill holes can be assigned to specific predators. On the sandy inner bay beaches are many shells with drill holes that appear to have been drilled by Polinices. In the rock tidepools, where there are many different species of Muricidae drillers, it is difficult to identify the predator. There are many clams in the rocky areas that appear to have been drilled by an octopus. Clams and mussels are the most commonly drilled prey.

In the fossil beds Polinices and Murex holes can be identified, but it is difficult to determine which species was the predator. A high percentage of mollusks found in the fossil beds have been drilled. It is possible that the predator snails were starving as the waters receded and as prey was harder to find they are whatever they could find. In some of the fossils there are more than a single drill hole - in one shell are six holes and five of these are completed holes. Another reason for so many drilled shells might be that in some locations the dead and drilled shells were washed together by wave action.

Most of the dead Norrisia norrisi examined have more than one drill hole - in some there are as many as seven or eight, but usually only three or four appear completed. Because of the shape of the holes I think these holes are usually drilled by an octopus.

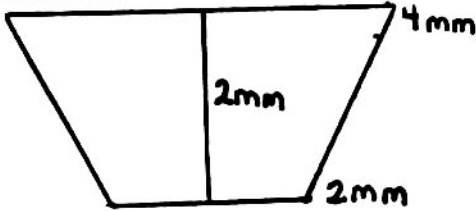
The photographs of the living mollusks were taken in the aquarium with a Pentax camera with close-up lens. The photographs of the drill holes were taken by the same camera and close-up lens and a 10-power magnification lens.

I have found the boring gastropods very interesting, not boring.

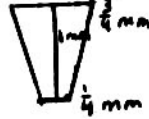


# The Shape and Size Comparison of the Drill Holes

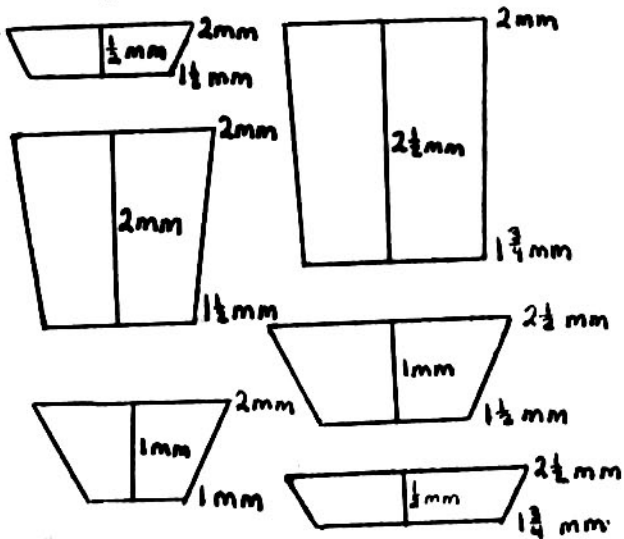
*Polinices reclusianus*



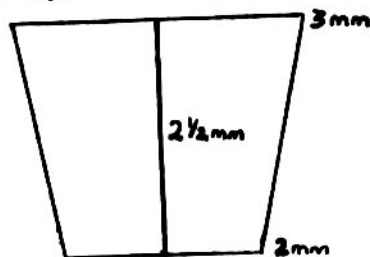
Octopus



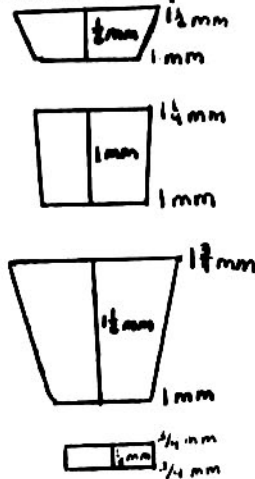
*Murex festivus*



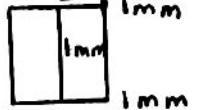
*Murex trialata*



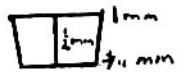
*Acanthina spirata*



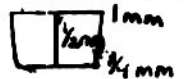
*Murex gemma*



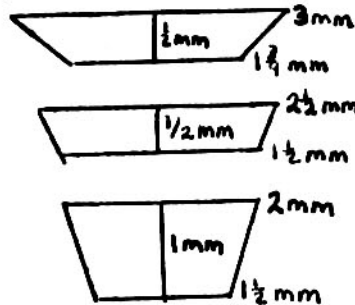
*Ceratostoma nuttall juvenile*



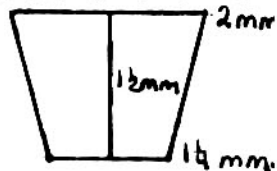
*Ocenebra circumtexta*



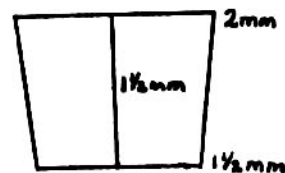
*Ceratostoma nuttalli*



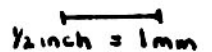
*Murex belcheri*



*Thais emarginata*



Scale



# The Poets' Page

## ODE TO A SMELLY SHELL

Oh, smelly shell,  
So difficult to clean;  
You're so awful,  
The worst mess I have ever seen!

You weren't all that bad,  
When I dropped you in my bucket;  
But now you can be smelled,  
From here to Nantucket.

I boiled you, I froze you,  
At all such extremes;  
But still I can smell you,  
Each night in my dreams.

I put you in Clorox,  
Ammonia, and such;  
But I am afraid,  
It didn't help very much!

I tried all the mothballs,  
And deodorants, too;  
And I even tried dying you,  
With methylene blue.

I even tried my neighbor's,  
Radar range;  
And many other methods,  
Exotic and strange.

I also got a witch doctor,  
Chanting his spell;  
But he ran away,  
Because of the smell!

All of these methods,  
So tried and so true;  
Could not remove the odor,  
That was within you!

But then I tried,  
One last stubborn stand;  
And I buried you,  
Deep within the sand.

And this old method,  
So very, very slow;  
Worked so well,  
That you're the Best Shell of the Show!

JOE CARTER

## WHITHER THE SOURCE

somewhere      my where  
shore birds stalk the sand  
I am here      not where  
December slick ice outside  
my desire      is there  
pallid tones  
replace  
cinnamon skin

## THE MOLLUSK AND ME

"You collect WHAT???" The impeccable lady at the party inquired  
"Seashells", I said again - beginning to feel rather tired.  
(She in her diamonds, Chanel and gown of Dior;  
Me in my pukas, powder and suty-dress plucked off the floor)  
Summoning strength, I tried once more to explain  
About shells and the quest ... and sound sort of sane.

She politely nodded and listened (with her nose pinched tight in utter disdain)

She was not swayed, not in the least and for sure she labels me quite mad.  
(For all her dignity, plucked eyebrows and rouge, she looked too lifeless  
and pale ... and I thought, how sad.)

That's O.K., I said to myself with a sigh, as she melted into the crowd ...  
I possess greater wealth than your riches endow:  
While you spend your hours in Beauty Parlors and Boutiques,  
I search the ocean and shore for the treasures it keeps.

From the first bauble I found on the beach, to the last unobtainable shell  
Each in its own unique way, casts a tiny spell.  
It all started as a childhood hobby, you see -  
And has grown to an addiction to understand what makes the Mollusk be.  
Thus to appreciate one of Nature's gifts, collecting shells has provided a key.

As I was then most certainly hooked,  
The following is the path my collecting took:  
I naively marched through the attractive cones,  
Gaily tripped onto the colorful cowries,  
Ooo-ed and awed my way into the sculptured murexes,  
S-l-o-w-l-y lingered on the tempting volutes ...  
Andranexpectantly onto the Olives, Mitras and Strombus!  
Abruptly, I discovered things were looking rather ominous

For I HAD thought that just a FEW of each would do ....  
And then I would be contentedly and certainly through!

But, alas ... it wasn't to be ... NO ..... WAY ...!  
For I began to discover at least one "new shell" a day,  
That I would yearn for anxiously and with a sigh -

I really must have THAT shell or surely I will cry!

Oh, you silly mollusk, what has your spell done to me ???!  
It is no wonder that cocktail-party-lady thinks me out of my tree!  
Yes, in my mind hourly, I visualize and plan my shelling trips to the sea.  
And concede that it is true, there is a serious thing going - between the mollusk and me!  
So - go preen and gossip, fancy-lady, old fool-you!  
For I have by far, more important things to do!  
It matters not anymore, how you label me,  
For I'll shout it out for all to hear, "IT'S A SHELL FREAK I'LL ALWAYS BE!"

Feeling much better now, I smile to myself as I see  
The lady, going to the table, reaching for the pate, while its Crossostrea virginica  
for me!

FRANCES McC. RING  
Falls Church, Virginia

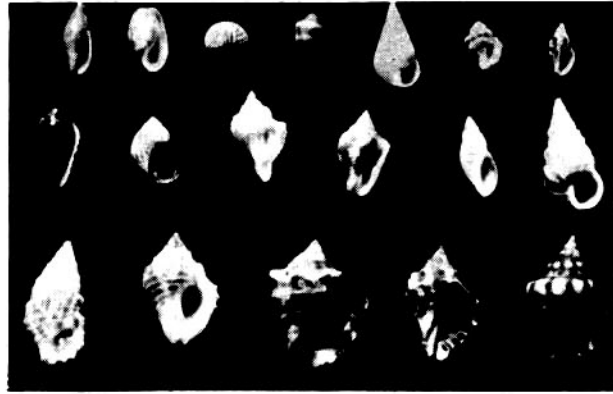
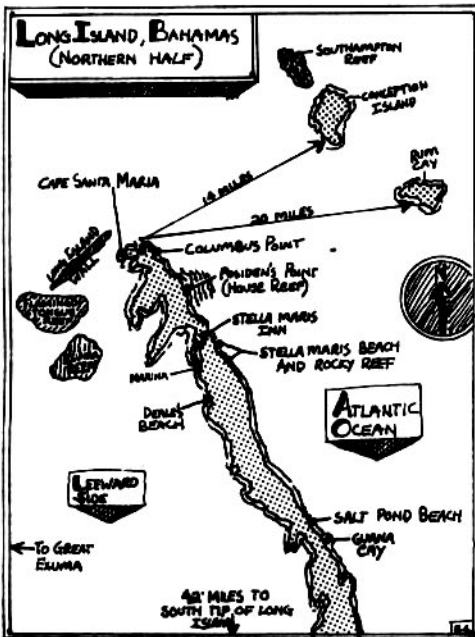
I tolerate the time  
spent between here and my where

here will never be      my where

MYA KERN PASEK  
St. Louis, Missouri

# SHELLING ON LONG ISLAND, BAHAMAS

By RICHARD GOLDBERG Flushing, New York



A few of the shells found on Long Island

Jerry had found a perfect *Conus mus* with periostracum at the base of a coral head.

new finds and another scream of "holy mackerel, I can't believe it" from room number 14.

Long Island, in the southern Bahamas, is about 150 miles south of New Providence (Nassau) and is the closest thing to paradise imaginable. I had learned about the Island through a skin diving magazine, promoting the new Stella Maris Diving Resort. The owners not only run diving trips daily, but cater to snorkelers too. I do a majority of my shell collecting this way and my decision was made. After rounding up fellow Long Island (that's New York) Shell Club members Linda Springer, Gerald Hyman and my brother Marc, we were off to Nassau and then a hop to Long Island, for some intensive shell collecting.

Long Island is quite rural by standards (no major industry except for Diamond Crystal Salt in the south) and Stella Maris is the only Inn on the Island. When we arrived, we were greeted by owners Jorg and Peter, at the air strip. Before we knew it, they had us settled in our rooms and then off to our first coral reef.

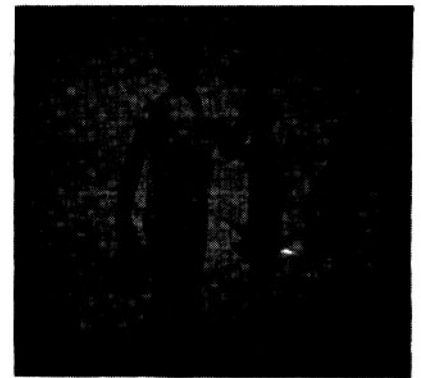
Posiden's Point (House Reef) is a spectacular reef starting five feet from shore, and stretching four miles along the coast. Each area is a different experience. The coast was very rocky and, before entering the water, we collected a variety of different rock-dwelling mollusks. *Leucozonia ocellata*, *Cittarium pica*, *Thais rustica*, *Nerita peloronta*, *Nerita versicolor*, *Nerita tessellata*, *Puperita pupa*, *Nodilittorina tuberculata*, *Tectarius muricatus*, *Echininus nodulosus*, *Littorina ziczac*, *Littorina lineolata*, *Littorina mespillum* and *Engina turbinella* were collected. Some land snails were found in the brush further back. The reef had us spell-bound and I forfeited the remainder of my shelling time for some underwater photography.

The next day we visited a beach approach to House Reef which was south of Posiden's Point. An extremely low tide confined snorkeling to some shallow areas between the coral mounds. It was amazing how a reef in ten feet of water yesterday was completely exposed for even the non-diver to see. It looked like the Great Barrier Reef at low tide. Being adventurous, Linda and I put our sneakers on and walked south along the top of a rocky cliff, that overlooked the reef. After a climb down the cliff, I walked across the coral jungle and found a *Cassis tuberosa* in one inch of water, waiting out the low tide. An abundance of marine life was observed at close range. During the rest of the nine day stay the tide never receded as low again.

Stella Maris Beach was within walking distance of our room, so this was an area we visited every day. It was a small coral sand beach, surrounded by the characteristic rocks of the Atlantic side of the Island. The same rock-dwelling mollusks were observed here that inhabited Posiden's Point. What made our visits frequent here was the rich shell fauna found in the beach drift. We would scoop up the entire 30-foot stretch of drift, bring it back to the room and pick through everything. Some of the shells found in the drift were *Tegula lividomaculata*, *Vexillum puella*, *V. gemmatum*, *V. albocinctum*, *V. hanleyi*, *Favartia cellulosa*, *F. alveata*, *Epitonium lamellosa*, *E. multi-striatus*, two species of *Rissoina*, *Littorina meleagris*, three species of *Tricolia*, *Truncatella caribaeensis*, *Petalocochus erectus*, *Triphora decorata*, *T. nigrocincta*, three species of *Melanella*, *Calyptrea centralis*, *Trivia suffusa*, *Haminoea elegans*, *Anachis pulchella*, *Nitidella laevigata*, *N. nitida* and twenty other species of shells. Each day's new tide brought

Our next collecting area was Deale's Beach, which turned out to be no big deal for shells. It is located on the leeward side of Long Island. I attributed the poor shelling to the fact that this is the southern-most portion of the Grand Bahama Bank, which is reputed to have a poor shell fauna. After snorkeling in a barren sand cove, a little sailboating and collecting a few shells from the drift, we left. Among the drift was *Retusa candei*, *Conus stearnsi*, *Seila adamsi*, *Cerithidea scalariformis*, *Mangelia cerina*, *M. fusca* and *Natica carrena*. Other shells were found that were also in the drift at Stella Maris Beach. On the way to the truck I spotted a *Murex florifer* crawling across the littoral line. A very quick inspection revealed that a crab must have brought him out of the depths. This proved to me that a hermit crab can be a sheller's best friend.

After an exhausting night of catching up on sorting and cleaning the previous day's catch, we were ready for the next trip to Guana Cay (pronounced Key). We were told by Jorg to re-



Author and two friends at the beach.





Underwater scene at Long Island

strain ourselves from taking to many conch shells. This sort of told us what to expect. I was also told by a non-sheller that this was a great place for Murex. The 25-mile trip seemed like an eternity. To reach this secluded beach and Cay, the route included an unpaved backroad of the worst possible condition. We soon learned that this area is the native Long Islander's main source for conch as food. About 1,000 conch shells laid in a pile along the shore. The Cay formed a barrier for this bay area and snorkeling was at its best. The bottom was covered with turtle grass and covering the turtle grass was thousands of live pink rollers (Immature *Strombus gigas*). I was pleasantly surprised to see no one walk away with any of these conchs for souvenirs. These mollusks are the main food source for the natives and our collecting for that one live conch would not help them any, or the conch population. Collected were two beautiful specimens of *Murex pomum*, *Turbo castanea*, *Conus jaspideus*, *Modulus modulus*, *Tegula fasciata*, *Tellina listeri*, *Codakia orbicularis* and *Lucina pensylvanica*. Guana Cay, being mainly a shelling area, and the rest of our group non-shellers, they decided to head for Salt Pond Beach, just north of here. Linda, Marc, Jerry and I, being sensible, decided to go with them, instead of being stranded in the middle of nowhere.

Salt Pond Beach looked no better than Deale's Beach, but a walk down the sandy stretch revealed a heavy patch of beached seaweed and bottom rubble. One poke into the pile brought sour shellers converging into this one fantastic concentration of shells. Some species found were: *Olivella nivea*, *Trivia nix*, *Pisania pusio*, *Polinices lacteus*, *Cittarium pica*, *Tegula excavata*, *Hyalina avena*, *Epitonium lamellosa*, *E. multistriatum*, *Cymatium pileare*, *Nitidella nitida*, *Decipifus sixaolus?*, *Anachis pulchella*, *Pyrene ovulata*, *Morum oniscus*, *Cymatium nicobaricum*, *Cantharus auritula* and *Conus mus* among others. In a later inspection at the base of a large sandstone mountain, I found two beautiful *Purpura patula*. Upon leaving Salt Pond, I got the shock of my life. The mollusk has excreted its purple dye all over my hand. Soap and water did not remove my royal Tyrian purple tattoo.

The next day Jerry bid us farewell, as previous commitments shortened his stay. We then decided to devote the rest of the day to resting in our rooms. Between sunburns and pure exhaustion, there was no chance for another excursion. We did, however, manage to run down to Stella Maris Beach for some more beach drift and, of course, a new tide brought new shells. By now we had compiled a list of 147 species found, 140 identified. This was great incentive for our next day at Columbus Point.

We had anticipated good shelling in this area, but fair shelling was more descriptive. Marc had found a beautiful long-spined specimen of *Astraea phoebia* and a native child showed us where to find multi-colored specimens of *Asaphis deflorata*. Also *Batillaria minima* was collected in the eel grass and *Planaxis lineatus* on the rocks. Columbus Point abounded with tropical marine fish and I had turned back to some underwater photography. I had also learned a good lesson in the process. Leaving Marc and Linda, I went to snorkel among the fish along the rocky shore line and ended up in some deep water. Seeing one of the group members fishing towards where I was snorkeling prompted me to yell from the water, "What are you fishing for?" His reply, "Baracuda!" With one quick glance behind me I met face-to-face with what he was fishing for! Lesson learned? Don't panic in this situation, running up those jagged cliffs in swim-fins can cut a person really bad!

We returned to House Reef the next day to be treated to the most spectacular part of this coral reef. This area was north of Posiden's Point. Sliding off the rocks, we entered 30 feet of water. Twenty snorkelers were gliding around uncountable numbers of tropical fish, a Volkswagen-sized manta ray and coral heads rising out of 50 feet of water, which made us reluctant to ever get out. After capturing the reef on film, we bid a fond farewell to House Reef.

A return to Salt Pond Beach at high tide gave us a completely different type of shelling from our last time there. Snorkeling uncovered the most productive spot in terms of quantity of shells. Species found included: *Cypræassis testiculus*, *Trivia pediculus*, *Conus verrucosus*, *Mitra bardadensis*, *Vexillum albocincta*, *V. histrio*, *V. gemmata*, *Cantharus tinctus*, *Terebra hastata*, *Ocenebra intermedia*, *O. muricoides*, *Engina turbinella*, *Leucozonia nassa*, *Cypraea spurca acicularis*, *C. cinerea*, *Astraea caelata*, *A. americana*, *Mitra nodulosa*, *Drupa nodulosa*, *Conus mus*, *C. regius* and *Columbella mercatoria*. The find of the day was a fresh-dead *Cypraea zebra*, picked up by a little boy who treasured it. This outing turned everyone's attention to shelling.

Our last shelling day brought us to Cape Santa Maria. The sand here was powdery fine, unlike the coarser coral sand of the rest of the island. The only shells found were beach.

Many *Olivella nivea* and a *Laevicardium laevicardium* pair were found. *Cypraea cinerea* and *Epitonium angulatum* were the big finds. In total, 8 shells were collected. Back I went, photographing the fish. A broken piece of *Cymatium femorale* tempted me to venture out into deeper water to take a look. But a warning of sharks by some friends and one gad experience already under my dive belt, put that notion out of my mind.

The lazy afternoon back at the Inn, reminiscing about the past eight days, brought shell fever to an all-time high. Back we were to the rocky reef, south of Stella Maris Beach. Low tide made it excellent for a walk, observing beautiful marine growths and the coral formations on the reef. Hundreds of large *Thais deltoidea* covered one area. A live *Cymatium muricinum* found by Linda was traded for my *Mitra nodulosa*. At one point Linda and Marc turned back, but I forged ahead to a small sandy area, which ended my vacation with a bang.

There I collected the most fantastic specimens of *Tegula fasciata*, *T. lividomaculata*, *Mitra bardadensis*, *M. nodulosa*, *Vexillum puella*, *V. hendersoni?*, *Morum oniscus*, *Pyrene ovulata* and *Nitidella laevigata*. The "big find" was one lovely *Conus aurantius!* No comment needed. The 5-mile hike back in the hot sun was no problem.

Looking back on an island of friendly people, beautiful landscapes, fantastic coral reefs, great shelling and rewarding experiences. I know we will never forget Long Island, Bahamas.

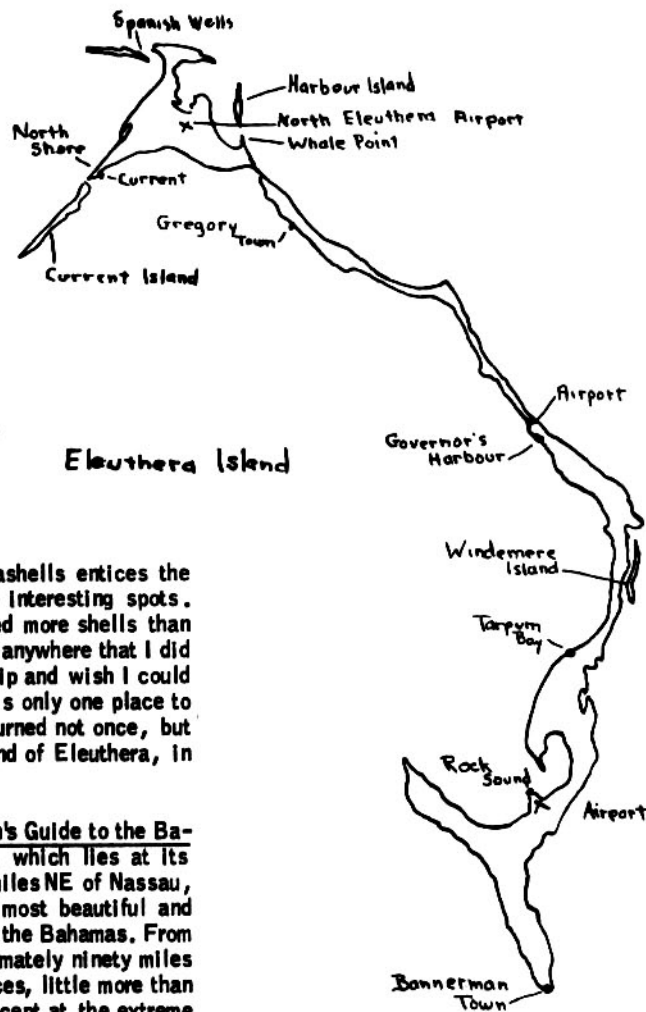
#### PUBLICATIONS RECEIVED

Continued from page 178

Prey of *Oliva sayana* (Gastropoda: Olividae)" by Nick Fotheringham, 2pp; "The Vertical Distribution of Pea Crabs (*Pinnotheres maculatus*) in Mussels (*Mytilus edulis*) from Montauk, New York", by J.S. & P. Weis, 2pp; "Pigment Polymorphism in the Blue Mussel, *Mytilus edulis*" by M. Waldron, R.M. Packie & F.L. Roberts, 2pp, 2 plates; "A New Species of Aplacophora Mollusk from the Southeastern Pacific Ocean: *Chaetoderma araucana* spec. nov. (Mollusca : Caudofoveata : Chaetodermatidae)" by C. Osorio R. & E. Tarifeno S., 6pp, 5 text figs.; "Changes in Nucleotides Organophosphates and Organophosphotransferases in the Foot Muscle of the Pond Snail *Pila globosa* During Aestivation (Gastropoda : Ampullariidae)" by Vijayalakshmi Brahmanandam 6pp, 1 text fig.; "Biochemical Studies on the Reproductive Organs of a Land Pulmonate, *Soempera maculata* (Tompleton, 1858; Semper 1885) During Seasonal Breeding-Aestivation Cycle: I. Biochemical Seasonal Variations in Proteins and Lipids" by S.G. Nanaware & A. T. Varute, 10pp.

Please let us know if you'd like this publication "round up" to be continued in OS&S.

## A PLACE TO RETURN



By

BETTY JEAN PIECH

Wilmington, Delaware

The fascination of seashells entices the collector to explore many interesting spots. For me some have produced more shells than others, but I have yet to go anywhere that I did not thoroughly enjoy the trip and wish I could repeat it. However, there is only one place to which I actually have returned not once, but twice. That is to the Island of Eleuthera, in the Bahamas.

Harry Kline's *Yatchman's Guide to the Bahamas* says, "Eleuthera, which lies at its nearest point some thirty miles NE of Nassau, is undoubtedly one of the most beautiful and well-developed islands in the Bahamas. From north to south it is approximately ninety miles in length and, in most places, little more than two or three miles wide except at the extreme north and south ends ... The coasts alternate between high steep cliffs and the most beautiful beaches imaginable." The island is large enough so that there are a multitude of places to explore, and remote enough so that most of the time you are completely alone as you hunt for that elusive little seashell - alone with the crystal clear water, the brilliant blue sky, the glistening white beach and the ever-present wind to cool your back as you bend and search.

My first visit to Eleuthera was in April of 1972. We flew into Governor's Harbour Airport, which is about in the center of the island and taxied a couple of miles to a small inn on a bay on the west coast. With high hopes, we looked forward to a week of collecting.

The first few days were spent investigating the calm clear waters of the bay and the bordering beach. The results were good. The water's edge was littered with dead *Strombus costatus*, some in very good condition. The beach drift offered lots of little shells and surprisingly some live *Pinctada imbricata* and *Pteria colymbus* that had apparently been washed up by a recent storm, still clinging to their sea-whip home. Snorkeling produced some live

*Strombus costatus*, *Fasciolaria tulipa* (one about 10") and a few immature *Strombus gigas*. And, exploring the rocks at either end of the bay, we discovered *Cittarium pica*, *Conus mus* and several different species of *Nerita*, *Littorina*, ceriths, limpets and chitons.

Early on the fourth day, armed with a few suggestions from the manager's wife and a map that proved to be deficient in many respects, we rented a VW with no horn or windshield wipers (but half-a-tank of gas left by the previous renter) and started out on the one paved road that runs the length of the island, intending to explore all the way to Bannerman Town at the southern tip of the island.

After stopping at a few of the innumerable small west coast bays that are often within a few feet of the road and finding nothing new, we turned left over a short bridge and tried Windemere Island. We were told we might find *Cassia tuberosa* on the western side of the southern end. We found a shallow grassy area that looked very promising, but we saw no

helmets, or anything else for that matter, although we waded around for quite some time. However, only a short distance north of that place we did find a sandy beach that yielded some dead pairs of *Tellins* and *Lucines* of several different species, as well as a few *Asaphis deflorata*.

Leaving Windemere and returning to the main island, we continued south and in a few miles turned west on a sandy lane and headed for the beach about a quarter of a mile away. This was where the manager's wife said we should find some *Laevicardium laevigatum* washed up on the beach. As there was heavy brush out into the water to the north, we walked south on the sand and found only a few single valves of the Egg Cockle, but there were *Columbella*, *Marginella*, *Tegula*, *Bulla* and *Nassarius* in the beach drift. The tide was about half-way in and rising. The water was full of jagged coral rock and a particularly strong breeze ruffled the surface. Wading was impractical so we decided to move on. However, feeling I needed a little privacy before continuing our journey, I cautiously worked my way out into the water and around the scrub to the north and completely forgot my original purpose. Beyond the brush were exposed flat rock slabs literally covered with beautifully colored pairs of *Laevicardium laevigatum*, plus quite a few *Xenophora conchyliophora* - all dead but in excellent condition. We happily collected there for about half an hour before climbing back into the car.

We stopped around Tarpum Bay, where we were told there were large *Fasciolaria tulipa*. But we could find no beach and no easy access into the water over the steep rock, so we headed on for Bannerman Town.

Most of the southern part of the island is so sparsely settled as to be almost uninhabited. Due to our poor map, the complete absence of any road signs or markers and no one to ask for directions, we never did get to Bannerman Town, but we did find a lovely little sandy beach. It was devoid of shells, but excellent for swimming. Then we headed north having some fifty miles to go and one does not make particularly good time on Eleutherian roads.

Two days later we again took the car and headed north stopping along the road at several places that looked interesting. But finding nothing too exciting, we turned around at Gregory Town (we didn't find out until four years later that we could have obtained locally grown pineapples there) and headed south.

We stopped at a resort on the east coast about twenty miles below Governor's Harbour for lunch. Luckily they were not too particular about the appearance of their guests. Perched up high, the dining room offered a magnificent view of the ocean and after eating we explored

the beach. We soon decided that shelling the more sheltered west coast with its little bays and gentler surf was much better.

Returning in the afternoon, between Governor's Harbour and our Inn (which was about six miles north of that town) we saw a "House For Sale" sign tacked up on a telephone pole by one of the many sandy paths leading west from the main road. Thinking it would be fun to go and see, we turned off and bumped along, scraping brush on both sides of the car. But the house was boarded up and no one was around. Parking the car we stepped out for a look at the beach and found the loveliest one we had seen. The tide was way out and many bars of sand and tiny coral were exposed. Wading out to these, a few hundred feet from shore, we crossed over about eight before we came to one where I needed to bend down and re-tie a sneaker; with my face that close, I suddenly realized that one little piece of what I had thought was coral had moved slightly. Investigation revealed that the bar was alive with hundreds of *Murex florifer*, so encrusted as to be impossible to see unless they moved. When cleaned (which was a tremendous job) they were exquisite, with long delicate spines. A few were varying shades of burnt orange and brown, but the majority were almost completely black. We felt no qualms about picking up about thirty, since several hundred were left.

After two more pleasant days we left. Even the six-hour wait for our plane, sitting on a hard bench in the tiny airport and resulting missed connections in Miami did not dampen our enthusiasm for this delightful place.

In March of 1974 we decided to return. However, we wanted a place where we could do our own cooking, both for ourselves and for our shells. We looked for different accommodations and settled on the Sea Raider Cottages at Current at the north end of the island.

We flew into the North Eleuthera Airport and arrived to be delighted with our choice. About fifty feet from the water's edge, it was an efficiency with a complete kitchen, very clean and attractive and with a magnificent view through the sliding glass doors that covered the front of the unit. We had taken some food in our luggage, but the picturesque town of Current, about one-fourth mile up the road, had two quite complete grocery stores for everything else we needed.

The water around the shore here was extremely shallow. At high tide we walked down steps built over the coral rock into about two feet of water with a lovely sand bottom. At low tide the sand was exposed for several feet beyond the rock. The bottom dropped off very gradually and we could wade out for a great distance and cross the many sandy bars that dotted the area. At first these appeared barren, but as the tide turned several kinds of sea stars started emerging, and then *Oliva reticularis*, *Natica carrena*, *N. livida* and *Polinices lac-teus*. *Gemma gemma* made tiny holes as evi-

dence of their presence and minute trails led to a small brown gastropod about 3mm in length, later identified as *Turbonilla palmerae*. As we continued walking across the flats toward town, the bars became less smooth and by exploring every bump (most of which turned out to be broken bits of coral or shell) we found great numbers of *Chione cancellata* and many nice *C. paphia*. There were also some *Trachycardium egmontianum* and *Americardia media*. In about six to twelve inches of water, a little closer to the shoreline than the bars, were some small patches of grass. Here we found a few *Pinna carnea*, several large *Atrina rigida* and a couple of *Strombus costatus*. Exploration of the coral ledges at the water's edge did not prove too successful. There were lots of various species of *Littorina* and a few common limpets, nerites and chitons, but that was all.

For a change of pace we soon learned to walk or bike to the edge of town and turn right across the island to what is known as the North Shore where there is a lovely sandy beach (distance about three-quarters of a mile). Walking a short distance in either direction produced only a few single valves of shells, but we continued to go there as it was an excellent place for sunning and swimming.

One day we walked on the road up beyond Current and then climbed into the water among the rocks. Here we found several species of arcs and mussels, as well as the usual limpets and chitons.

On the fifth day we rented a car as we wanted to revisit some of our successful areas of two years before. Stopping to explore numerous places along the road as we drove, missing our turn in the town of Lower Bogue (which is above Upper Bogue), we eventually arrived at Windemere Island still hoping to find some *Cassia*. But just as we got there the skies opened up and the rains came down.

After waiting a while with no signs of its stopping, we returned to the main island and drove out of the rain as we continued on to what we had named Cackle Beach, hoping for some more Egg Cackles and Carrier Shells. No luck. The tide was quite well in. On the beach was a small amount of drift, but very little of interest; around the brush, in the outhouse section, the rocks were bare. The water was fairly calm so we tried wading, but the coral rock bottom was so full of holes and slippery with algae that walking was hazardous.

We had some lunch and then headed north, wondering if we could find that fabulous *Murex* bed. Wonder of wonders, after two years the for sale sign still identified the right lane and we got to the beach. But the tide was high and not a bar was in sight, a strong wind had come up chopping the surface and there was the threat of more storms or we would have tried snorkeling. And so we sadly drove back to Sea Raider, stopping here and there, but finding nothing we wanted to keep.

The rest of our stay we spent profitably combing the sand flats in front of our efficiency and swimming on the North Shore. We also took several hikes up to the Cut where the rushing water has gouged a deep narrow channel between the tip of Eleuthera and Current Island. Then, after eight days, we headed back to the States without some of the species obtained on our first trip, but well satisfied as we had many others we had not collected before.

Two years later we gave in to the urge to try to get some more of those *Murex* and returned to Eleuthera in April of 1976. Without question we returned to Sea Raider and were again delighted. The establishment had changed hands and the new managers were a young couple who were so helpful and eager to please. They were happy to answer questions, make suggestions, arrange transportation, etc. One does not need all this to find shells, but it certainly makes it easier and more pleasant.

We really did not expect anything much in the way of new species on this trip, but merely hoped to get some specimens that were larger or prettier than we had found before. The sand flats in front of the cottage yielded more of the same shells we had collected in 1974. But we had two days of extremely low tides where, at one point, we could wade about one-half mile out and still not be in water over four feet deep. It was very calm and the visibility through the water quite good. Way out there we did find *Strombus gigas*, but immature ones so we left them to grow. Also numerous *Fasciolaria tulipa* but every one was in the process of laying eggs, so we admired their handiwork and continued leaving them to complete their reproductive business. We did pry a couple of pretty *Chama macerophylla* off an old rusty something-or-other lying exposed on a bar some five hundred feet from shore. And found one live *Argopecten gibbus* in the sand, new to us in this area.

But the big surprise was the North Shore. We hiked over there the second day for a swim and found the tide extremely low. For exercise we started walking along the beach toward the Cut. In about one-fourth of a mile patches of rock started interrupting the sand and by one-half mile the shoreline was completely jagged coral. Scattered between the patches of rock and in the edge of the water we found many beautiful dead pairs of *Laevicardium laevigatum*, numerous pairs of *Glycymeris undata*, a few *Papyridea soleniformis*, some single valves of *Macrocallista maculata*, plus several different species of *Lucina*, *Tellina* and *Lima*. We also found many live specimens attached to the rocks. In addition to the usual limpets, *Littorina*, chitons and mussels were two species of *Thais* and a few *Chama macerophylla*. And the lower algae-covered rocks held *Columbella*, *Tegula*, arks and two lovely *Cyrtium pileare*. The high-tide line added some lovely Tusk Shells, a beautiful *Epitonium lamellosum*, two *Muricopsis oxytatus* (a new species for me), *Margarella guttata*, *M. apicinum*, *Bulla striata*,

Continued on page 154



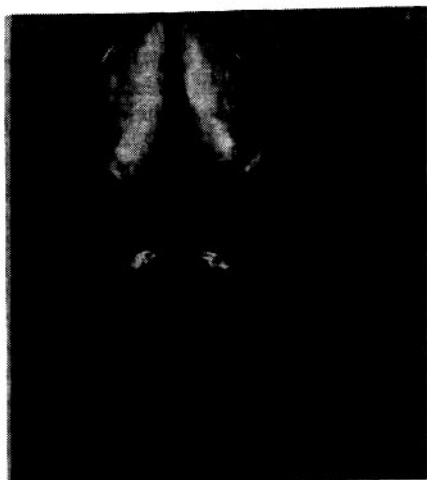
## ASTARTE, EIDERS &amp; MYTILUS

By ROBERT R. TALMADGE

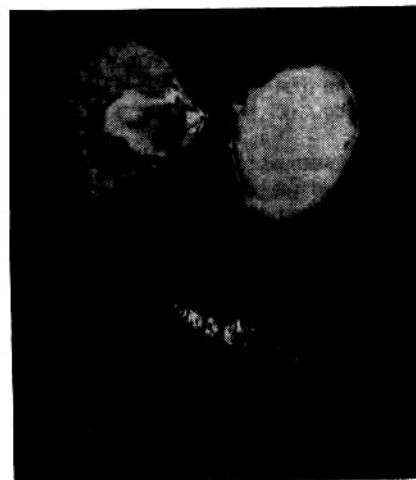


*Somateria m. mollissima* Linne  
Northern Eider. Line drawing of the head of a mounted specimen, adult male. Drawing by the author.

Photographs by the author.



*Mytilus edulis* Linne; Fossverge Fjord, Reykjavik, Iceland; May 14, 1976



*Astarte borealis* Schumacher; Fossverge Fjord, Reykjavik, Iceland; May 14, 1976

My Field Journal for 14 May 1976, begins with a brief notation: "Reykjavik, overcast, but not raining; Peter (Holm) and Arni (Siburgerson) will not be by (Hotel Loftilier) until 1300 hours (1:30 PM), so will go down to the fjord to look for birds and drift mollusca." I had arrived in Iceland the previous noon in the midst of a heavy rain and had spent the late afternoon and evening working with the collection of Icelandic species in the home of Peter Holm. At that time arrangements were made to visit two additional collections of Icelandic material in Reykjavik the following day, the 14th of May.

From my room in the hotel I could see a black-top, narrow road leading down along the edge of an old lava flow to the fjord. Reykjavik is built upon such flows, actually appearing more like low rolling dunes or hills. These brief notes are based upon my findings that morning and pertain to the three most common genera that I found.

The black-top road leading to Fossverge Fjord passes along the flat land adjacent to the old lava flow which is covered with a veneer of gray-green mosses and lichens. Where the lava has decomposed into soil a dense, low tussocky yellowish-green grass was found. The main flat, with a small airport, was covered with domestic grasses which had been cut for hay as indicated by a few remaining shocks of hay and remains of additional shocks, plus a small barn with filled hayloft.

In this grassy area I flushed several pair of Golden Plover all in high or breeding plumage, some Ringed Plover and Redshanks, a bird I had not seen since 1944-45 in Europe. The everpresent Raven was watching my movements from high spots on the lava knoll, perhaps out

of curiosity, but more probably watching for me to flush a bird from a nest. I failed to find any nests, probably the season was a bit too early, so I went down to the fjord. I did turn up some small black slugs under a cardboard container, but as I had no equipment to prepare and/or preserve them, they may still be in the same locality.

Fossverge Fjord is approximately one-half mile in width and penetrates the island approximately three miles. The south side has docks and is settled, but the north side abuts onto a rocky wall which is backed by some low rounded lava hills. The rocky edge of the north side of the fjord is nearly vertical, not over 15 to 20 feet in height and consists of a series of superimposed basalt strata, both basic and acidic. A narrow shingle beach fronts this nearly vertical wall and the day that I was there was during the Neap Tides, so there was no low-low nor high-high water. Projecting out into the waters of the fjord were a number of low rocky headlands, which apparently were intrusions of later date than the major flows. All of these had been scoured by past glaciers until they were flat and low, with numerous scars (parallel grooves) cut into the top surface of the intrusive basaltic flows. I arrived at the shore of the fjord in a small cove and noted that the water was steaming and had the odor of over-ripe eggs. I soon found that several hot springs entered this locality from the broken lava and that the effect was limited to this one cove.

Offshore in the next cove to the east I spotted my first flock of Northern Eider Ducks, *Somateria mollissima mollissima* Linnaeus. Although I had seen other species of Eiders in Alaska, this was my first sighting of the Atlantic species. The males were quite gaudy in their black and white plumage, while the

females were more or less a uniform brown. The Eiders were feeding upon some item from the bottom of the fjord. After working along one of the rocky projections I was able to see that at least part of the diet was a Mytilid. A second pelecypod was rounded, but flat, dark brown to black and often discarded as the birds elevated their heads and necks while preparing to swallow the food whole. Search along the receding tideline yielded several valves of *Mytilus edulis* Linne and a single valve of a species of *Astarte*. Part of the answer for the discarding of the *Astarte* was present in my hand. The shells are thick and the digestive systems of the Eiders was obviously incapable of handling a larger specimen of the *Astarte*. Hence, only small ones were taken.

On one of the headlands a group of young boys were fishing, so I walked out to see what they were catching and what bait was used. The bait can caught my attention immediately: *Astarte* and *Mytilus edulis*. I inquired how they obtained the bait and one young chap provided the answer by taking a lard bucket with holes in the bottom and a long rope tied in the bail. This he threw well out into the fjord, allowed it to settle onto the bottom and then pulled it into the rocky headland. Within the bucket was gravel from the bottom substrate, plus several *Astarte*. I tried the method and ended up with a nice series of *Astarte*, plus a small clump of *Mytilus edulis*. Later I learned that the *Astarte* was *A. borealis* Schumacher, that they live on the surface in gravel and they are quite common in Fossverge Fjord. Incidentally, I used my knife to clean the *Astarte* and *Mytilus*, leaving the flesh from these as additional bait for the young fishermen.

\*Curator of Natural History; College of the Redwoods, Eureka, California

## A PLACE TO RETURN

Continued from page 152

Melampus monilis, Tralia ovula, Hippoxis anti-quatus, Morum oniscus, Trivia quadri-punctata and Heterodonax bimaculatus. We went back to this spot several times and never found as much as on the first day, but always returned with something.

Every day seemed to bring something new. One morning we got into the water in front of our unit and turned left instead of right and started exploring the face of the coral wall that was underwater at high tide. Very little was there, but after several hundred feet the coral gave way to a miniature bay (about twenty feet across) and in this shallow area were numerous flat rocks. We turned one after another, finding nothing - until one finally exposed a whole colony of Pisania auritula.

Being determined to get back to the Murex bed of '72, we rented a car and started off early one day so as to arrive at a good tide. But fate was again against us. The house must have been sold for we could not find the sign indicating the right lane. There were so many, some obviously private drives and some so overgrown as to be impassable. We did try two that looked vaguely familiar, but found the sand so soft that we were afraid of getting stuck. So in rather low spirits we decided to continue on south for another look at Cackle Beach.

Again we were in for another surprise. The tide was way out and the rocks that were so hard to walk on under water two years before were now exposed and with care we could step around and see to poke and prod amongst the algae. We were rewarded with live Astraea phoebia and A. tecta americana, Modulus mod-ulus, Leucozonia nassa, Conus mus, plus a few Strombus costatus (they seem to be every-where around this island). But the final triumph was in finding a few Murex florifer. The spines were not as long or the color as strikingly dark as from the coral bed farther north, but still very acceptable. We also found dead specimens of Murex pomum, M. rubidus, Tonna maculosa, Murex macgintyi, Cymatium moritinctum carib-baeum, Latirus angulatus, Conus regius, C. flavescens, Turbo castanea and Calliostoma pulchrum. One cannot help but wonder why some of these never wash up on the beach.

We spent over three hours hunting and re-hunting the area. The live animals were so well hidden in the depressions and holes, or camouflaged in the algae, that we could continually retrace our steps and still find more specimens. Finally the tide forced us to stop and we stumbled back to the car finding it difficult to straighten spines that had been bent for so long. There were several other places we wanted to investigate, but we were too tired and we contentedly headed back to Sea Raider.

Our little remaining time was spent being very selective in what we picked up. We were

## Local Assistance

By JACK LYTTLE\*

(as told to G. Thomas Floyd)

My family and I have just returned from a week's holiday in Crail (a small lobster-fishing village on the Fife coast), Scotland. There I learned an object lesson in shell collecting.

Always consult the locals .... I had just found my first Trivia monacha and was crawling over weed-covered rocks avidly looking for more and in so doing had attracted the attention of several local children who were staring at me with the expression reserved for lunatics, or tourist. A subtle blend of amusement and apprehension. After a muttered conference had taken place in their ranks, one small boy was elected as spokesman and pushed in my direction by the others. He politely asked what I was doing (poised for flight as he did so). I informed him that I was looking for Pig Cowries, which obviously meant nothing to him. I then showed him my solitary Trivia monacha, "Och", he said, his perplexed expression disappearing, "dinna be daft yons no a Pig Shell, yons a Johnie O Groats an I kwn fine whaurye kinget a wheen o' them." Which in translation meant "Don't be silly, that isn't a Pig Shell its a Johnie O Groats and I know where I can get plenty of them." I followed him to a small patch of sand near the harbour and he wordlessly pointed downward -- the sand was thick with Trivia monacha, all badly bleached beach specimens, however, but a near rock pool yielded ten good specimens. As my guide departed, rewarded by the price of ice cream for himself and his colleagues he paused and said solemnly "By the way mister, pigs havna got shells", he then fled spluttering with laughter. I was obviously regarded as both tourist and a lunatic.

\*Glasgow, Scotland

running out of alcohol and baggies, as well as wondering how we were going to fit everything into our luggage.

Since this last visit I have been asked if I would like to go back to Eleuthera again. My answer is a definite "yes". I still would like to prove we can find Bannerman Town. I would like to visit Spanish Wells and Harbour Island. I want to find some Cassis on Windemere Island. Maybe I have not been fair to the East Coast and should give it another chance. And I would particularly like to explore Whale Point. And there is always the question of what I might find next time I go to Cackle Beach. But the biggest attraction is that Murex bed that some-day I am going to find again. There are many other islands I want to explore, but I am sure a year or two will find me again at Eleuthera - it is definitely a place to return to.

## If You Want 'Em Enough

By G. THOMAS FLOYD\*

I remember a lady that I met while on a shelling trip along the coast of Maine. I would describe her as motherly, sixtyish, plump and very determined. We discussed Buccinum undatum, that common boreal shell that is so hard to obtain. You can find some of them in the fish markets, but always with a broken lip and/or spire, neither of us had been able to obtain a good specimen.

One morning she told me that she had talked a lobsterman (very much against his will and better judgement) into letting her go out with him the next morning. The lobsterman kept trying to tell her that she could not take it in a small boat long enough for him to pull all of his traps. She insisted that she could if he did not throw her overboard.

The next morning the water was rather choppy with considerable breeze, I wondered if she went out.

About 3:00 PM I was on the dock when the lobsterman came in with his catch and a very sea-sick passenger. I had often heard the expression "So sea-sick that they were green around the gills" - that's the way our lady looked. When she got on the dock, she was carrying a pail about one-half full of whelks. She held the bucket out for those of us standing around to see. With a weak smile, mumbled, "got 'em" and stumbled shoreward on a pair of "rubber" legs.

The lobsterman watched her go and turned to a friend nearby, shook his head and said "She has more guts than any woman I ever saw, sick as she was, she never whimpered the first time".

Next morning she was sitting very quietly on a beach near the dock. Said that she was going home the next morning -- that hereafter her collecting would be confined to the shoreline and water shallow enough for her to wade!

\*Akron, Ohio

## Exchanges Wanted

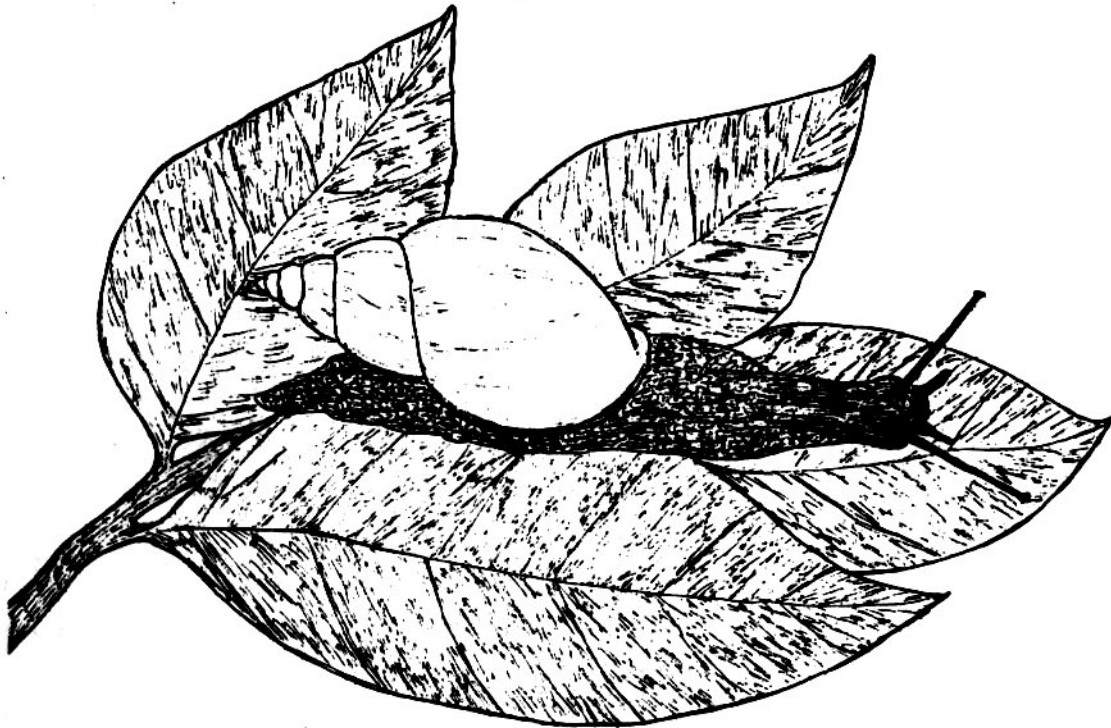
Will exchange fossil shark teeth for recent animal skulls - preferably cleaned. TOM ARNDT, age 11, 18012 S. Martha Place, Cerritos, CA. 90701.

New collector wishes to exchange South African shells for worldwide species. G. ANDREWS; 901, Granten Heights, Windermere Rd.; Humewood, Port Elizabeth, South Africa.

We have moved from Bangkok to the U.S.A, our new address: MRS. RENATE WITTIG SKINNER; c/o Carolina Leaf Tobacco Co.; Box 137; Greenville, North Carolina 27834

## TROUBLESOME, TRAVELING GIANTS

By VIVIAN ABREU



The snails of the Family Achatinidae are among the largest land snails. *Achatina* are natives of Central and West Africa, but with the help of man have spread over much of the earth's surface and today can be found in many lands.

The largest of the *Achatina* have a maximum body length of nearly nine inches and weigh up to a pound. The sturdy shells of these animals are brown, marked with streaks of yellow, buff, lavender, pink, very dark green or white. Each district seems to produce its own special type, only slightly modified from some neighboring forms making a separation of the species very difficult. The West African types are most richly colored and more diversified in form and size. *Achatina zebra* has some of the most strikingly colored shells of the common species.

The giant snails are typical Pulmonata forms, having lung-like organs for breathing air. They have the typical land snail's head, tentacles, eyes, jaws, radula, visceral mass, genital gland and other vital organs. Their mantles are thin, except near the aperture of the shell where they are thicker. The snails have a broad, flat, retractile foot which is a muscular organ used for adhering to plants, crawling and digging in the soil. A tough, granular skin, moistened by many slime glands, covers the upper part of the foot. The posterior end of the foot is bluntly pointed. The snails have no operculum, but the aperture of the shell can be sealed by

a mucous membrane. Dry or unfavorable periods cause the snails to close their apertures and enter into a dormant state of aestivation. The periods of aestivation last up to four months. When the warm, wet season arrives, the snails rasp open the mucous curtains and resume normal activities of feeding, mating and egg laying.

The snails, when very young or very old, feed on decaying vegetation, but intermediate aged snails attack living plants. They will eat almost any vegetation whether it be natural forest growth, ornamental plantings, flowering plants, vegetables, grasses, tree bark, fruit or decaying vegetation. *Achatina* also feed on other decaying material - including the dead bodies of their own species.

In the great lush forests and jungles of West Africa, the environment would seem to be ideal for *Achatina*, but for some reason, the great snails are not found there. Instead, they are most commonly found in and near the gardens of the native villages. Seeming to prefer to live near the habitations of man, the snails have invaded even densely populated urban areas of many lands.

Native African plantations of bananas, plantains and oil palms are favorite homesites for the great snails. They also live on the wide leaves of the arum, taro or dasheen plants and the foliage of small shrubs. During wet season the snails will climb as high as fifteen feet up

the stalks of banana trees, or the trunks of palms, so that they may hide under dead leaves that hang down on these plants. While the tropical rains drench and flood the ground, the snails find an ideal refuge with plenty of food, under the dead leaves. Then, when the burning sun beats down in drier seasons, the snails find cool protection from the heat and plenty of moisture, necessary for their well-being.

In Madagascar, at the end of the tropical rainy season, while the ground is still soft and damp, *Achatina panthera* dig in for aestivation and wait for the rains to come again. The ground bakes as hard as brick under the blazing sun, but the snails sleep undisturbed. Nourished by the fat stored in their bodies, the snails awaken when the earth absorbs the first rains of the new rainy season. Creeping out of the water softened soil, they begin to feed upon the fresh tender shoots of plants, eating and storing fat in preparation for the next dry season.

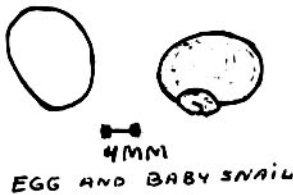
*Achatina* are hermaphrodites and any two sexually mature individuals may mate, but they cannot fertilize their own eggs. Mating occurs in spring and early summer, after the snails reach sexual maturity at the age of five to nine months. A single copulation usually furnishes fertilization for the eggs of an individual snail over a long period of time.

Continued on the next page.

\* Tampa, Florida  
(Drawings are by the author.)



The calcareous, elliptical eggs are laid in clutches varying in number from 100 to 400. Most land snail eggs are white, but in the *Achatina*, the eggs are of a peculiar pale shade of yellow. They are about three-eighths of an inch long and about one-half of an inch in diameter. Several clutches may be deposited by each mature snail each year, thus producing a staggering number of offspring during their average life span of six years or longer. It is frightening to think of the number of snails that would be produced from even one small colony of *Achatina* and the tremendous amount of vegetation necessary to sustain that great number of hungry creatures.

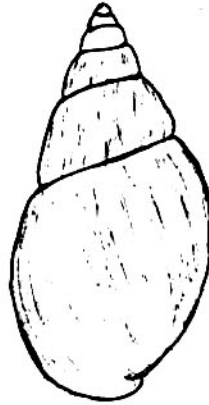


About thirty days are required for the eggs to develop and hatch. Most *Achatina* eggs are laid during rainy seasons, in organic matter at the base of plants, in small depressions or the surface of the ground. Once the young snails have managed to leave the nest and climb up into the trees and shrubs, they are fairly safe from predators. Many, however, never attain the shelter of the banana trees or arum leaves and are eaten by birds and small wild animals. Free wandering chickens of the African villages devour the little snails by the hundreds. The natives prize the snails as food and use their empty shells for various implements. So, in their African homeland, *Achatina* are kept more or less under control by man, beast and fowl. However, it is quite another story in lands across the seas.

The history of how the *Achatina* spread is interesting and goes something like the following chronology.

A shell collector took a few live snails while visiting Mauritius in the year of 1847, carrying them to Calcutta, India. They were released in the gardens outside the city. The Hindu people, although often suffering starvation, refused to touch them as food and the snails had no other obvious enemies in the Calcutta area. In the next fifty years, the snails spread into Ceylon and Singapore with the help of humans. It was not long until *Achatina* were found on the island of Borneo and other nearby islands.

By the 1930's, *Achatina fulica* were destroying rubber trees in Sumatra and Java. Upon reaching Formosa, about 1933, the snails were well received by the Japanese people there and became an addition to their food supplies. The Japanese also used the snails as a potent medicine. Living snails were shipped to Japan from Formosa and by 1936 some snails had been carried by Japanese to Hawaii.



The snails were spread by man to most of the other islands of the South Pacific, far and wide, into New Britain, New Ireland, New Guinea, the Caroline Islands, Okinawa and other islands, the snails were carried by the Japanese and other snail fanciers as a food supply and rapidly became a serious pest.

The snails have been intercepted several times as the ports-of-entry into the continental United States. Army equipment being returned from the war areas of the Pacific brought the snails to California in 1948, but fortunately; intensive eradication efforts prevented them from becoming established there. The snails, although providing a substantial emergency food supply, have such voracious appetites, such short and rapid growth to maturity and such extraordinary fertility that they have proved to be of more lasting devastation than the bombs and other destruction of warfare in the islands of the Pacific.

Returning to Miami from a visit to Hawaii in 1963, a boy carried three snails in his pocket, to be given to his grandmother as a gift. They were *Achatina fulica* snails. Three years later, in 1966, the snails had infested a large area of North Miami with more than 20,000 offspring. By 1969 an all-out effort to eradicate the giant snails from Florida was necessary. The Florida Department of Agriculture, Division of Plant Industry, waged war on the troublesome pests.

Leaflets describing the snails, their life cycle and habits were distributed to residents of the Miami area and southern Florida. The program was successful in the quarantine areas of North Miami, but the snails were carried to other neighborhoods by souvenir hunters and work crews hauling out yard debris of slippings, leaves and other trash. The carriers of the snails were unaware of the potential nuisance and danger involved in moving the snails to new areas. Very recently, new colonies were found in Miami and another eradication program was launched. At least for the present, there has not been any new infestations found or reported, but the rascals may be lurking under a rotten log or some other secluded place, just waiting for a chance to start eating up the beautifully landscaped yards again.

Since the snails are carried by man from place to place, the public has to be educated and convinced that these creatures are serious pests, not novelties. Anyone who has had the experience of living where the snails have established a colony knows what they can destroy and how objectionable they can become.

Besides the terrible destruction of vegetation, the snails have an odd taste for calcium and they feed on painted surfaces, leaving fecal matter and slime in smeary, smelly masses which discolor and stain the surfaces on which they creep. When the number of snails in an area increases, many snails venture onto grassy lawns and garden paths. There they are crushed under the feet of walking people or smashed by the whirling blades of lawn mowers. The dead and dying snails create an objectional odor as the fleshy bodies decay in warm tropical climates.

On the island of Ponape, in Micronesia, the snails are raked up in piles every morning and evening, doused with inflammable liquids and burned. In Hawaii and Florida, infested areas are treated with poison bait, care being taken to avoid contamination of swimming pools, bird baths or food and water for pets.

It is said that natives of Africa's villages often eat the snails' flesh, saving the empty shells, which they use in many ways. The snails are gathered from the village gardens and banana plantations, boiled in their shells and then the flesh is removed and rinsed before the natives eat it. The snail meat is cooked in stews and other dishes, and eaten drenched in oil after it is boiled and rinsed.

Large *Achatina* shells are made into cups by the Africans and most pots of drinking water, standing in the corner of native huts, will have a shell cup floating around on top of the water. Spoons and ladles are also made from part of a snail shell, attached to a stick handle. Salt dishes are another reported use of the snail shells utilized by the aborigines of East and West Africa. Precious salt quickly turns to liquid in the hot, humid climate, so the natives store the salt in *Achatina* shells. When the salt turns to liquid it is not lost, but stays right in the snail shell where the briny mess can be stored for long periods. As the natives eat, they dip their fingers into the brine and season their food as desired.

To protect their small gardens, the African natives fasten *Achatina* shells to liana vines that grow on the trees surrounding the garden plots. The shells hanging on the vines and moving in the breeze act as scarecrows which frighten the birds away. The shells are used for decorating and ornaments, too.

Many oriental people readily eat and enjoy the *Achatina* snails' meat, but Americans do not consider the African snail as fit for human consumption. The meat is tough, foul smelling  
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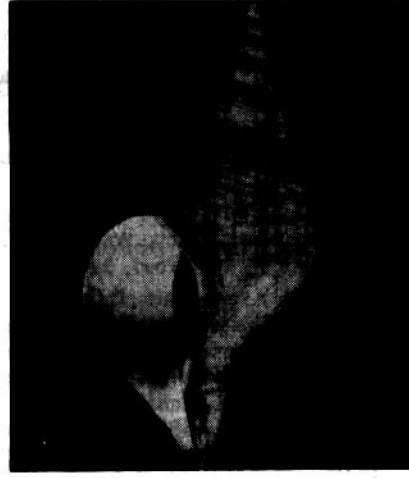


# SINISTRAL NEPTUNEA

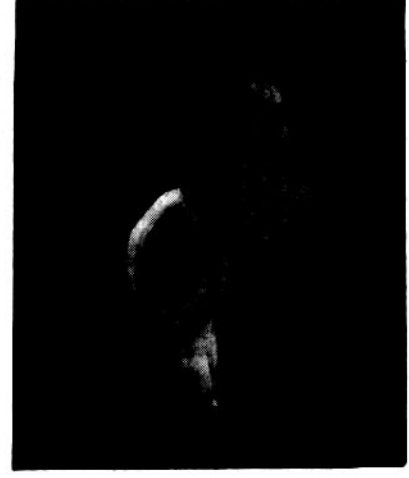
By ROBERT R. TALMADGE\*



*Neptunea contraria angulata* (S. V. Wood, 1848) Kallo Sands, Scaldesian, Upper Pliocene, near Zeeland, Holland; Fig. #1



*Neptunea contraria* (Linnaeus, 1758) Merksem Sands, Poederlien. Lower Pleistocene near Antwerp, Belgium; Fig. #2



*Neptunea contraria contraria* (L., 1771) 100+ meters, off Virgo, Spain. Recent. (Photographs are by the author.) Fig. #3

During the greater part of May 1976, I studied the collections of both Haliotids and Neptunids in some of the major research collections of Europe. One of the special projects attempted was a detailed examination of the Recent and fossil sinistral species of *Neptunea*, which apparently are restricted to European waters and fossil deposits. Although I have worked with most of the major collections of *Neptunea* accumulated around the Pacific basin, I have never seen an actual sinistral specimen, although a few isolated specimens are reported. In England, Belgium, Holland, Spain, Italy and other parts of the Mediterranean Basin, however, both Recent and fossil sinistral *Neptunea* are found. Specimens from these localities have reached American collections, including my own, but under quite variable taxa. As there appears to be some confusion as to the name or names to be applied to these, and as the major series of such sinistral specimens were in European collections, including the Type Lots of most taxa, I decided to work with as many of the original Type specimens as possible in order to understand what the author had in front of him when the description was made and the taxon proposed. The following notes are not to be construed as a technical or taxonomic discussion, but rather a general discussion of what I found, studies and photographed while working in the European collections, both private and institutional. I hope that such an illustrated discussion will be of use and assistance to the average malacological and/or paleontological student, who can begin his or her study from this data.

How to approach and present these sinistral specimens of *Neptunea* presented a problem.

As both fossil and Recent specimens were studied, a pure paleontological approach was out. However, there was a definite distribution in time as well as geographical distribution. So, in this brief presentation I will compromise, utilizing a combination of several disciplines. As to the genus, I use *Neptunea* Roding in Bolten, 1798, rather than the many genera used in the original descriptions: *Murex*, *Tritonis*, *Fusus*, *Trophon*, *Chrysodomus*, etc.

Perhaps the most commonly noted species of sinistral *Neptunea* in American collections comes from western Holland and Belgium, and is received under the name *Neptunea contraria* (Linnaeus), Scaldesian fossil.

One learns that some other collections have *Neptunea contraria*, but when these are examined a definite shell difference is noted. Still other specimens, labeled as *Neptunea contraria*, but this time from England, produce still another form of shell and the location is "Red Crag". So, the problem was, how many species, forma or local clines were actually represented and what was their relationship.

In western Holland and Belgium there are Pliocene marine deposits which are usually referred to as the "Scaldesian". In the upper or more recent levels there is a marine sand, the "Kallo Sands", which contain fossil sinistral *Neptunea*. Across the North Sea on the southeastern coast of England (Norfolk, Suffolk and Essex), the lowest or oldest member of the Red Crag, the "Waltonian", contains a similar fossil sinistral *Neptunea*. Both localities are considered to be Upper Pliocene in age. This fossil *Neptunea* has a sinistral,

rather elongate shell, with an angular shoulder on each whorl. The sculpture consists of strong encircling cords, with the intersacing areas filled with fine thread-like cords. The "species" is commonly found in the Kallo Sands, but is uncommon to rare in the Waltonian (based upon specimens noted in collections). This is *Neptunea angulata* (S. V. Wood, 1848), described from the Red Crag and the single Type specimen is in the Paleontological Section of the British Museum (Natural History), London. (see figure #1)

Superimposed upon the Continental Kallo Sands, a later sand, the Merksem Sands of the Poederlien (Lower Pleistocene) also contain a sinistral *Neptunea*. In England the uppermost Red Crag member, the Newbournian and the still higher Norwich Crag of Icenian time, contain the same form of sinistral shell (Fig. 2) This shell has a weaker sculpture, no carina at the shoulder, but still retains the basic sculpture pattern and shell shape and obviously is a later form of *Neptunea angulata*.

Off the northern coast of the Iberian Peninsula, near Santander and Virgo, Recent specimens of a sinistral *Neptunea* have been collected in over 100 meters depth. The identification of this population was easy, as the Type specimen is in the Linnaean Collection, London. The single shell is the original *Neptunea contraria* (Linnaeus, 1771). (Fig. 3)

When placed together, specimens of the three "species" furnish a fine example of the morphology of shell characteristics over a period of time. In this instance it ranges from Upper Pliocene, through the Pleistocene, to

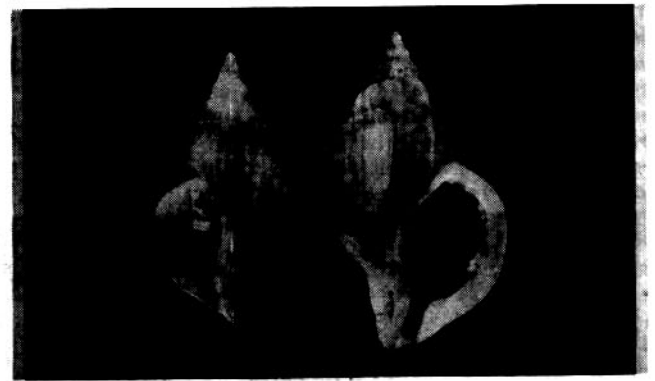


Fig. #4, *Neptunea antiqua* (Linnaeus, 1758), left: Ipswich Suffolk; Waltonian, Red Crag; Upper Pliocene; (= *N. elongata* (S.V. Wood, 1858))

Fig. #5, *Neptunea antiqua* (Linnaeus, 1758), right: Ipswich Suffolk; Waltonian, Red Crag; Upper Pliocene; (= *N. sinistrorsa* (S.V. Wood, 1848) non (Deshayes, 1830))

Recent. In my own collection I use the following labels: *Neptunea contraria angulata* (S.V. Wood, 1848) for the carinate form of shell found in the Waltonian and Kallio Sands of late Pliocene. The Recent species is, of course, *Neptunea contraria contraria* (Linnaeus, 1758) and the intermediate specimens from the Pleistocene deposits are usually cataloged as only *N. c. cf.* with either *angulata* or *contraria*, depending upon the sculpture and/or carination of the individual specimen.

Perhaps the major problem in the nomenclature of the sinistral Neptunids is that there are two, not one, species in the Crag which are not represented as sinistral species on the continent. There is a rather solid, well rounded and finely sculptured sinistral *Neptunea* in the Crag from the lowermost Waltonian to the uppermost Norwich Crag. There are two distal forms of this species in the lower or older deposits, one with an elevated spire and the other less so. The elevated form has been called *Neptunea elongata* (S.V. Wood, 1848) and the shorter form has gone under the names of *N. contraria* (J. Sowerby, 1813) (non Linne, 1758) and *N. sinistrorsa* (S.V. Wood, 1848) (non Deshayes, 1830). (Fig. 4) Beginning in the upper part of the Red Crag, the Newbournian Member, I noted that there were both sinistral

and dextral specimens and in the Norwich Crag the sinistral specimens were quite rare. A comparison with Pleistocene specimens of *N. antiqua* (Linnaeus, 1758) from Pleistocene deposits in Holland and Sweden, provided the answer. *Neptunea antiqua* began as a sinistral species in the Red Crag, but altered in early Pleistocene to a dextral form in both the English and Continental beds. It might be of further interest to illustrate Recent sinistral and dextral specimens taken at Walton on Naze, Essex, England, where the sinistral form is found, although in extremely few instances. (Figure 5)

G. P. Deshayes, in his continuation of Bruguiere's work in 1830, named and described a small sinistral *Neptunea* as *N. sinistrorsa*. There are many problems related to this "species, subspecies or forma", which at this time still remain unsolved. The actual geographical range is hazy, as specimens from many localities in the reputed range are not available. I have seen definite fossil examples from the coastal deposits, somewhere south of Naples, and listed as both Sicilian and/or Calabrian Stages of Pleistocene time. I have seen some specimens dredged off "North Africa" which are definitely fossil, but I also have seen specimens taken "di pesca" (*ex pisci*) from a deep basin off Naples. I have not been able to locate the Type specimen of Deshayes, if such still exists.

There is some question as to the status of this form of sinistral *Neptunea*; is it only a Pleistocene fossil, a remnant of a more southern distribution during glacial time, or is it a relic population, both fossil and Recent based upon a similar southern range during the same glacial period. Most Italian malacologists consider that the sinistral *Neptunea* is only a fossil and that the *ex pisci* are loose specimens from the deep sea floor that the fish ingested. This last is difficult for me to accept as I have seen too many specimens of mollusca taken from the stomach of fish on the "Fillet Lines" of the commercial fisheries here on the northern California coast and have seen too many specimens of *Cypraea*, *Haliotis* and even *Neptunea* still

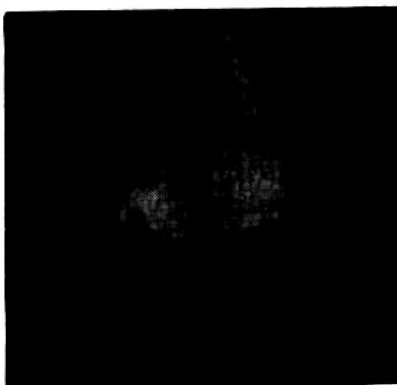
in flesh, which had been collected from deep water fin fishes from various parts of the world. There is a special "surface sheen" on such specimens which are taken as food by fishes. (Figure 6) However, I am not familiar with the feeding habits of Mediterranean fish which might ingest such fossils. At the present time, too few examples of Deshayes *Neptunea sinistrorsa* are available here in America, either as Recent (?) or fossil shells to be certain if this represents a southern race of *N. contraria* or a distinct species. So, in my collection, I still retain the name at the specific level.

The figured specimens are in the Talmadge Collection, Eureka, California and are representative of the actual Type specimens. These were selected by a comparison of the actual photographs of the Type Specimens, plus notes made during examination of the same Types.

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\*Curator of Natural History  
College of the Redwoods  
Eureka, California



*Neptunea sinistrorsa* (Deshayes, 1830), deep basin off Naples, Italy; "*ex pisci*"  
Figure #6.

# FLORIDA HORSE CONCHS, CASTRATED & OTHERWISE

By CORINNE E. EDWARDS\*



Vera Roberts and Corinne examine 23" Conch

There was to be an extremely low afternoon tide, here in Miami, Florida -- all week long. BUT - I had to give programs on Shells and Sea Life and one on Japan - and I had a ten-page publication, back from the printers, to collate, staple, address, add membership blanks, fold, staple again, add stamps, sort by Zip Code, bundle and take to the special window at the Post Office. Every afternoon I thought of those low low tides. I soothed my shelling instinct by watching the weather reports of high, on-shore winds, I'd had an offer of a boat ride out to the flats, but come Thursday, I said, "It's pretty windy." However, Captain Neil, wife Diane and seven year old Tonya said they were going -- so, naturally, I intended to be aboard. I looked over the life preservers and checked the fuel gauge - chipped in some gas money and off we went. It was a beautiful ride despite the "flung spray and blown spume" in our faces. The Bay was choppy, the trip pretty rough. Tonya whimpered a little at the bouncing we were getting. We anchored off what rubble area was exposed. The strong east wind just had not let the tide go out as it should - but we were there and made the most of "our day".

The comical Sponge-Carrying Crab, *Dromia erythropus*, came into view under nearly every shining piece of hard, gelatinous, black colonial Ascidian we picked up. I have preserved large specimens of this sponge crab for my Show & Tell programs at school, but only when it was found peeking out from under a complete cover of true Sponge - which does not shrink as the Ascidian cover does. Children like to be shown the last pair of legs, reduced in size and oriented dorsally holding the sponge-umbrella. They enjoy being shown how very hairy this crab is and how it has bright red claw-tips or "painted fingernails". The red-clawed Hermit Crab, *Petrochirus diogenes*, was occupying

many long-dead *Strombus gigas* (Pink Rollers). Peering out of *S. alatus*, the Florida Fighting Conchs, and even from fresh-dead *Conus spurius atlanticus*, a three-inch, colorful Alphabet Cone, were bright-eyed Hermit Crabs. They saw us first and gave away their silt-covered shells by the quick movement they made as they ducked and froze - presumably to hide from us. A few *Murex pomum* were noticed and one huge, communal mass of *Murex* egg capsules.

We had floated ashore from the boat, a huge styrofoam container to act as an aquarium for our mollusks, crabs, sea-urchins and curiosities -- most of which we put back before we left the flats. We netted some Sea Horses and Pipe Fish - along with small Spider Crabs - and enjoyed them for a while. We kept a clean and beautifully-shaped Queen Conch with a fully developed, flared wing - the inside covered with Jingle Shells, *Anomia simplex*, and occupied by a fat Toad Fish which can and does bite. (Back home we suddenly noticed any number of tiny baby Toad Fish swimming about in the hastily prepared aquarium. Tonya called in the neighborhood children to impart her just-learned knowledge of sea life.) Beautiful 12 and 14 inch Cushion Sea Stars, *Oreaster reticularis*, were left high-and-dry on the exposed rubble. Tonya, having grown up hearing talk of conservation, kept trudging to the water's edge to put them out in deep water. We decided to keep one, so fixed it right then and there. With the paring knife, hitched to my shelling apron by a length of monofilament, I cut deep between the double rows of tube feet on each point. This prevents the Sea Star from "flumping" down to an ugly, flattish mess before one gets it home. At the house we immediately enclosed it, upside down, in a stout plastic bag, completely covered it with formaldehyde and let it soak for 24 hours. Then we dried it rapidly and thoroughly. I do mine in the back window of my car parked out in the Florida sun. However, before I drive the car I have to open all the windows and cry a little until the fumes blow away.

About the Horse Conchs referred to in the title - *Pleuroploca gigantea* (Kiener, 1840). The orange-colored Florida Horse Conch was made our Official State Shell by House Bill #568 signed by Governor Claude R. Kirk, Jr. 18 June 1969.

Sitting high-and-dry on top of the nearby dry rubble, no one had noticed it. As I wandered around, I suddenly came upon it, clear out of the water, its red body gleaming in the sunlight. The lip was perfect, the apex tip sharp, the aperture mustard-chocolate color (I wish it had been bright orange colored). The aperture's colors, orange or mustard color, do



The author.

not designate male or female -- I've sexed many a sizeable Horse Conch and found both colors for both sexes. So - I still wonder why some are orange and some are this chocolate, brownish, mustard color. There were no barnacles, blemishes or riders on the dark, brown-black periostracum - it measured out at 15½ inches. I HAD to have it! (We, in the Palm Beach County Shell Club, and even our friends, had given up every single sizeable, orange Florida Horse Conch in our collections. We gave them up back in 1969. When Representative William G. James's bill appeared on the calendar, every legislator in Tallahassee, more than 84 of them, had one on his desk for himself, along with a mimeographed sheet telling about this mollusk. It is very common all around the coast of Florida. It is not too common off the coast of a few other southern states, so it is truly a Florida shell.)

Wrapped in a towel lest the bumpy boat ride home would cause the lip to get chipped, I carefully guarded it all the way. Into the freezer it went - I had no pot large enough to simmer it. Days later, completely thawed, thumped, frozen and thawed again, I worked the siphonal canal part of the body out of the deep canal. I tried to grasp the huge operculum and pull out the body, but the apex of the shell jabbed into my stomach - it hurt. I held the huge Horse Conch shell a different way and pulled, but I was afraid I would chip the lip or siphonal canal tip. So, sitting on the rug, my bare feet bracing the shell, I wiggled and pulled, wiggled and pulled some more and then fell over backwards as practically the entire body came loose. I could see the grooves in the white muscle meat that were left by the oblique plica ridges on the columella. It is these ridges that prevent the entire body from slipping easily down the columella as happens when one pulls the animal from a frozen and thawed Queen Conch, which has a smooth columella. I had wanted to show my neighbor how the mollusk body, diminishing in size, continues right up to the very tip of the apex. Now it would take several days to "rot out" the viscera left up in the apex.

\*Coconut Grove, California



The operculum was peeled off the foot, scrubbed with a brush, to remove the silt in the slight grooves, and carefully saved. I don't just throw out a huge, non-smelly body like this one - I like to study it. If I ever get an 18-inch Horse Conch again, I will preserve the entire body with the operculum attached - I would want both a male and a female body. The last preserved Horse Conch body I had I mailed away to a museum that needed bodies for study or for observation while making a life-like model for display. A *Pleuroploca gigantea* body is very red, yet one has only to peel away a thin outer layer, with a razor-sharp knife, and there is the nice white meat. We have eaten it. Though it tastes a little peppery in stew or chowder, unless mixed with Queen Conch meat or even a plump body or two of *Certopleura costata*, the Angel Wing bivalve we dig over at Ft. Myers, from deep down in oozy mud. The Horse Conch's tentacles, with the eyes near the bottom, are rather short, the proboscis is large and retracted.

It was a male, but it was one of those commonly found on the Florida Keys - diseased, the penis, or berge, just a tiny, half-inch vestige of what should have been a long, healthy appendage capable of copulating with a female of the species, probably even larger than the male. No one seems to know of any studies made into the reason for the dehydration of the penis of a Horse Conch. From personal correspondence, a possible explanation -- the mollusk may be heavily infested with parasites which may cause destruction of the gonads. The trematode parasite, *Cercaria neptuneaea*, has been reported as doing extensive damage to the reproduction glands of my favorite Cape Cod, Massachusetts mollusk - *Buccinum undatum* Linne (#2188 in Abbott's 1974 edition of *American Seashells*; *Pleuroploca gigantea* is #2506).

My Horse Conch, being so large, had probably lived a long, lonely, solitary life. I wonder if it had unsuccessfully approached many a female -- poor creature!! I carefully slit the head open to find the great retracted proboscis, cut its muscular attachments and removed it. In a glass container, I put a quantity of Drano and the proboscis and covered it with ice cold water. The colored particles in the Drano bounced up and down, the container got hot. When cool, I poured off the dissolved material and only the narrow, two-inch ribbon and the radular sheath remained. I washed this in clean water, could feel the rough teeth and see them under the magnifier. I am always amazed at how small the toothed radula is for such a large carnivorous mollusk. Because I did not seal the radula between glass slides it later rippled and shrunk even smaller. Did you ever pick up a Horse Conch or a large *Fasciolaria tulipa* to find its foot partly engulfing, smothering or holding, aperture to aperture, a fully grown *Strombus raninus*, the Hawk Wing Conch, or a *S. pugilus*, the Florida Fighting Conch?? Even on the dock or in one's bucket the carnivorous mollusk usually retains its prize, and finishes its meal leaving an empty shell and the operculum of it.

John Root, of West Palm Beach, once found a 23-inch Florida Horse Conch at a garage sale. There is always a touch of "doubting Thomas" in articles that say our Horse Conch is one of the world's largest gastropods. But, in August of 1975, I was in Brown's Shell Museum in Yeppoon, Queensland, Australia and I saw a growth series of *Syrinx aruanus* Linne, their False Trumpet Shell and the lead shells in that parade were well over 25 inches long - I am certain. (That shell was once called *Megalatracta probosciferus* (Lamarck) and the spelling varies from *auranus* to *aruanus* in its present name.) Jim Fox, of the South Florida Shell Club here in Miami, for reasons of his own, as he is a dealer, GAVE me a 22 inch *Syrinx* - which I display when I give programs on my shelling trip to Australia with Tom Rice. This False Trumpet is a massive yellow shell. Most shell collectors that I know like to have only a tiny *Syrinx*, with the fascinating protoconch still intact. Not many covet the shell which is, I am now convinced, the largest univalve shell in the world. If only someday I can find that 24-inch Florida Horse Conch that is mentioned for size in many of our shell books!

Speaking of Florida's official State Shell; North Carolina's official State Shell, adopted in May 1965, is the lovely Scotch Bonnet, *Phalium granulatum* (Born, 1781). There are many Scottish people in that state which probably influenced the choice. This mollusk is secretive and usually lies buried. Fresh-dead shells are collected when they wash ashore. Shellers do not find many living ones or see immature ones. There probably are plenty of Scotch Bonnets out in deeper water and down in the sand - I do not believe that making this a State Shell has diminished the living population - only the number of those dead ones found on the beach or in shell shops.

Why don't some states choose a shell, one that will not be easily over-collected? Texas, for instance, might select the coveted *Amaea mitchelli* (Dall, 1896), #1218 in Abbott's 1974 edition of *American Seashells*. It is not a very common Wentletrap or Staircase Shell, but is occasionally washed up on Texas beaches. If all the Texas shell clubs would agree on one choice, then their Legislature would probably quickly vote it for the Texas State Shell - Texas never likes to be outdone by any other state and this shell would never be over-collected.

Back to *Pleuroploca gigantea* (Kiener, 1840) the Florida Horse Conch. There may be plenty of growing ones out in deep water. So many that we see in shallow water are castrated, sickly or old. We know they are sickly or near the end of their lives as the body seems shrunken. Often these inshore mollusks no longer keep the inner siphonal canal glossy smooth. Sometimes even part of the aperture lip, as well as part of the siphonal canal, is dull, dead looking, pitted or partly eroded away. I've one giant specimen that was in trouble due to a huge, heavy, coral covering over the upper part of the body whorl and spire. I've another that was so badly cut (probably by a propeller from a

## Smart Like a Person

By JOHN NEMEC\*

The dolphin is smarter than any other animal with the exception of chimpanzees and dogs. They often invent their own games. When a dolphin (also called "porpoise") is captured and placed in a tank, he continued to behave with great intelligence.

This frisky marine creature is in the group of small whales, measuring between four and ten feet in length. They are found throughout warm seas of the world.

The Bottlenosed Dolphin is the common species found along North America's Atlantic coast. People have often played games with this species in Scotland and New Zealand.

One day an American boy stood on the deck of a boat and saw another ship pass. Several minutes later he cried, "Thar she blows!", when some giant whale spouted water into the air nearby. Both sights were fascinating to the lad, but not as amazing as the school of dolphin he saw that same day. Leaping from the watery surface in a single group, then back into the white-capped waves, they followed his boat. Such teamwork shows almost "human" thought by the dolphins.

"I've watched common dolphins alongside our vessel," one Captain said. "They travel at 20 knots and keep up with us for quite a way.

Whether just showing off or looking for food, these intelligent mammals show that man is not alone in the brains department.

\*Bridgeport, Connecticut

BOOKS, continued from page 176

Now I have another book, *Seashore Life of New Zealand* by Eric Heath and R. K. Dell. Heath comes first for this book is full of his beautiful colorful paintings that are scientifically accurate. For shallow-water waders, on this fanciful tour to New Zealand, this book is perfect. Price \$6.50. Wave action and filter-feeding to the structure of a Sea Squirt are covered. Intertidal life and its adaptations to its environment are pleasantly told. Where to look for certain shallow-water animals is covered very well. Readers will really fall in love with the realistic and colorful paintings of Sea Life in natural postures by Mr. Heath.

A companion book *Marine Fishes of New Zealand* by John M. Moreland is also fantas-  
continued on page 168, bottom

boat passing over the flats) that it could not repair the gash and lived on to evidently nearly starve to death.

So it is, I have a collection of 16 to 18 inch non-specimen-type, live-taken Florida Horse Conchs that only I really care to have.



# SNAILS OF WILDERNESS WATERS

By VIVIAN ABREU\*



Limpkin

Everglades Kite, the Snail Hawk

Through the watery inland wilderness, a strange wild sound shattered the green stillness. A Limpkin, the crying bird, screamed again as it hunted for food. With half-spread wings, the bird scrambled over the thickly matted bonnet-lily pads and with its long, slightly curved bill reached into the water and plucked a large dark brownish green snail from a cluster of emerald leaves and pale yellow blossoms. Flying low and jerkily to a dead stump near the edge of the pond, the Limpkin placed its long toes over the snail to hold it securely and, with an expert peck, the Limpkin removed the snail's operculum and dropped it upon the muddy ground. Another pull with its long bill tore the soft body of the snail from its shell and with one gulp the Limpkin swallowed the juicy morsel. The empty shell fell to the ground beside the stump, adding to the pile of shells already there. Satisfied after its meal of ten or twelve snails, the Limpkin flew away, across the pond and into the tall, moss-draped cypress trees.

On the swampy shores of other inland ponds the reeds and bullrushes grow profusely and scattered about the muddy ground there are many snail shells, the discards of the dark-feathered grackles that pass along the way. In the woodlands where ponds, lakes, rivers and creeks

form marshy glens, the raccoons, possums and other small animals occasionally hunt for the snails and enjoy gourmet meals, but the lives of some inhabitants of southern Florida's great swamplands depend completely on the abundance of the Pomacea paludosa snails.

Where the "river of grass" spreads its shimmering expanse in the watery world of the Everglades, Pomacea paludosa, the amphibious Apple Snails, live and multiply plentifully. There, too, lives the "Snail Hawk" whose very existence depends upon the snails. The swamp-land is the home of the unique bird, properly known as the Everglades Kite, and the beautiful creature eats no food other than Pomacea snails.

Gliding low and smoothly through the air over the sawgrass, the snail hawks search for the snails and when snails are sighted the hawks swiftly dive and seize them in their talons. Carrying the snails to the nearest cypress knee, low mound, dead stump or even fence post, the hawks extract the snail animals neatly, leaving the shells undamaged. Around cypress knees in the swamp piles of the snail shells and their opercula are found intact, revealing where the snail hawks have feasted.

Drawings by the author.

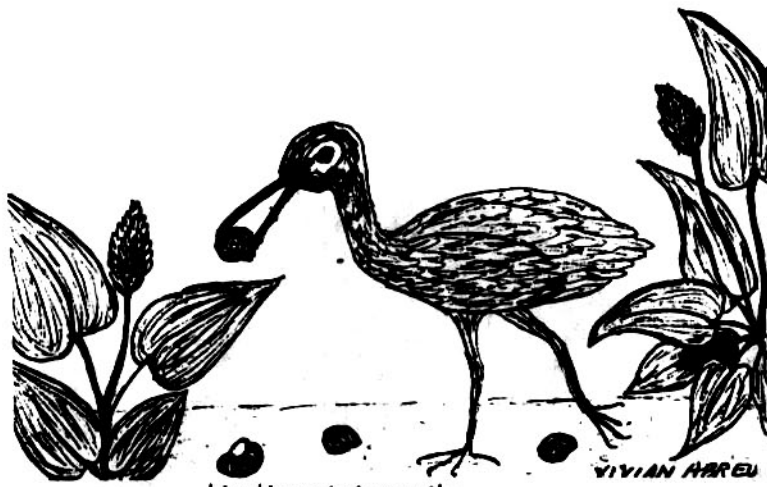
Not only do birds and animals enjoy the tasty snails, but humans enjoy the mollusks as food and considerable amounts of them are gathered to be eaten. The Seminole Indians of the "Big Water" have used Pomacea snails as food for years, especially during emergencies when other food is scarce. Many natives of Florida's woodlands and wilderness areas use the snails as food and they are considered great treats for more urban residents also. The snails are washed thoroughly and boiled in their shells. When they are cooked the animals are



Pomacea paludosa

\*Tampa, Florida

Continued from previous page



Limpkin capturing snails



Pomacea and eggs on hyacinths

removed from the shells, rinsed in clear water and cut into small pieces. The meat is then added to stews and soups or cooked with rice. Some snail fanciers prefer the meat dipped into butter sauce or served with olive oil and vinegar.

Most of the inland waters and marshes of Florida and southern Georgia have *Pomacea* snails living amongst the thick growths of purple water hyacinths and creamy white pond lilies. The snails like swampy areas overgrown with aquatic plants and the muddy bottoms of creeks connected with larger streams and rivers, but they do not live in stagnant or polluted waters. The pioneer settlers of Florida and Georgia tested the purity of their wells and cisterns by putting *Pomacea* snails in the water. If the snails survived, the water was considered pure enough to drink and to use for cooking.

The *Pomacea* are air breathing animals with a sac in their mantle cavity that fills with fresh air and acts as a "lung". The small opening to the "lung" is near the edge of the mantle where shell meets the animal's foot. At intervals, the snails rise to the surface of the water, take in a supply of fresh air and submerge again. The snails never leave the water completely except late at night when they deposit their eggs.

The bodies of the snails are securely fastened to the inside of their shells by large columellar muscles and by the contraction of these muscles the foot is quickly withdrawn into the safety of their shells when they are disturbed. Dark brown, chitinous opercula are attached to the animal's foot and when the columellar muscles are contracted the operculum fits snugly into the aperture of the shell, closing the opening tightly and efficiently. Adult *Pomacea* shells grow to two or three inches in diameter and are dark green, so dark that when seen in the water appear almost black with soft velvety surfaces. The bodies of the animals are of dark

gray color and they have long elegant tentacles on their rather broad heads. The shells are usually corroded on the apex, leaving a white area with a scratched appearance. The corrosion is caused by tannic acid that is released where decayed leaves and other vegetation form a thick layer on the muddy bottom. Wilderness waters are often stained a clear dark brown from the tannic acid.

In cold weather and in short dry periods, the snails burrow into the debris and mud on the bottoms of the waters in which they live and wait for more favorable conditions. Clay bottoms are the best protection for cold periods when the muddy bottoms hold moisture extremely well and are, therefore, best for dry periods.

Perfectly adapted to their homes in the natural wilderness and where the slowly moving currents of rivers and creeks are hidden under thick mats of pale green water lettuce, bonnet lilies and hyacinths, the *Pomacea* multiply by the hundreds of thousands. In fact, they seem to spend the two or three years of their lifespans eating, mating and laying eggs.

Beginning in the spring and continuing on through summer until early autumn, clusters of pink pearl-like eggs are deposited on the stems of reeds, blades of sawgrass, leaves of pond lilies and hyacinths, water-soaked logs, cypress knees, dock pilings, bridge supports and overhanging dead trees, roots or rock ledges. The conspicuous clusters of little round "pearls"

contain any number from two or three to as many as eighty eggs. The Limpkins, snail hawks and grackles do not eat the eggs, but other birds, small lizards and green anoles often eat them.

When the baby snails are hatched they emerge looking exactly like their parents and immediately seek the water where they begin to feed upon the plants and living algae that covers most submerged surfaces. The coating of algae furnishes a large part of the snail's diet, but dead plant material is frequently eaten in addition to aquatic plants and grasses that grow on the bottom under the water. Seldom do the snails live more than eighteen inches below the surface of the shallow wilderness waters. Often they cling to muddy banks of deeper waters, but most of their lives are spent on and in the soft muddy areas of shallow waters. Every age and size of snails, from eggs to adult animals, can be found in one small area.

The axe and machete have carved their paths through the wilderness areas and following those trail-breakers in the forest lowlands, the steel monsters of today have cleared, drained and filled most of the swamps, but the *Pomacea* still flourish. In the remaining wilderness waters, despite the appetites of the limpkins and snail hawks, small animals and humans, the prolific snails are plentiful in unpolluted places and new clusters of little pink pearls appear every night of the summer months, insuring new generations of *Pomacea* snails in the southern swamplands.

#### TROUBLESOME TRAVELING GIANTS, Continued from page 156

and most unpalatable as far as Americans are concerned. Some recent investigations have led scientists to suspect the snails may be carriers of disease and should not be eaten.

The giant African snails present few problems

in their native homeland and habitats. They have, however, thrived, becoming serious pests that cause great damage and considerable expense in the lands where they have been distributed, far from their original habitat, by both direct and indirect actions of man.

# SHELLS IN SCIENCE AND RELIGION

By DORMA PAXSON COLEY

(Editor's Note: the following appeared in 1966 in The Pacific Northwest Shell News.)

To those for whom a shell means nothing more than an object which lies inert upon a beach, or a knick-knack a grandmother or great aunt has cherished for years because a seafaring relative brought it home from some far-flung land, it would appear that conchology has little to teach along the lines of science and religion. However, those who are collectors and students of molluscan and other marine life know shells have played a most important part in the lives of mankind since the beginning of time. In fact, the deeper we delve into conchology, the more we realize what an enormous part shells have played in all the science, art, religion and history of the world.

Shells compose the second largest natural kingdom and have lived on all lands and in all seas, at one time or another, since life began on this planet. Their variety of habitat is paralleled by their equally diversified living habits. It has been said that they differ from humans only in degree, for in the examination of many specimens of the same species it will be found that there are giants, dwarfs, albinos and, in rare cases, cross-breeds. In fact, among all the various branches of the animal kingdom there are few creatures more beautiful, more interesting, more varied in form and habit, or of greater importance to man. All down through the ages, they have been used in innumerable ways and the animals that build and live in shells still provide mankind with its third largest natural food supply. The pages of history are filled with references to shells. We can learn much of early man, his life and migrations, from where shells or their remains are found. Perhaps no other group of natural objects is more widely used by geologists and paleontologists to determine the age or period of geological formations than fossil shells. They also act as guides in the search for chemicals, minerals and the innumerable other materials that are extracted from the earth.

These days we are all interested in and marveling over the scientific feats and accomplishments of the astronauts in outer space. However, the findings and data produced by the Navy's highly successful 45 day man-in-the-sea project that was conducted from Sealab 2, last September and October off La Jolla, California, were so amazing that Navy Secretary Paul H. Nutze made the statement that "the potentialities of inner space (the sea) are as great or greater than outer space." Also - astronaut/aquanaut Scott Carpenter has urged that the government support undersea research as strongly as it supports the space effort. Carpenter has stated that the U.S. could realize

more immediate returns from undersea research than from our space efforts. Currently, financial support for ocean research is but a fraction of that given to space.

So many legends and sea yarns have arisen around the squid and octopus that most people regard them almost with aversion, but they are really wonderful and fascinating creatures. They can teach us much even in this scientific age in which most of our thinking is in terms of supersonic speeds, jet propulsion and atomic energy. It is seldom realized that the squid was the very first jet propelled object in the world. It has fin-like extensions on its pointed tail which serve as equalizers and elevating rudders. The body is long, perfectly streamlined and built for speed. The jet propulsion locomotion is by means of water quickly drawn in through the wide mantle opening and then ejected with great force from the siphon, like the jet of a rocket. There are also side fins for stabilizing and planing up and down. In fact, the entire structure of the squid's anatomy seems to follow the rules and laws of hydraulics and other modern sciences. Also, it is not too generally known, but the specific structure of the two eyes we enjoy has been duplicated but twice in the course of evolution on this planet, once in the race of the iron blooded (man) and once in the race of copper blooded (the squid).

Even more amazing than the locomotive powers, the body construction and the truly remarkable eyes of these creatures, is their ability to display glowing lights and change their colors. Many deep sea squid are phosphorescent and photographs have been taken which show bodies which appear to be adorned with a jeweled diadem. Sky blue, ruby red, ultramarine and pearly sheen, glow about these otherwise repulsive-looking creatures. However, the real miracle of the squid is not in its speed as it shoots through the water like a living arrow, or that it has many features of 20th Century science, but that it had its origin so far back in time among the crawling, heavy-shelled, sluggish snails of the primeval seas.

In fact, the squid and octopus are possibly one of the most pronounced examples of evolution in sea creatures. While these creatures are not true mollusks, they belong to a very closely allied family. Far back in time, these so often repulsively regarded cephalopods possessed great cumbersome, sometimes 20 to 30 foot shells and were so numerous they fairly dominated the seas. With the passing of time, many species became extinct, but others evolved to the point where they no longer needed the protection of a shell and it atrophied entirely or became rudimentary. Perhaps the energy released from shell formation was diverted to the

development of mental powers, for certainly the chambered nautilus, the only member of this family to retain an external shell, is a stupid creature when compared with its shell-less kin.

It might even be said that shells are one of the greatest of all evidences or scientific proofs of this theory of evolution. There are few species that have not evolved, grown more complex, more beautiful, more active, even intelligent, down through the ages. None can deny, that the delicate, complex shells of today possess something, whether it is termed intelligence, reasoning powers, or just "survival of the fittest", that the great cumbersome mollusks of the Cambrian era did not.

One of the few exceptions to the theory of evolution seems to be in the lamp shells (not mollusks, but brachiopods). They are much the same today as they have been for billions of years. However, many prehistoric species have become extinct. They have neither progressed nor degenerated, but have lived on, practically at a standstill as far as organization is concerned. In prehistoric days, they were so numerous that thick layers of rock have been built by their accumulated remains. They are not commonly found in modern seas and perhaps here is an example that "All must progress or be left behind in the struggle for existence".

On the other hand, it might be said that shells are capable of practicing a form of Yoga, that of suspension of life. There are authentic records of certain land snails having been removed from their natural habitat and remaining in a dormant state for many years, but upon being returned to their normal conditions, they will start to live and grow again.

Certain species of shells are seldom found with the tops or first whorl of their spirals intact. There are two schools of thought as to the reason for this, but if it is due to the growth of the mollusk and it no longer inhabits that section of its shell, does it not teach us to discard our thoughts and customs when they are no longer necessary or beneficial to our progress? Should we not also realize that we must use every ability and facility with which we have been endowed or it will atrophy?

There are many evidences of what might be termed "intelligence" or at least some slight reasoning powers, in the molluscan kingdom. Those great scientists who still belong to the materialistic school claim that the actions and customs of the animal world are all the results of heredity, instinct and environment. They refuse to attribute any real intelligence or reasoning powers to anything less than man. Yet,



there are things about shells which cannot be completely or satisfactorily explained from purely natural causes.

Why do the pectens, and others, color and mark their shells so differently? No two are ever identical. Even the two sides of a shell are usually dissimilar, one side being of a definite color while the other is of a more subdued hue. Does this not suggest the "positive and negative" side of nature? How so the animals living in the "Carrier" shells (*Xenophora*) know always to cement the convex side of other shells to their tests and thus prevent any impediment to their own forward progress along the floor of the sea or over the rocks?

Much about shells, their customs and habits, may be explained by the word "instinct", yet do they not teach us that greater beauty, perfection and progress may be attained by a close observance to natural instinct and the divine laws of nature?

It has been said that the best means we have of understanding God and the working out of His Divine Plan is in the study of nature. There may be those who scoff at the idea of a soul in shells, never-the-less none can deny that there is life, and just what is life? It is one of the things that even the greatest minds have been unable to completely understand or reproduce.

All of the great religions and many of the lesser ones have had their sacred shells. In the Hindu, Vishnu is seldom depicted without a chank shell in his hand, emblematical of the legend of the chank's theft of the sacred writings. The chank shell is the heaviest as to texture of all shells. In fact, its weight suggests that of lead. The analogy suggested by the legend of Vishnu and the chank, seems to be that of Wisdom (symbolized by the sacred books which were stolen by the chank) descended into densest matter (the shell) and was carried to the depths of the sea (darkness or grossest ignorance) but was recovered (brought to light) by Vishnu (the Preserver).

The Gita contains one of the first reference to shells in sacred literature. It mentions the blowing of the conch shell horns to summon warriors to battle. Shell horns were and are used in the Jewish, Christian and other religious sacred rites, and in each case the significance attached to the blowing of these horns is much the same - that of "summoning the Deity" as well as calling people together.

In Christianity there are countless references to shells aside from their being used as horns and even at the present time giant clams are often used as baptismal and holy water fonts in many churches and cathedrals. The Twelve Apostles were among the greatest men of Christian history. They all had their insignia or symbols and that of St. James was the *Pecten jacobus*, as many of you undoubtedly know. This bivalve later became the symbol of the Crusaders who made the pilgrimage to his shrine in Spain.

So many pretty legends have arisen around shells that it would require volumes to recount them all. That of the snail and the Easter legend is among the loveliest and perhaps most significant. Since the very beginning of Christianity, the 'snail' has had special significance. It is a symbol of humility, frugality and contentment. The slow movement of this little mollusk is indicative of the perseverance man should practice in right doing. In many ancient pictures of the Crucifixion, a snail is often seen at the right of the Cross. It is a symbol of the penitent thief whose delayed conversion took place in the last hour of his life. In other words, his "birth into immortality". However, we should not follow a "snail's pace" in our efforts towards goodness or wait until the "last hour" of our earthly life to try to attain immortality, but should rather ever maintain the snail's determination and perseverance to "return to the Father's house".

The snail has another even greater and more beautiful significance. In the spring when the first warm rays of the sun reawakens all nature the snail bursts open the door of its little shell and emerge once again into active life. So Jesus, on Easter morn, broke open the seal of His tomb and came forth, the glorious Conqueror of death and the powers of darkness.

Even before the dawn of civilization and the coming of the Great Masters who taught the Ancient Wisdom and established the major religions, primitive man felt the instinctive need of worshipping some visible object. He turned to nature for the solace he craved and employed many natural objects to represent "the gods". Many different types or species of shells have been used for this purpose, in the various parts of the world. Also, most of the creation myths have dealt with shells.

In the Dresden Maya Manuscripts and Codex are accounts of "A sea snail giving birth to a tiny person" from whom the race originated. Sea snails have even been associated with the gods of birth, the moon, death and the sun. Among the Central American people the snail has always carried a sacred significance. The coastal Indians of southern Alaska and northern British Columbia also had their primitive beliefs, traditions and legends regarding the origin of their races which like those of the peoples living further south on the Pacific Islands, were to the effect that the first people sprang from a shell, and of a little female child "shell born" who became the mother of the race. Is this too far from what science teaches today - that all life came from out the sea?

In Africa and other lands where cowrie shells are found and used, that shell was used to represent "birth" and we can readily understand why when we examine the base of the shell and notice how closely it resembles the portal through which a child enters the world. Some primitive races practiced the custom of tying a certain type of cowrie around the waist of a baby girl at birth. She wore this shell as long as she was a virgin, but at marriage it was removed and another species of cowrie was

## A SHELLY STORY

This is the story of a little girl named xxx-xxxx; her mother didn't realize that the original xxxxxxx had opened a box allowing all the pills in our world to escape or I'm sure she'd have called her child xxxxx or maybe xxxxxxxx or some such. Anyway, this child was not like her predecessor, for she was xxxxxxx and a joy to have around.

One day she had some coins that went xxxxxx in her pocket and she decided to go to the corner store for a xxxxxx of ice cream in a xxxx. Her mother thought she should wear a xxx to keep her head warm, or "Maybe," she said, "you'd rather wear your xxxxxx. It will match your xxxxxxx." "I'll xxxxxx," said xxxxxxx. She liked the latter better for it had xxxxxxx on it and it did look pretty. Off she went, admiring the bed of xxxxxx along the walk. She asked the nice man at the store to please put a xxx on her xxxx, on the xxx, and he did. My, it was good!

As she walked home she was intrigued by a white baby xxxx in a xxx that was in a neighbor's yard. She was so interested that she tripped on a crack in the sidewalk, her xxxx flew up in an xxx and poor little xxxxxxx ended up with a xxxx in her dress and a bump on her knee. She ran home to her mother who put a xxxxx on the bump to stop the swelling as she watched the tears xxxxxx up and run down her daughter's face. She told her gently that her troubles were xxxxxx, but she cut her a big xxxxx of cake and put some ice cream on top. "There," she said, "Isn't that better than your xxxx?" Her daughter smiled wetly and said, "I'm not xxxxxx."

(the following fill the "x"'s above)

margarite	jingle	triton
tulips	top	bubble
pandora	sanguin	cap
cone	dipper	doris
spoon	trivia	pen
scallops	ark	slippers
slip	bonnet	nut
duck	tellin	wedge

substituted. It was believed this would assist her in giving birth to many healthy children.

To those who see and hear God in all the forces, sights and sounds of nature, our ancient forebearers were not quite so foolish or ignorant in their ancient theology as they may appear to many. Much of the symbolism connected with sacred talismans may seem far-fetched, perhaps even a bit ridiculous, yet the most enlightened minds of the present day do not fully understand cosmology or comprehend all the forces which create and motivate man. Would it not be far wiser if we did not belittle the ideas thoughts and beliefs of early man, but rather try to better understand them and the sources from which they sprang? If we will, it is a certainty that a greater knowledge and understanding of all life and the cosmos will be gained. Even a most casual study of the beauty of shells will aid in a greater understanding of nature and The Great Creator of all.



## Art in Shell of the Ancient Americans

By WILLIAM HENRY HOLMES

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

(Continued from our last issue.)

"The 'fish', or public treasure, consists principally of these belts, which, as I have said, with them, take the place of contracts, of public acts, and of annals or registers. For the savages, having no writing or letters, and therefore finding themselves soon forgetting the transactions that occur among them from time to time, supply this deficiency by making for themselves a local memory by means of words which they attach to these belts, of which each one refers to some particular affair, or some circumstance, which it represents while it exists.

"They are so much consecrated to this use that besides the name *Gaianni*, which is their name for the kind of belts most used, they bestow that of *Garihona*, which means a transaction; that of *Gauouenda*, voice or word, and of *Galanderenfera*, which means grandeur or nobility; because all the affairs dignified by these belts are the endowment and province of the *agolanders* or nobles. It is they who furnish them; and it is among them that they are re-divided when presents are made to the village, and when replies to the belts of their ambassadors are sent.

"The *agolanders* and the ancients have, besides this, the custom of looking over them often together, and of dividing among themselves the care of noting certain ones, which are particularly assigned to them; so that in this way they do not forget anything.

"Their wampum would soon be exhausted if it did not circulate; but in almost all affairs, either within or without, the law requires a reply, word for word, that is to say, for one belt one must give another, to be of about the same value, observing, however, a slight difference in the number of beads, which must be proportioned to the rank of the persons or nations with which they treat.

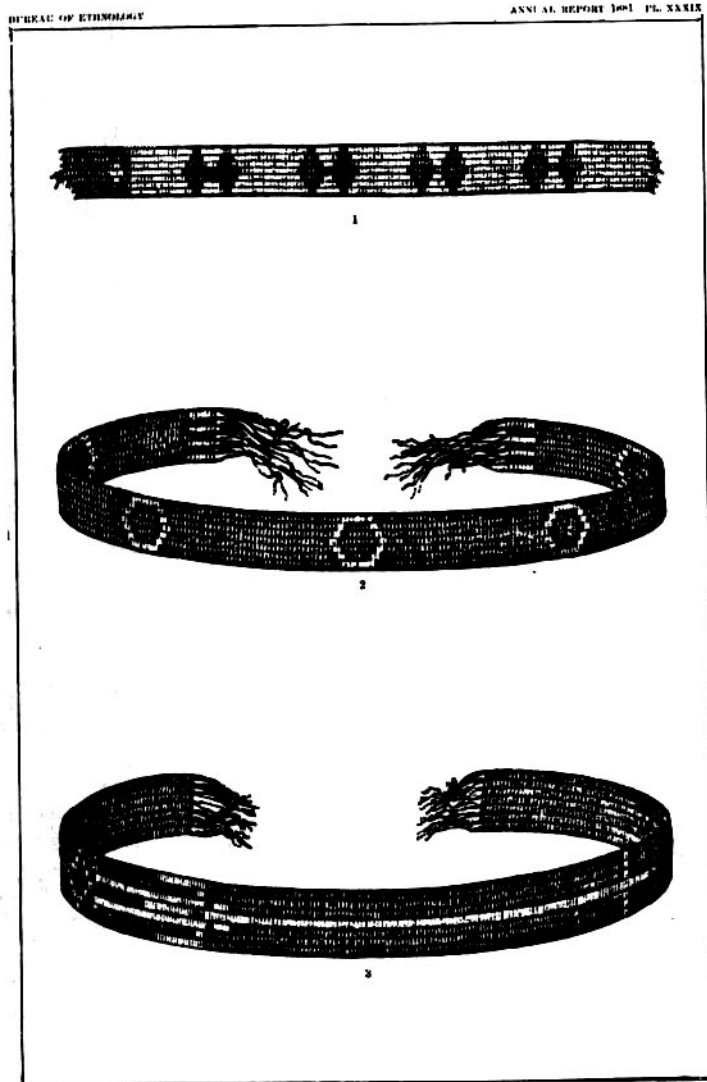
"They do not believe that any transactions can be concluded without these belts. Whatever proposition is made to them, or reply given them, by word of mouth alone, the affair falls through, they say, and they let it fall through very effectually, as though there had been no question about it. Europeans little informed or little concerned about their usages have slightly inconvenienced them on this point in retaining their belts without giving them a similar response. To avoid the inconvenience which might arise from this they acquired the style of giving only a small quantity, excusing themselves on the plea that their wampum was exhausted; and they supplied the rest with packages of deer-skin, in return for which they were given trinkets of small value, so that transactions between the Europeans and them have become a sort of trade.

"Although all the savage nations of America make various kinds of ornaments of shells, I believe that it is only those of North America who employ them in transactions. I cannot even affirm that all of these do." (1)

A very complete account of wampum is given by Loskiel, from whose work the following extract is made:

"Four or six strings joined in one breadth, and fastened to each other with fine thread, make a belt of wampum, being about three or four inches wide, and three feet long, containing, perhaps, four, eight, or twelve fathom of wampum, in proportion to its required length

(1) Laftau: *Mœurs des Sauvages Américains*, 1724, tom. II, pp. 502-3 and 506-7.



WAMPUM BELTS BELONGING TO THE ONONDAGAS.

and breadth. This is determined by the importance of the subject which these belts are intended either to explain or confirm, or by the dignity of the persons to whom they are to be delivered. Everything of moment transacted at solemn councils, either between the Indians themselves or with Europeans, is ratified and made valid by strings and belts of wampum. Formerly, they used to give sanction to their treaties by delivering a wing of some large bird; and this custom still prevails among the more western nations, in transacting business with the Delawares. But the Delawares themselves, the Iroquois, and the nations in league with them, are now sufficiently provided with handsome and well-wrought strings and belts of wampum. Upon the delivery of a string, a long speech may be made and much said upon the subject under consideration, but when a belt

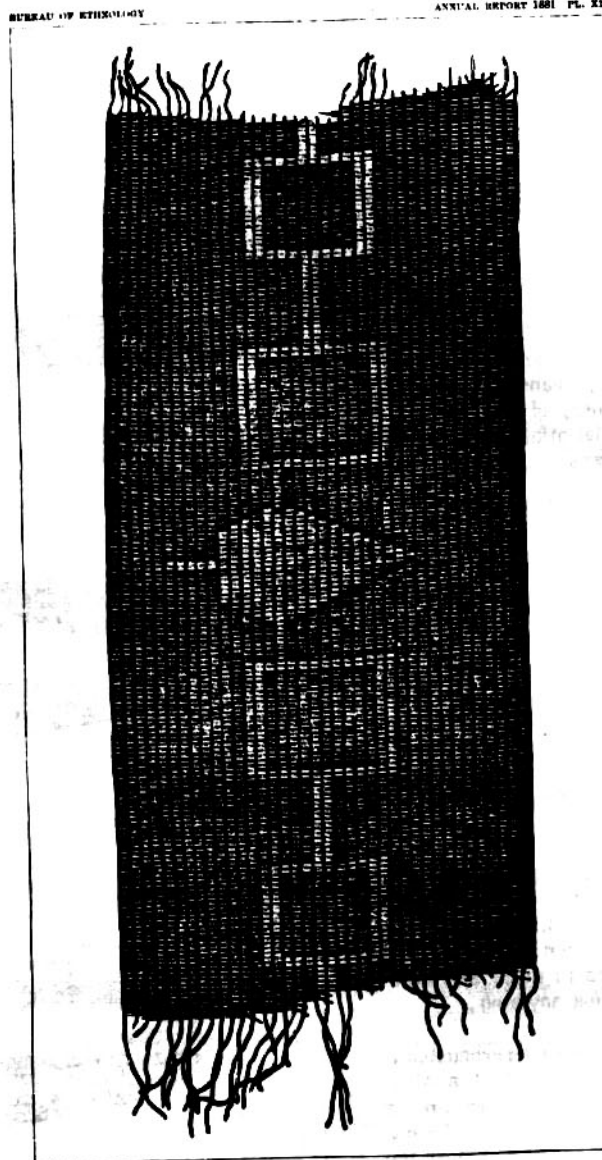
is given few words are spoken; but they must be words of great importance, frequently requiring an explanation. Whenever the speaker has pronounced some important sentence, he delivers a string of wampom, adding, 'I give this string of wampom as a confirmation of what I have spoken'; but the chief subject of his discourse he confirms with a belt. The answers given to a speech thus delivered must also be confirmed by strings and belts of wampom, of the same size and number as those received. Neither the colour nor the other qualities of wampom are a matter of indifference, but have an immediate reference to those things which they are meant to confirm. The brown or deep violet, called black by the Indians, always means something of severe or doubtful import; but the white is the colour of peace. Thus, if a string or belt of wampom is intended to confirm a warning against evil, or an earnest reproof, it is delivered in black. When a nation is called upon to go to war, or war declared against it, the belt is black, or marked with red, called by them, the colour of blood, having in the middle the figure of an hatchet in white wampom. \* \* \* They refer to them as public records, carefully preserving them in a chest made for that purpose. At certain seasons they meet to study their meaning, and to renew the ideas of which they were an emblem or confirmation. On such occasions they sit down around the chest, take out one string or belt after the other, handing it about to every person present, and that they may all comprehend its meaning, repeat the words pronounced on its delivery in their whole convention. By these means they are enabled to remember the promises reciprocally made by the different parties; and it is their custom to admit even the young boys, who are related to the chiefs, to their assemblies; they become early acquainted with all the affairs of the State; thus the contents of their documents are transmitted to posterity, and cannot be easily forgotten." (1)

It is to be presumed that if a treaty or a promise were broken, the belt would be released from its office and in the same form, or worked into another, could again be used. Otherwise the records, if properly kept, would in time become extremely cumbersome.

The repudiation of a treaty and of the wampom which accompanied it is recorded by Brice. It was at a council held at Miami in 1790, between Mr. Gamelin and a number of tribes. Mr. Gamelin in beginning his speech presented each nation with strings of wampom, but "the Indians were displeased with the treaty, and after consultation returned the wampom, saying: 'From all quarters we receive speeches from the Americans and not one is alike. We suppose that they intend to deceive us. Then take back your branches of wampom.' The Pottawatomies were better pleased with the speeches and accepted the wampom." (2) (\* in Ohio)

(1) Loskiel: Missions of the United Brethren. Trans. by La Trobe, Book 1, p. 26.

(2) Brice: History of Fort Wayne, p. 118.



WAMPUM BELT BELONGING TO THE ONONDAGAS.

Another good example which illustrates the manner of canceling treaties, confirmed by intention of the red men to take no part in the impending struggle." (3) wampom, is given by Mr. Gilpin:

"When Washington, then but a youth of twenty-one, was intrusted by the colonial governor of Virginia with a mission to the western wilds of Pennsylvania, where the French from Canada were then penetrating and had already established, as was believed, four posts within our limits and were seeking to unite the natives in alliance against us, \* \* \* he found that such an alliance had indeed been formed. He found that they had exchanged with the French, as its symbol, a wampum belt on which four houses were rudely embroidered - the representations of the posts which were to be defended, even at the risk of war. Influenced by his remonstrances, the Indian sachems consented to withdraw from the alliance; but they declared that the belt of wampum must be returned before the agreement could be abolished; and one of the sachems repaired to the French commander in order to restore to him the token of the warlike compact, and to proclaim the

intention of the red men to take no part in the impending struggle." (3)

Heckewelder relates that "it once happened that war messengers endeavored to persuade and compel a nation to accept the belt by laying it on the shoulders or thigh of the chief, who, however, after shaking it off without touching it with his hands, afterwards, with a stick, threw it after them, as if he threw a snake or toad out of his way." (4)

It is remarkable that other objects were not more frequently used for mnemonic records. We can only explain the partiality shown to wampom on the supposition that the idea of value

(3) Gilpin, in Memoirs of the Hist. Soc. of Penna. Vol. VI, p. 248.

(4) Heckewelder: Indian Nations, 1876, p. 110.

To be continued

## BAHIA HONDA

By Lt. Col. CORINNE E. EDWARDS

(Editor's Note: The following article originally appeared in the "Miami Malacological Society Quarterly" Vol. 2, No. 2 in 1969. Neither the Society nor the Quarterly are active.)

Shelling at low tide on exposed sand bars is my favorite way, if I want to "collect". At low tide we carry little plastic bottles and big buckets as we walk the flats and shallows looking for tracks or breaks in the damp sand that reveal the movement of living mollusks. Out on the reef the water is usually deep and shelling is for strong swimmers. It is rugged and takes a lot of air in one's lungs or a scuba on one's back to dive down, check a trail or cave or turn a rock, search on and under it and turn it back. There are lots of friendly fish, but often a barracuda lurks nearby or one "thinks big" as he sees a small shark. Low tide on jetties and causeways is back-breaking rock turning. One needs stout sneakers, gloves, knife and a shelling apron like mine. There is usually no flat place for a bucket, so trips must be made back and forth to it.

Thirty miles northeast of Key West, off the ocean side of Bahia Honda Key, from the swift water under the high bridge, easterly for a mile or more, there is shallow water. Here one can find a few coral rocks and slabs, and turtle grass flats. There are gorgonians, sea whips, sea plumes, sea fans and all kinds of sponges, fire coral and, now and then, a great barrel-sized living head coral (*Orbicella annularis*?). Wading is no good due to the rippled on the water and a glass-bottomed bucket is cumbersome, but I love to snorkel here. Through the faceplate of one's mask everything is enlarged and what a fascinating part of our world comes into view. Here one can observe living sea creatures in their natural environment.

So, this summer, on normal low tides, I thoroughly enjoyed studying or observing marine life off Bahia Honda State Park. *Holothuria* in all sizes and colors were big and knobby on the grass and small, plentiful and brightly colored under rocks. I searched the bigger ones for *Balcis intermedia*, the Cucumber Melanella, a scarce little mollusk sometimes found on these echinoderms, or is it only found on *Holothuria empatiens*? Red-brown snapping shrimp with purple antennae and various species of *Ophiura* (Brittle Stars, measuring 12 inches from tip to tip) would dart and squirm back under as I turned their rock hide-away. On the rocks I found writhing Fire Worms as well as Feather-Duster Worms that vanished into their tubes like magic. Blue and yellow Beau Gregory (a tropical fish), *Eupomacentrus leucostictus*, resented their rock hide-out being disturbed and bravely nipped at my hands trying to scare me off. I took an occasional one and one-half inch *Stenoplax floridanus* for Bill Old or for

trading. I do like chitons, especially when they are big enough to see.

It was here at Bahia Honda, on the 4th of July, that I took my first live *Prunum guttatum*. Usually the silt rolls up when one lifts small rocks to look them over in search of *Lucapina sowerbii*, the almost invisible grey fleshy Key-hole Limpet. This day I made myself turn rocks ever so gently and searched beneath them. Now and then, settled in the silt, I spied a shining creamy-yellow-orange-pinkish-brown white spotted marginella. I took six mature ones and hoped I could keep them alive and Ellen (Crow) could raise them in her aquarium. Maybe they will be as easy to raise as are *Prunum apicinum*. The next morning, early, after a night sleeping out under the stars and following bacon and eggs cooked on the beach, I searched for and found two more to take back to Miami in a separate container, but I needn't have worried - they all lived.

Out on these snorkeling flats are the most beautifully apertured, thick-lipped *Strombus raninus*, ranging from great four inch ones to tiny males barely two inches from tip to tip. Unless spotted as they made a leaping frog-like movement, they are silt-covered and pretty well camouflaged. There are *Vasum muricatum* in all sorts of small sizes. I imagine that these never reach full size as this camping area is shelled all the time. Vase shells clean up on the outside beautifully with a strong brushing and a little picking on the apex, but don't bleach off that lovely tan periostracum unless you want just a plain white shell. To get all the animal out is another matter - and I often wonder if anyone has a secret way of getting all the body past those strong folds on the columella?

Another "first" for me was *Hipponix antiquatus*, the white Hoof Shell. We, in M.M.S., collect colorful and freshly dead shells to be made into Florida shell packs and sold by and for the Science Museum. I had quite a handful of these white cap-like hoof-shaped shells from the drift line at Ohio Key. I had an apron pocket for crab specimens of *Natica carrena* and *Polinices lacteus*, but when reaching for a dead *Codakia orbicularis* to add to these shell-pack shells, I noticed one was oddly shaped. Attached to the umbo was my very first live-collected *Hipponix antiquatus*. The edges were not worn back as are dead shells. They were uneven and as thin as paper. It appeared to me when, at home, I studied the *Codakia* shell, that this mollusk lays down a shelly layer under itself --- I must search for more live Hoof Shells and check this theory.

Through the face plate of one's mask the *Astraea americana* and *phoebia* loom extra large. They really are full-sized or more and, if one

is selective, he can take ones that will clean up nicely - just don't let your bleach eat away the apex layers and leave you with a pearly-tipped star shell.

*Nitidella nitida*, *Tegula fasciata* and *T. unifasciata* were found on the underside of rocks. An occasional *Lima pellucida*, like a Will-O-The-Wisp, flitted away and, being gray on the silt-gray bottom, became almost invisible. *Leucozonia nassa* and *Cantharus tinctus* were fairly common. There were small *Isognomon radiatus*, flattened out on many of the rocks and on dead shells. I do not like oyster shells very much, but did take several *Isognomon* that were exceptionally irregular and elongate in shape - measuring 3/4 inches wide and 3 1/2 inches long. They were well-fastened by byssus threads in crevices.

Out in the deeper water, under the edges of big rocks, Bill Hughes looked over the plentiful pincer-less Florida crayfish-like lobsters with thoughts of an August 3rd camping trip when the season would open and they would be even larger. He found a mature *Cypraea cervus* under a great coral slab, but it was the only one we saw. I took a pair of *Cyphoma gibbosum* as they looked different out there without my glasses. They turned out to be exceptionally large and light, almost white, but not *Cyphoma mcgintyi* or *signatum* as I had hoped. I looked and looked, and felt along the sea whips, for *Neosimnia*. I have found them, both purple and yellow, quite by accident on beached pieces of purple sea whips after soaking them in fresh water - maybe this is the only way to find them for they seem invisible.

Fred Harper took a small, but living, *Cypraea femorale* here at Bahia Honda in May, which seems to be the time to find this Angular Triton - my seven inch live one came from Bear Cut back in May of 1964 and my 6 1/2 inch crab specimen, but freshly dead, came from Sister Creek area off Vaca Key in May 1967. Near the shore there were *Conus jaspideus* making tracks in the sand and, of course, *Batillaria minima*. Here too, the shape gave away a sponge-covered *Chlamys sentis*, which was a deep purple, so I took it. I have crawled along Bear Cut drift line "Thinking Green" searching for and finding dead *Smaragdia viridis* and *Tricolia affinis*. Here at Bahia Honda, on the grass, were two more "firsts" for me to find alive. I took, cleaned and even saved the tiny calcareous opercula from the pea-green Emerald Green Nerites and from the spotted and checkered Pheasant Shells. Out in waist-deep water, Ellen, Louise and John Beers swept the grass with nets. Those "sweepers" enjoy miniature shells more than I do and they found plenty of these tiny shells out there that day.

\*Coconut Grove, Florida



Small *Pleuroploca gigantea* were there and, like *Vasum*, never get to grow up (at least not to the 19-21 inch size found under Seven Mile Bridge) due to over-collecting. The same goes for *Strombus gigas* in this area, only dead ones or immature pink rollers were noticed. By the way, these Horse Conchs are often diseased or castrated. (See article elsewhere in this issue - Editor.)

Of course, on dead shells, one could see small *Crepidula aculeata*, *C. plana* and *C. fornicata*. No need to rip off sponges firmly attached to *Arca zebra* and *A. imbricata* which were, in turn, firmly attached to the substrata. The shore was lined with this ecological combination of sponge and ark shell. I took some of the already cleaned sponges and shells for my "Show & Tell" programs as I do like the Family Arcidae. *Barbatia domingensis* and *Arcopsis adamsi*, speaking of arcs which are so small and cute, were plentiful in crevices on the underside of most rocks.

Just for the record, the silt-resistant Rose Coral, *Meandrina brasiliensis*, was here, the solitary-living Slate Pencil Sea Urchin, *Eucidaris tribuloides* (now called the "Satellite Urchin" by the younger generation), an occasional Sea Biscuit or Cake Urchin, *Clypeaster rosaceus* and, now and then, a *Diadema antillarum* and an *Arbacia punctulata*. Stone Crabs, big enough to eat, dared me to capture them and I often did, then let them go.

Try snorkeling at Bahia Honda if you're ever in Florida. You'll enjoy it!

**PUZZLE PAGE**

Submitted by GLENN WEGNER

All of the words on the list below can be found in the puzzle. When a word is found, draw a light line through it and cross it off the list. When all the words on the list have been found, the letters in the puzzle that have not been used will also spell a word that is related to the list of words.

E E A D I L L E N A I S A H P  
 A M E A D I L L E R U S S I F  
 D R E A D I R A L L E C N A C  
 I C O N I D A E A D I S S A C  
 L Y A H A R P I D A E C A P L  
 L P D E P A C O Z A I E E E E  
 E R O N O O A O D O A A A C A  
 N A P I O C C I L D D D D T D  
 I E O D M L E A I I I I I I I  
 G I R A O N R R L R V N Y N T  
 R D E E U I R U T P G I M I E  
 A A T T I U V I I S Y L D D M  
 M E P D T O M F A M I L Y A R  
 T E A D I B M O R T S E O E E  
 N E A D I C R A L L E T A P V

- Acmaea
- Arcidae
- Cancellariidae
- Cassidae
- Conidae
- Cypraeidae
- Enidae
- Family
- Fasciariidae
- Fissurellidae
- Harpidae
- Marginellidae
- Mitridae
- Myidae
- Neptuneidae
- Olividae
- Ovulidae
- Patella
- Pectinidae
- Phasianellidae
- Polyplacophora
- Pteropoda
- Strombidae
- Tellinidae
- Turridae
- Vermetidae

The following are answers to the "Puzzlers" on page 78 of the last Issue.

- |                           |                      |                 |
|---------------------------|----------------------|-----------------|
| Pterospira roadnightae    | Ninety Mile Beach    | Australia       |
| Altivasum flindersi       | Back Stairs Passage  | Australia       |
| Amphidesma ventricosum    | Ninty Mile Beach     | New Zealand     |
| Cypraea cernica tomlini   | Poor Knights Islands | New Zealand     |
| Alcithoe arabica depressa | Spirits Bay          | New Zealand     |
| Argonauta nodosa          | Mayor Island         | New Zealand     |
| Tolema australis          | Lakes Entrance       | Australia       |
| Neptuneopsis gilchristi   | False Bay            | South Africa    |
| Conus aurora              | Still Bay            | South Africa    |
| Trophon stuarti           | Deception Pass       | Washington      |
| Volutoconus grossi        | Tin Can Bay          | Australia       |
| Sabia conica              | Table Island         | Canada          |
| Pyrazus ebeninus          | Botany Bay           | Australia       |
| Harpovoluta varhoefferi   | Gaussberg Mountain   | East Antarctica |
| Melo miltonis             | Swan River           | Australia       |
| Cymbiolacca complexa      | Broken Bay           | Australia       |
| Alcithoe fusus            | Bay of Islands       | New Zealand     |
| Cottonia nodiplicata      | Rottnest Island      | Australia       |
| Philobrya subpurpurea     | Sea Elephant Bay     | Australia       |
| Argalista kingensis       | Surprise Bay         | Australia       |

**BOOKS**, continued from page 160  
 tically beautifully illustrated by Eric Heath's paintings. This book also sells for \$6.50. You will want both books, though I am sending the book *Marine Fishes of New Zealand* to Tom Rice for his museum. Maybe wife or girl friend will collect shells and enjoy shallow-

water seashore life while husband or boyfriend fishes, just off shore. You will again be struck with the similarity of fish you know from your own waters and those of New Zealand. One hundred accurate and detailed pictures with scientific names and their sizes are here. Even what the fish eats, size hook to use, where it

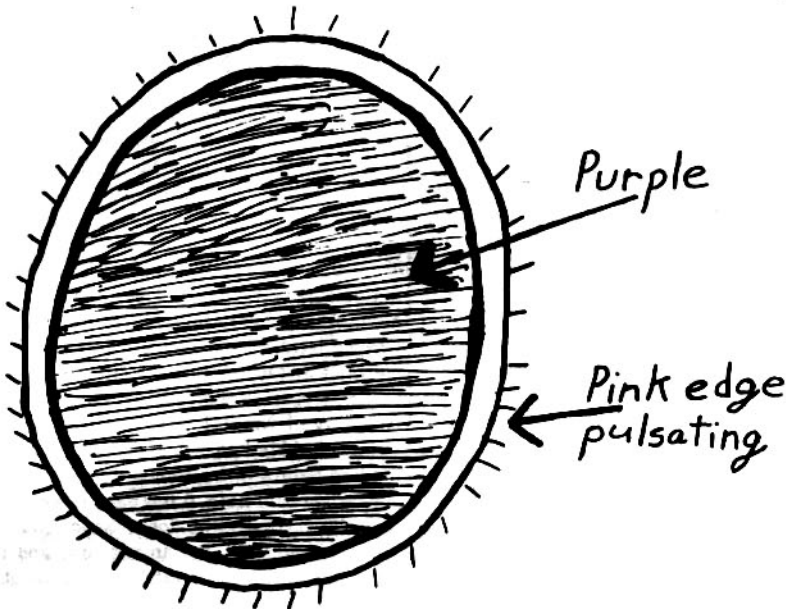
lives and its common name are all plainly stated for each large-size painting.

These four books have been imported from New Zealand for your library. They are available from your favorite book seller. My only critique please continue to page 191



## A Monstrous Jellyfish ?

By GARY MANGIACOPRA\*



Drawing based upon a sketch of Mr. Richard Winer. Over-all view looking down on the upper surface of an unknown marine animal off Bermuda.

One of the fascinating oddities of the seas is the immense size that marine animals are able to attain in their watery habitat. Seldom, except under the most chancey circumstances, are the largest of these marine denizens ever seen by man.

While I was researching information regarding reports of colossal octopods, I, by chance, came across a book by Richard Winer in which he related a short tale concerning himself and a fellow skin diver. Diving off Bermuda they sighted an immense and unidentifiable marine animal.

This incident interested me as it might have been related to a sighting of a gigantic octopod. I wrote to Mr. Winer, who graciously and generously replied. He was able to add a few additional facts relating to this incident.

In November 1969 Mr. Winer and his fellow skin diver, Mr. Pat Boatwright, were at a depth of 30 to 40 feet in waters of 1400 foot depths 14 miles southwest of Bermuda. They were photographing the underwater movements of a telemetry buoy in rough seas for their employer, General Electric. Winer had exhausted the film in his camera when his attention was moved downward at the urging of his companion. All conditions were not perfect, winds and rough seas and late afternoon with distorted light rays penetrating the depths - what both divers saw

was a large unidentifiable object beneath them at a depth of 100 to 150 feet.

Winer estimates the size of the object at approximately 50 feet minimum and 100 feet maximum in diameter and nearly perfectly round in shape. In their opinion it was an animal of some kind.

The color of this "animal" was a deep purple with the outer perimeter pink, and pulsating. But there was no discernable movement of water as it slowly began ascending towards them. As the divers retreated towards the surface the "animal" stopped its ascent and started to descend into the depths. The entire sequence of events unfolded in four or five minutes.

What might this animal be? The two witnesses differ. Mr. Boatwright theorized that it was a giant squid; Mr. Winer thought it was a monstrous jellyfish.

Based upon a sketch by Winer (see above) the author would be inclined to side with him. This would at first seem somewhat improbable to most readers and one is inclined to think this incident as a skin diver fable. Let us examine what we do know about the largest of the known jellyfish.

The largest recognized size for a jellyfish is recorded in the Guinness Book of World

## More on Microwaves

In reading Jude Brook's article in the Spring 1976 issue of *Of Sea and Shore* regarding microwave cleaning of shells, I just had to comment. I really chuckled at Iris's unfortunate experience!

Although I haven't reached 100% success using my microwave, shell cleaning was one of the reasons for its purchase. The first "must" is certainly to start with live or freshly dead shells. All the rest is trial and error.

I feel confident no harm has come to my microwave oven. My husband likes his groceries too much to allow any mistakes!

Zip-loc bags are perfect as they hold in all the smells and juices. Occasionally a *Cyphoma gibbosa* will explode from its shell in 22 seconds. A *Strombus alatus* falls out in about 25 seconds. The *Strombus raninus* take 30 seconds and a *Nerita peloronta* from 20-25 seconds.

I've tried many shell cleaning techniques, including boiling, freezing, hanging, ant hills and I still prefer the microwave oven.

K. WESTERGREN

Big Pine Key, Florida

Records and was measured in 1865. The bell of the specimen measured  $7\frac{1}{2}$  feet in diameter and the tentacles stretched 120 feet. Further checking by the author reveals that this specimen was examined and recorded by Professor Alexander Agassiz at Nahant, Massachusetts and had the name *Cyanea arctica* (Family Cyaneidae) and inhabits the Bay of Fundy, Boston Harbor, Long Island Sound and the northeast coast of the United States.

So the question remains, could this be a gigantic jellyfish off Bermuda? The answer has to be, yes. Though there are biological limits even in the seas that have to be obeyed such an immense size could theoretically be attained.

It is possible that readers of this article may know of additional information regarding sightings of jellyfishes of sizes greater than the established record. The author would appreciate hearing of such incidents. Please contact Gary S. Mangiacopra, 7 Arlmont Street, Milford, Connecticut 06460.

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## The Hermit Crab and Empty Seashells

By I. S. KHOMASURYA\*



Hermit crabs have a constant housing problem. They require new and larger "houses" as they grow. Having lost the protective armour at the abdomen (unlike their relatives, the lobsters and the crabs) these hermit crabs seek out the sanctuary of gastropod shells to house their sensitive bodies. Interestingly enough, the soft abdomen is permanently twisted to fit the spiral of the shell; furthermore, at the end of it, the last pair of appendages (equivalent to a lobster's tail) is modified to form small pincher-like claws, with one side of the claw bigger than the other. These uneven-sized claws anchor the abdomen to the centre piece of the shell. It is, therefore, quite difficult to pull hermit crabs out of their shells, without injuring their bodies. In nature, however, some hermit crabs resort to a game of tug-of-war for ownership of a new home. A small crab in a big shell is a likely target for such struggles. The weaker crab usually ends up outside the shell, abdomen and all, to avoid injury - on being yanked out by the stronger crab.

By nature these hermit crabs cannot resist checking out empty shells they come across; even when they have comfortable-fitting shells as homes. The empty shells are inspected for cleanliness and size, with the help of their antennae and claws. Having selected a particular shell, moving into it is done with great rapidity. The abdomen is withdrawn from the original shell, then literally thrust backwards into the new shell. The quick-change merely ensures that the soft abdomen is not exposed or unprotected for too long.

(Photograph by the author)

As hermit crabs do not generally like to expose their abdomens for too long, this fellow (see photograph), *Pagurus hisutisculus*, from California, has opted for a small shell (*Tegula funebris*) as a home for a while. The soft abdomen fitted the shell perfectly, although it could do with a larger shell to house the rest of the body! Shell collectors and beachcombers should leave behind seashells they can do without, so that the hermit crabs can choose better fitting shells and not be subjected to a housing shortage as this one was.

Specimen in the collection of the Royal Ontario Museum, Toronto.

\*Department of Invertebrate Zoology  
Royal Ontario Museum  
Toronto, Ontario, Canada

## Eppy

By DR. NORMAN PASCHALL\*

There comes a time in everyone's life, when one has to step out on their own, and I guess now is my time. For over thirteen years now I have been working on the family of Epitonidae. That's "Wentletraps" to those who are not informed.

In 1960, while I was still in the Navy and stationed aboard ship - in drydock at Hunter's Point, California - on weekend liberties, I headed for the beach. In early June I collected a good-sized supply of *Epitonium tinctum* - live and feeding on the green anemones at Half Moon Bay. I collected adults, juveniles and egg strands and took them to the Academy of Science, Golden Gate Park, San Francisco. Allyn Smith, of the staff, took some beautiful photos of my "babies" and then they were placed in one of the tanks at the Steinhart Aquarium. To our dismay, the following Monday, we found that one of the assistants had placed a sea star in the same tank and the star had made short work of our great find. The following weekend I was able to collect more and I was "off" on the Epitonidae.

Last summer, on my way down to Miami for a week's cruise in the Caribbean with a shelling group, I stopped at a marine speciality shop on the west coast of Florida. We greatly enjoyed our visit and, in our conversation, I happened to ask the fellow if he had ever had a chance to collect live Epitonium. His reply to that was "Not in over twenty years". I explained that they could, at times, be found as parasites on sea anemones. In leaving I told him, "If you ever find one alive, send it on to me".

\*Topeka, Kansas

On March 20th, at about 8:30 in the morning, the postman was knocking at my door. To my surprise he had an Air Mail, Insured parcel for me from Florida. I opened the parcel and, for the surprise of my life, there was a live and healthy wentletrap. Now Kansas is a long way from salt water, so what does one do now? Off I went to the only tropical fish dealer in town who handles saltwater fish. "Eppy" wasn't too lively and didn't put on much of a show and I know they thought I was crazy. But they set me up with an aquarium, base filter and pump, gravel and some established algae and I was "in business". Whoever heard of a person with a pet Epitonium?

"Eppy" made himself at home; he wasn't too active during the day, but at night checked-out his new home well. Meanwhile, I am frantically writing letters to anyone I know who could tell me what and where about Epitonidae. I wrote to Dr. Robert Robertson at the Philadelphia Academy of Natural Sciences and to several others. Robbie had published an article on the feeding habits of Epitonium back in 1963, so maybe he could help. A few days later I received a reply: he will live for a good time eating algae. Maybe get him an anemone and lots of luck. These things I already knew, but at least someone else also agreed.

On April 2nd I found "Eppy" a small salt water anemone. About twenty minutes after I placed the anemone in "Eppy's" tank he was having a feast, his proboscis was extended and fastened good and solid into the side of the anemone. For three hours "Eppy" gorged himself and the poor anemone was dead. So let it be known that Epitonium will definitely feed on anemones and they love them. "Eppy's" back on an algae diet for now and seems to be doing right well, but it's sure hard to find live anemones here in Kansas!

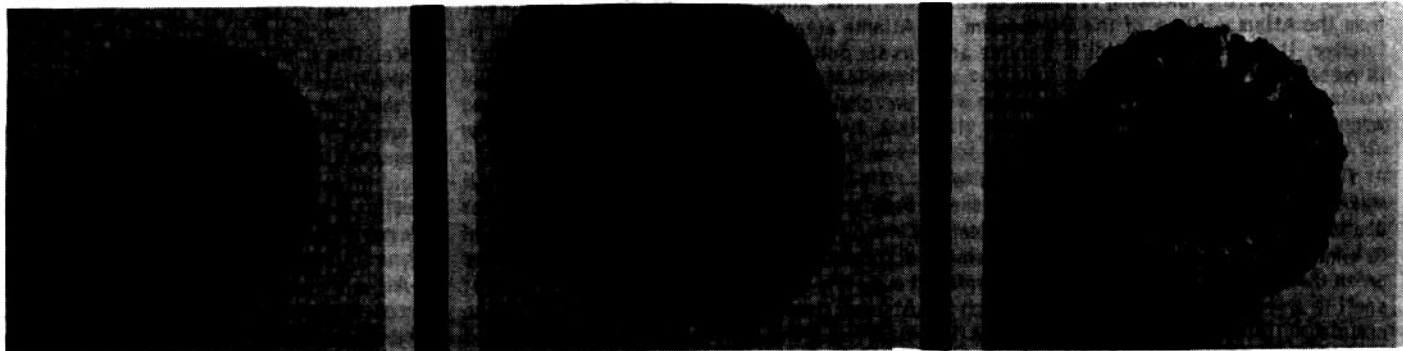
All kidding aside, if anyone has ever had any experience or has any knowledge on the care and feeding of Epitonium, I would sure appreciate hearing from you.

Oh yea, as far as I can judge, "Eppy" is a new species; at least I have never seen or worked over any specimens which will compare. His measurements are: angle of spire, 34 degrees; 8 whorls with two smooth nuclear whorls; 9 strong, slightly coronated at the shoulders, varices; a length of 27mm and a width of 11.5 mm; no basal disc or body striata; he is an overall fulvous brown with the varices a light brown or ivory in color. It looks like I will have to head for North Florida to try to find "Eppy" a mate, or at least to get him some food for a while. I hope to get some photographs of him soon, but as yet have not figured out a method for a night picture, and he sleeps all day.

Dr. Norman D. Paschall  
930 Oakland Avenue  
Topeka, Kansas  
66616

# A DOUBLE ECHINODERM

By ROBERT R. TALMADGE\*



Central disk of *Rathbunaster californica* Fisher, 1906 stretched over unbroken *Brisaster townsendi*. Aboreal or dorsal section. (dark spines belong to *Brisaster*)

*Brisaster townsendi* (A. Agassiz, 1889) 200+ fathoms, soft mud bottom taken off Northern California (Photographs by the author)

Ventral or oral section of central disk of *Rathbunaster californicus* covering unbroken test of *Brisaster townsendi*, mouth parts and rays lost because of decomposition

On numerous occasions the local dragboat fleet, fishing out of Humboldt Bay on the extreme northern California coast, have picked up unusual and interesting marine invertebrate specimens, as their nets sweep the bottom for food fishes. Nearly all of the invertebrate phyla have been recorded at one time or another, but the phyla Mollusca and Echinodermata appear to be the two most commonly found. Specimens of Coelenterata, Porifera and Arthropoda are taken in sufficient numbers to warrant keeping a small identification collection, plus the associated taxonomic and/or biological publications on each. So, it was nothing unusual to have Captain James Riley of the M.V. Ina hand me a specimen which he and his crew had picked up in a tow off Trinidad Head, California (Lat. 41°05'N.), which had been made at a depth of approximately 300 fathoms (= 550+ meters) on a soft mud substrate.

At first glance the "Specimen" appeared to be the central disk or body of a "new" species of Asteroidea, or perhaps a "new" species of

a Heart Urchin, *Brisaster*. Examination revealed that the "specimen" was actually a dual object, with the outer and dorsal surface the same as the central disk of the deep water sea star *Rathbunaster californicus* Fisher, 1906, but with the shape and interior formed by an entire Heart Urchin, *Brisaster townsendi* (A. Agassiz, 1898). A more detailed examination of the projecting spinlets on the arboreal surface of the dual specimen showed that the small spines of the *Brisaster* had penetrated through the thin membrane on the arboreal of the *Rathbunaster*, welding the two specimens into a single unit.

It was impossible to determine if this had caused the death of the sea star, but the soft parts were somewhat decomposed when the Asteroidea fell out of the net onto the deck. I located several of the detached rays, but apparently the *Rathbunaster* was incomplete when caught up in the net. The mouth parts were totally deteriorated. Weight indicated that the interior of the Heart Urchin had not been digested and the external openings were clear

and free of the soft parts of the Asteroidea. However, I doubt that the *Brisaster* could have carried the weight of the central disk and two or three attached rays along the soft mud of the substrate.

As far as I can determine this apparently is the first record of an Asteroidea feeding upon another Echinoderm, as usually they prefer pelecypods. Mr. Allyn G. Smith (personal communication) has mentioned that the Great Squid, *Moroteuthis robustus* (Verrill, 1876) had been noted feeding upon *Brisaster*, indicating both a depth range and a substrate on which the Cephalopod fed. These notes are presented in the hope that it will stimulate others who might have access to deep water specimens, to be not only watchful for Mollusca, but also for specimens and field data on other marine invertebrate phyla. They are interesting also.

\*Curator of Natural History  
College of the Redwoods, Eureka, Calif.

## ALLYN G. SMITH

Continued from page 140

able scientific collection of photographs of natural history subjects.

Mr. Smith is survived by his wife, Isabel, two daughters, Leslie and Shirley, a son, Allyn G. Smith, Jr., three grandchildren and one great grandchild, Allyn G. Smith, III.

By his own request there was no funeral. An Allyn G. Smith Memorial Fund has been established at the California Academy of Sciences. Anyone wishing to donate to the Fund can do so by mailing their check, made out to the Allyn G. Smith Memorial Fund to the California Academy of Sciences, Golden Gate Park, San Francisco, California 94118.

## Contributors Sought

American conchologists are being asked to join in contributing funds to present a lovely specimen of *Conus gloriamaris* to the Smithsonian Institution. Many people were surprised to learn that our national collection does not have a specimen. This is a fitting Bicentennial birthday gift to the U.S. Dr. R. Tucker Abbott is chairman of the committee. Your contribution is tax-deductible whether it be \$5.00, \$50 or more. Checks should be made payable to the Delaware Museum of Natural History and mailed to: Gloria Maris, Delaware Museum of Natural History, P.O. Box 3937, Greenville, DE 19807. Your name will be listed as one of the donors. Any excess contributions will be given to the Smithsonian for other species they do not have. This conchological "drive" ends on December 31, 1976.

## BOOKS, Continued from page 176

larger map on pages 42-43 he did not outline the coast so in printing since the only demarcation on the original was a color difference, the coastline was "dropped out" and one can not use the map to follow the coast. This is a small and shared problem in an otherwise well done and useful volume. TOM RICE

*Murex Shells of the World, An Illustrated Guide to the Muricidae* by George E. Radwin and Anthony D'Attilio, 7 x 11", 296pp., 200 b/w line drawings, 32 pages of color illustrating nearly 500 specimens is to be published in November by Stanford University Press and is available from your favorite shell book dealer. \$35.00 is the announced price for this long-awaited volume.



## Green Tree Snail Sales Are Illegal

(Editor's Note: the following is a news release from the Atlanta office of the Department of Interior, U.S. Fish and Wildlife Service and is presented as released.)

Atlanta, Georgia August 16, 1976

Federal and State Wildlife Officers are making the rounds of all shell shops and shell dealers in the Atlanta area today in an attempt to eliminate the illegal sale of Manus Island green tree snails. This very attractive spiraled snail is an endangered species and as such is completely protected by Federal law, thus the sale of them in Georgia is also illegal. (Underlining mine: Editor.)

The Manus Island green tree snail is listed as an endangered species by the United States and also by the Convention of International Trade in Endangered Species of Wild Fauna and Flora. This beautiful emerald green snail is eagerly sought after by snail collectors around the world and has been overexploited from its very limited range. This has boosted the price of the snails in an illegal market to

the point where shell dealers in the greater Atlanta area and elsewhere are asking as much as six dollars a piece for the one and one-half inch long green beauties. Jewelry makers use the snails extensively in their craft, making them even more valuable and desirable as gifts.

U.S. Fish and Wildlife Service Agent Bill Frazier and Lt. V. J. Garrison and four other Georgia Wildlife Rangers made the rounds of all shell shops and dealers in the Atlanta area today and confiscated more than 200 snails. At the going price of six dollars each, these could bring as much as \$1200 on the local market.

Manus Island, where the snail is entirely endemic, is in the Pacific Ocean in the Admiralty Island group. The snail there is collected by natives who sell them for about ten cents each in the Australian and Philippine market. It is reported that they are so eagerly sought after by the Islanders that most of the trees in which the snails live have been felled just to collect the snails and that a band about a mile wide around the island has been virtually clear-

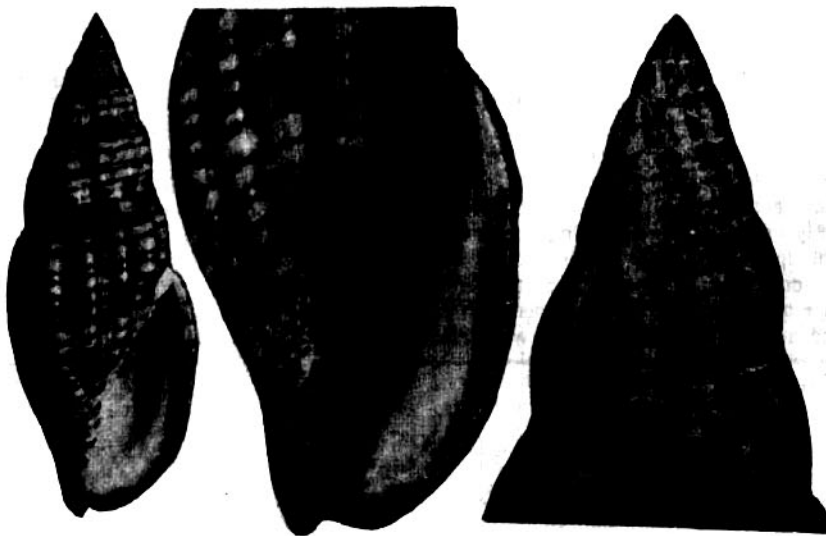
ed already.

Ken Black, Southeastern Regional Director for the U.S. Fish and Wildlife Service, pointed out that "we are not interested in making a lot of arrests but are interested in stopping the illegal sale and importation of the snails which would in turn reduce the market and slow down the illegal taking of the snails from their only source, Manus Island."

All of the dealers in Atlanta willfully consented to the confiscation of the snails and the jewelry made from them and no arrests were made. The cases will be filed with the U.S. Fish and Wildlife Service's Endangered Species Office for possible civil action which could result in civil penalties. No criminal charges have been filed.

One investigation and seizure has been made in Charlotte, North Carolina, concurrently with those in Atlanta and undoubtedly other investigations will be made throughout the southeast and other parts of the country in order to restrict this illegal market.

## A New *Lyria* From Taiwan



Tsu-Chiao Lan, in the *Bulletin of the Chinese Malacological Society* (2:103-105, 1975) describes a new species of volute from the Taiwan area. The article: "A New Species of *Lyria* (Gastropoda: Volutidae) From Off Northeast of Taiwan" is reprinted here so that the new species can be recognized by our readers.

A Productive area for molluscs has been found for several years extending from Keelung to Tiao-yu-tai Isle, off the northeast of Taiwan. This area is part of the Taiwan Fishing

District No. 392 and its location is roughly at longitude 123.5°E., latitude 25.5°N., within the East China Sea. Many rare shells have been found from this area by coral boats, e.g. *Murex alabaster*, *M. loebbeckii*, *Conus kuroharai*, *C. stupa*, *C. stupella*, *C. hirasei*, *Cypraea teramachii*, *C. langfordi*, *C. hirasei*, *C. kuroharai*, *C. tessellata*, *C. joycae*, *Pleurotomaria schmalzi*, *P. rumphii* and *P. hirasei*. Recently I have found an unknown species of *Lyria* considered to be new to science. Description of this new species is given in this paper.

Family Volutidae Rafinesque, 1815  
Subfamily Lyriinae Pilsbry & Olsson, 1954  
Genus *Lyria* Gray, 1847

*Lyria (Lyria) taiwanica* n. sp.

Shell fusiform, thick and heavy; apex sharply pointed; with 1½ whorls of protoconch and 7-8 whorls of teleoconchs. There are 18-23 fine parallel spiral lines of dark brownish color, and 3 interrupted bands also of dark brown color on the last whorl. Twelve to 13 axial ribs on the last whorl are strong, wide and aligned in equal distance. The outer lip is dentated. Five to 6 columellar plaits on the lower part are strong and 7 plaits on the upper part are fine and weak. Aperture narrow, oblong and with whitish cream color inside; a few brown lines on fasciole; siphonal notch sharply plated. Height of spire about ½ the total. Shell is creamy color in general. Operculum unknown.

Measurements of type specimens:

Holotype: - length 75.4mm, width 27.2

Paratype 1: - length 47, width 20.3mm

Paratype 2: - length 57, width 23.3mm

All type specimens are preserved in the author's collection.

Locality: West of Tiao-yu-tai Isle, depth about 96 m to 120 m; specimens collected by coral boats.

Remarks:

This shell is somewhat close to *Lyria mitraeformis* (Lamarck, 1811) in shape but has a more slender body whorl and the aperture is

Continued on page 173

## THE TIMOROUS CARRIER SHELL

By PAUL SHANK\*

(Editor's Note: this article originally appeared in the Miami Malacological Society Quarterly Vol. 2, No. 4, January-March 1969.)

The Atlantic Carrier Shell, Xenophora conchyliphora Born, is one of the most fascinating of the mollusk family. Its timid existence conducts it through a life of hard labor and constant sulking. I've kept one in my aquarium for several months and some of the observations I've noted were quite surprising. Everything it does points to a means of eluding detection.

I've tried feeding it many kinds of algae, but it seems to prefer only the microscopic variety that is nearly invisible to the naked eye. When I bring a fresh supply of water which I always siphon directly off the ocean bottom, the Xenophora spends its entire time feeding off the material that settles to the bottom of the aquarium. When I haven't changed water for quite some time it feeds on the algae growing on the side of the aquarium, often placing its shell at a 45 degree angle against the glass to reach higher up the side. The fine algae that it feeds on leaves no noticeable trail for an enemy to follow as the Xenophora just picks here and there instead of leaving an unbroken trail as it feeds.

When there is plenty of food it never reaches beyond the limits of its shell, but feeds entirely on the material beneath the shell. Its foot is never in contact with the ground while feeding. Only when food is depleted in the immediate area does it place its foot on the ground, raise its shell and move it to a new spot. The foot is again lifted from the ground and feeding continues in the new area. This may be another means of protection by leaving very little scent on the ground for an enemy to follow.

I've tried its dexterity at righting itself and am quite satisfied that it can turn over on any kind of bottom that it would naturally encounter. On a sand bottom it would reach around the edge of its shell and force its propodium into the sand beneath the overturned edge and pull. On most tries it would flip over on the first attempt and seldom required more than two. I tried it on a hard smooth plastic plate, but the Xenophora was unable to turn over on it. It would reach around its shell with its entire foot planted flat on the plastic and inch it all the way to the apex. When it would pull the shell would slide or else the foot slipped. This test was a bit unfair as the mollusk would never encounter such a bottom naturally. I then tried it on a couple of flat rocks placed together which were more smooth than would ever be encountered normally. Again, it reached over the edge and under its shell all the way to the apex with its foot placed flat on the rock then pulled. The shell slid several times, but the animal

finally gave a quick tug of the foot and snapped back into its shell and the shell rolled over with the narrow side against the rock, but still upside down. The Xenophora then reached over again and found the crack between the two rocks. It forced its propodium into the crack and on the second try upended the shell and turned it over. I only tried it once on the rocks for fear of breaking it.

The rubble it had attached to its shell when I got it was entirely fragments of Manicina areolata, a coral, placed like the spokes of a wheel. The extreme width of the shell was 2 3/4 inches. It attached a Turbo castaneus, Chestnut Turban, 7/8 inches long about a week after I got it. Since then, it has attached a second Turbo, 3/4 inch long, a 3/4 inch piece of Manicina areolata, a Crepidula maculosa 1 3/8 inches long, a third Turbo 3/4 of an inch, both valves of a 1 3/4 inch Spisula solidissima similis with the upper valve twisted at the hinge joint so it overlapped the lower about half way. The last was another surf clam two inches in length. The Xenophora's extreme width is now four inches and it lacks but half an inch of completing the full whorl.

The placing of the rubble isn't merely a matter of positioning shell against it and cementing it fast, but a meticulous job on the part of the mollusk. The rubble is turned over, twisted around, or upended to get it into the exact position whereas it has a downward slope in relation to the shell. It is also brought into contact with the mantle and usually in such a position that the weight of the shell is partially holding it in position. The Xenophora uses its head and proboscis placed below the rubble to raise it into place and its foot to raise and lower its shell at the same time, jockeying the two into position. Rubble is not turned by clasping between the propodium and the metapodium, as I have read, but rather it is clasped between the base of the antennae and the proboscis. Flat pieces are actually picked up in this manner while the mollusk is standing on its foot holding its own shell up so rubble can be worked to a more suitable position beneath the previously attached rubble. Up to an hour and a half is sometimes spent getting the rubble into position. Sand is raked from under the rubble with the proboscis to assure more slope and consequently leave more space beneath the shell after attachment is completed.

After the rubble is finally jockeyed into a suitable position the job is still not finished. The Xenophora then carefully cleans all the area coming in contact with the mantle to insure a tight joint during the process of cementing it fast. Gaps are checked between the mantle and rubble and filled-in by sticking pieces of sand and tiny pieces of debris to the mantle edge

by cleaning them and placing them there with the proboscis, one piece at a time. Occasionally, it sticks its head and proboscis under rubble for support and very gently rocks the shell to and fro, evidently checking rubble for security of attachment. With the larger pieces of rubble the mollusk remains stationary for over ten hours to assure a tight bond before resuming its food hunting.

All the debris that is attached adds quite a lot of weight for the mollusk to carry around for the rest of its life, but it is excellent camouflage and provides plenty of secluded space underneath for unmolested feeding. It would seem that all the junk attached would hinder movement, but it is usually placed with the smoothest side down to prevent snagging and the low position with the downward slant keeps the center of gravity low and the base wide to prevent turnovers. I've watched it moving past an obstruction when it turned the base of the shell upward at about a ninety degree angle without falling on its back.

Last and most surprising of my observations is the Xenophora's habit of burying its feces. It forces both its propodium and its proboscis into the bottom, then spreads them apart leaving a hollow between them in the sand. The dark brown fecal pellets, which are extremely small like termite droppings, then flow into the hole. Upon finishing, the propodium and proboscis are immediately withdrawn and it raked the hole full of bottom material with its proboscis, checking occasionally during the process to make certain it is covered completely before moving or feeding is resumed.

This little creature is definitely not a litterbug. Although my report has ended, my observations have not.

(Editor's note: this is the type of study we amateurs can undertake to add knowledge to the professional malacologists' efforts to understand the varied and amazing world of the mollusks. Why not write up your observations of live mollusks - maybe no one else is aware of some of the habits you've observed in your aquarium, during your skin diving trips or while you poked about in the intertidal zone.)

### NEW VOLUTE FROM TAIWAN

Continued from page 172

narrower. The line patterns are also similar to Lyrta lyraefomis (Swainson, 1821) but are coiled consecutively to the last whorl; moreover, the apex is sharply pointed. Paratype specimens are smaller but solid and thick indicating they are adults. Both paratype specimens were taken dead with lips trimmed or broken.

**Unitas Malacologica Europaea**

**A. M. U.**

The sixth congress of the Unitas Malacologica Europaea will be held in Amsterdam, the Netherlands, at the Free University in the week 15-20 August, 1977. We wish to attract as many malacologists from all over the world and from as many disciplines as possible. Therefore we have sought the support of a Comité d'Honneur consisting of Dr. Vera Fretter (United Kingdom), Dr. A. Riedel (Poland), Dr. K.M. Wilbur (U.S.A.), Dr. J. Lever (Netherlands) and Dr. C.P. Raven (Netherlands). Apart from the usual items on the programme, such as an European Invertebrate Survey meeting, field excursions and the U.M.E. General Assembly, we have decided to have twelve invited lectures by major specialists in addition to contributed papers. So far the following persons have kindly consented to lecture on the following topics:

- Dr. E.A. Malek (U.S.A.) - The control of snail hosts of schistosomiasis.
- Dr. J. Noosee (Netherlands) - Endocrinology of molluscs.
- Dr. J. Knudsen (Denmark) - Deep-sea Bivalves.
- Dr. J. Lever (Netherlands) - On torsion in gastropods.
- Dr. A.S.M. Saleuddin (Canada) - Shell formation in molluscs.
- Dr. A. Solem (U.S.A.) - Zoogeography of terrestrial gastropods.
- Dr. N.H. Verdonk (Netherlands) - Symmetry and asymmetry in the embryonic development of molluscs.
- Sir Maurice Yonge (U.K.) - Cementation in molluscs.
- Dr. M.J. Wells (U.K.) - Brain and behaviour of cephalopods.
- Dr. A. de Zwaan (Netherlands) - Energy metabolism in molluscs.

Two more invited lectures are being arranged. There will also be so-called 'poster-sessions' for demonstration and elucidation of data that otherwise would have been presented in the form of contributed papers.

All malacologists, i.e., all persons working with molluscs, whether in a professional capacity or privately, are invited to attend the 1977 congress. The fees will be as follows: f100.- (approximately US \$40) for full congress members, f20.- (approximately U.S. \$8) for associate members (accompanying ladies, etc.), and f50.- (approximately U.S. \$20) for student members. There will be sufficient hotel accommodations in various categories.

Prospective participants and others interested are requested to address their enquiries to the Sixth European Malacological Congress, c/o Congressbureau van de Vrije Universiteit, De Boelelaan 1105, Amsterdam, Holland.

The American Malacological Union, Inc. will hold its 1977 convention in Naples, Florida starting Sunday, July 10th. For more information contact A.M.U. Secretary; P.O. Box 394; Wrightsville Beach, N.C. 28480.

**Western Society of Malacologists**

The tenth annual meeting of the Western Society of Malacologists will be held June 15 to June 18, 1977, at Kellogg West, Center For Continuing Education, California State Polytechnic University, Pomona, California. The program will include contributed papers, symposia, exhibits and study workshops on molluscan subjects.

Inquiries about the meeting should be directed to Mrs. Jo Ramsaran, Secretary, 807 North Road, San Bernardino, CA. 92404.

Applications for membership should be sent to Mr. Merton Goldsmith, Treasurer, 1622 N. 20th St., Phoenix, AZ. 85006. Dues: regular membership - \$5.00; additional family members - \$1.00 per person; student membership - \$2.00; regular and student members will receive the published proceedings of the meeting.

"A Catalogue of Collations of Works of Malacological Importance", by George E. Radwin and Eugene V. Coan. Occasional Paper No. 2 of the Western Society of Malacologists has been published. The 34 page booklet lists sources of accurate dating of works and journals of significance to malacologists. An indispensable reference tool for every malacological library. \$2.50 per copy from the Treasurer of the W.S.M. (see address above)

**Indianapolis**

The Indianapolis Shell Club was organized on August 20, 1976 and the following were elected officers: Thomas F. Barnes, Club President and Mrs. Justyn Blackwell, Club Secretary/Treasurer. The members of the Club welcome correspondence with other clubs and interested collectors and solicit helpful hints on getting their new club off to a good start. Mr. Barnes' address is 4234 Arborcrest Dr.; Indianapolis, IN. 16226, phone (317) 898-8409. Mrs. Blackwell can be reached at 311 2nd Ave. N.E.; Camel, IN. 46032 or by phone at (317) 846-5348.

**C.O.A.**

The Conchologists of America will be holding their 1977 Convention the week following the A.M.U. meetings on the opposite side of Florida, that is in Ft. Lauderdale. Membership in C.O.A. is still only \$3.00 per year, so why not join today - it's the only nationwide shell club. Write Kathe Daniels, Sec./Treas. Rt. 1, Box 265A; Apollo, PA. 15613.

The Western Society of Malacologists, founded in 1968 to promote the study of malacology and invertebrate zoology, will award a grant of \$500 to an undergraduate or graduate (first or second year) student for the academic year 1977-1978. The grant is offered to initiate or further research concerned with molluscs, in systematics, biology, ecology, paleontology, anthropology, or related fields.

**REQUIREMENTS:** Part- or full-time upper division undergraduate (junior or senior) or graduate (first or second year) students at a college, university, or marine or field station may apply. The completed application and research proposal must be accompanied by an outline of the student's academic background and by a letter from a faculty member, instructor, advisor, museum curator or other professional scientist supervising or knowing of the student's work.

**DEADLINE:** Applications and accompanying materials will be accepted no later than May 6, 1977.

**APPLICATIONS:** forms may be obtained by writing:

James T. Carlton  
Department of Geology  
Univ. California at Davis  
Davis, CA. 95616

This page is devoted, each issue, to the activities of the shell clubs and malacological organizations - send us your news items so we can include them in our next issue, that's the only way to get printed.

**1976 JACKSONVILLE SHELL SHOW**  
Continued from page 175

from "Planet Ocean" showing the mathematical precision used by the Chambered Nautilus in developing each successive chamber in its growth. Walton Smith and Tom Guidera (President and Vice-President of the I.O.F.) were amazed at the size and beauty of our shell show.

In 1975 we had 121 competitive exhibits, for a total of 478 lineal feet; this year the number of competitive exhibits was 178 and more than 800 lineal feet, not counting several non-competitive displays. We expect a continued increase in 1977. This year at least 25 potential exhibitors were rejected because of late applications for entry.



## 1976 Jacksonville Show

By MINNIE LEE CAMPBELL



General view of the show area.

Photographs by ALLAN WALKER



Club President Charlotte Lloyd and Phyllis Pipher examine the Self-Collected Shell-of-the-Show, Cymatium parthenopeum

The Jacksonville Shell Club held its Bicentennial Shell Show on July 31 to August 1, 1976 at the Bicentennial Flag Pavilion, Jacksonville Beach, Florida. Many members and outsiders were very concerned about the Show being lost in the Beach's huge Bicentennial Flag Pavilion. Last year's show was held at the Beach's Community Center, which has an exhibit hall of 2,870 square feet. Since exhibitors had to be turned down last year, Show Chairman Don Campbell said the Club definitely needed more space. Therefore, arrangements were made in the New Show Exhibit Hall which has 13,655 square feet.

The Show was not lost in this beautiful building as you can see from the photos. Over 5,000 spectators walked through the doors the two days the show was open to the public. Judges of the scientific portion were: Mr. William E. Old, Jr., Scientific Assistant, Dept. of Fossil and Living Invertebrates, American Museum of Natural History, New York City; Mrs. Margaret C. Teskey, former American Malacological Union, Inc. Secretary (for 19 years), Big Pine Key, Florida and Mr. Robert J. L. Wagner, Editor of Van Nostrand's Standard Catalog of Shells, Marathon, Florida. Judging the Arts & Crafts section were: Mr. Kenneth L. McMillan, Associate Professor of Arts, University of North Florida; Mrs. Dale Burden, Duval County art teacher and Mr. Derby Ulloa, all from Jacksonville, Florida.

### Special Award Winners

- duPont Trophy: Phyllis & Bernard Pipher  
Tekamah, Nebraska
- Shell of the Show: Phyllis & Bernard Pipher
- Self-Collected Shell of the Show: Charlotte  
& Victor Lloyd, Jacksonville  
Beach, Florida
- Most Beautiful: Helene Avellanet  
Nokomis, Florida
- Most Educational: Phyllis & Bernard Pipher
- Most Scientific: Gertrude Moller, Jacksonville
- Exhibitor's Award: VI & Charles Hertweck,  
Venice, Florida

The show started off on Friday night with a dinner reception chaired by Laura Shepard and hosted by the local Club members for the judges and their wives or husbands and guests, plus all the out of town Club members, exhibitors and guests. Following the dinner, a get-acquainted party hosted by Board Members and Committee Chairmen was held at the Quality Inn for the Judges, out of town guests, Shell Show Committee Chairmen and Officers and Directors of the Club.

One of the highlights of the show was the display set up by the International Oceanographic Foundation - a continual slide show  
Continued on page 174

## ABOUT BOOKS ...

### THE MONSTERS OF LOCK NESS

Roy P. Mackal 1976  
Swallow Press, Chicago \$12.50

401 pages, 80 illustrations, 8 maps. To readers who are avid students of books written on the now-famous Lock Ness Monster, this book is definitely recommended. It is the most up-to-date and detailed analysis of the possible and probable animals that are inhabiting this lake in Scotland.

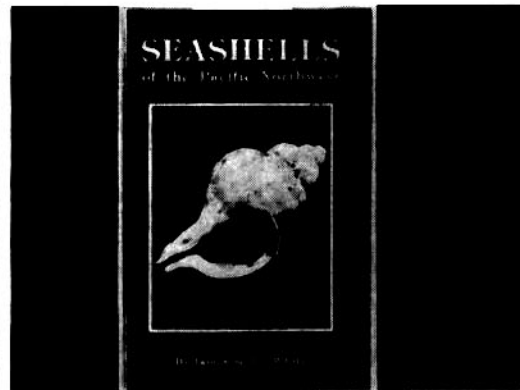
The first portion of the book is divided into three parts. Part one deals with Dr. Mackal's involvement at Lock Ness from 1965 to the present; his research at Lock Ness and other lakes in Scotland and Ireland where unknown animals were reported. Part two deals with examining the eyewitness observations, still and motion photographs and sonar soundings as evidence that something large is in the lock. Part three is an analysis of the various animals that could account for the Lock Ness monster: mammals, reptiles and amphibians - their morphology, environment, behavior and ending with Mackal's conclusion.

Section two consists of appendices and is highly fascinating. Detailed analysis of the 251 accepted sightings which have been examined is included as is additional data on the photographs taken, sonar recordings and the fish studies done at Lock Ness. A special appendix by Robert Love, the final one, on his plan to capture the Lock Ness monster, alive and unharmed.

And just what does Mackal thin in reference to the Lock Ness monster? He has two explanations: (1) it is an enormous thick-bodied eel or (2) - the more probable - that the animals have evolved from giant aquatic amphibians that had migrated to colder waters when they were pushed out of their ecological niche by the advancing reptiles of their era - and thought to have been extinct for 250 million years.

GARY MANGIACOPRA

I've never been there. In August 1975 some members of our Of Sea and Shore Tour to Australia went on to New Zealand, while a small group of us came on home. Word from the New Zealand trippers was scarce or covered touring more than shells and sea life. In Australia I was torn between shelling and echinoderms and crustaceans - I like them all - even coral, soft-coral, sponges, worms, bryozoa and oddly shaped fish (ones with exo-skeletons that live in shallow water). My world globe puts northern New Zealand about as far below the equator as Florida is above it. My so-called World Atlas showed me Australia, but relegated New Zealand to a tiny island group on a map covering the whole wide world.



SEASHELLS OF THE PACIFIC NORTHWEST  
James Seeley White 1976  
Binford & Mort, Portland \$6.50 ppb; \$9.95 hrd

128 pages, 5 1/2 x 8 1/2", 65 illustrations, 36 color plates. Written in a light, informative manner for the novice to shells of the area, this book has finally been released. One can sympathize with the author over the long delay from time of original announcement by the publisher and the appearance of the small volume. A wealth of information for the resident of the area as well as the visitor is given about each of the species covered: common name, description of shell and variations in which it occurs are included. The high quality color photographs enhance the volume as well. The author's observations of the animals' behavior, how to observe the various species while beachcombing and tips on preserving them make the book a useful tool for the average beachcomber, skin diver and student of nature. Unfortunately, the high cost of the book will limit its appeal.

So, through books, I looked at shelling and sea life in New Zealand Seashells in Colour by J.R. Penniket with colour (that is how color is spelled in New Zealand, Australia and Great Britain) photographs of shells by G.J.H. Moon. It is a neat little book - the photographs are great. Unlike most hardcover books, the cover is just as colorful as the jacket - orange-brown with four Trumpet Shells in color on the front and a whole page of Scallops or Pectens on the back. More than 25 families of the main groups of New Zealand shells are covered - the ones a shell collector visiting New Zealand would most likely find. The book does not profess to cover every New Zealand species, just the ones I would find or perhaps want to buy in a shell shop to round out my self-collected ones. I liked the sentence in the text that read "-- the student (of shells) is impressed by the resemblance of shell forms vast distances apart often have with one another." After my Australia shelling trip, I felt sure many differences (in shell form) were merely area variations rather than separate species. The text is friendly yet scientific. Even a stay-at-home arm-chair sheller could enjoy this \$8.50 book.



JOURNEY TO FALCON  
The Story of *Cypraea mus*  
R. W. Pitman 1976  
published by the author \$6.50

70 pages, 8 1/2 x 11", saddle-stitched booklet, 15 color illustrations, 10 maps, 2 tables, 8 graphs. This is one of the few attempts to cover a single species so thoroughly in a booklet. The author has traveled numerous times to Venezuela to collect *Cypraea mus* in all its variations and this booklet relates his experiences and observations. Even if you don't plan to specialize in collecting *C. mus*, this small booklet gives numerous bits of helpful information for the tourist or sheller visiting the Caribbean coast of Venezuela. While the cowry specialist will want this volume as an adjunct to his knowledge of *Cypraea*, the rest of us will find the general information very worthwhile. The author has one problem in common with this reviewer - in including the please turn to page 171 to continue

A companion book, the same colorful hard cover, and jacket to match, sells for \$7.50. The title - Beneath New Zealand Seas. It is by Wade Doak, even most of the gorgeous underwater photographs are his. New Zealand is a small, long, narrow country. Any diver is within an hour or two of a place to see the wonderful life in the ocean. Many forms of corals, soft corals, nudibranchs, sponges, algae, echinoids, crustaceans, plants, a few worms and even a few mollusks, that are hard to describe, are here in true-color photographs. Not only is there good text material, but there is information, easy-reading arm-chair descriptions. This book covers Sea Life in a twin, sub-tropical zone to Florida. The author covers several small islands just off the northern coast of New Zealand. He not only names species, but tells of their existence, functions and growth. Florida divers and snorkelers will want to read this book to learn more than just the names of sponges, algae, worms, coral and the like. It will make him want to get out in our own tropical waters and search our near-relatives of the creatures Beneath New Zealand Seas.

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## Publications Received...

The following is a short summary of some of the publications recently received.

**Astarte**, Journal of Arctic Biology, published by the Department of Zoology, University of Tromsø, Tromsø, Norway. \$11 per volume. Vol. 8, No. 1, 1975. Contents: "Summer food of the Purple Sandpiper (*Calidris maritima*) in Spitsbergen" by S.A. Bengtson & A. Fjellberg, 6pp, 2 figs., 4 tables; "Marine Mollusca of Jan Mayen Island" by J.-A. Snøli & A. Steinnes, 10pp, 1 map, checklist indicating species, station number and number of specimens per station, depth, type of bottom and total number of specimens; "Scanning electron microscope studies of the surface of the fish egg" by S. Lønning & B.E. Hagström, 6pp, 10 figs.; "A new *Saxifraga* from Svalbard" by Dag Olav Øvstedal, 5pp, 6 figs.; "Age distribution, mortality and migration of Willow Grouse, *Lagopus lagopus*, on Senja, North Norway" by Svein Myrberget, 7pp, 1 fig., 9 tables; "The sea anemone, *Bolocera tuediae*, and its copepod parasite, *Anthecheres duebeni*, in northern Norway" by Wim Vader, 3pp, 1 fig., 2 tables; "On the Ostracod fauna of the Arctic basin" by Yuk M. Leung, 7pp, 1 table; "Range extension of *Patella vulgata* (Mollusca, Prosobranchia) on the island of Skjervøy, northern Norway, between 1933 and 1973" 3pp, 2 figs.

**Basteria**, three per year, published by the Nederlandse Malacologische Vereniging, c/o Zoological Museum, Plantage Middenlaan 53, Amsterdam - C, Netherlands. Membership is 30 guilders per year. Vol. 40, No. 1, pp. 1 to 20, May 31, 1976 includes these articles: "Irregular growth in *Chlamys islandica* (Müller, 1776) by Eirik Lande, 2pp, 1 fig.; "Notes on *Bulimulidae* (Gastropoda, Euthyneura), 3 *Bulimulus trinadadensis*, sp.n. from Ilha da Trindade, Brazil" by A. S. H. Breure and A. C. dos Santos Coelho, 4pp., 4 figs., 1 table (other "Notes on *Bulimulidae*" have appeared in previous numbers of periodical); "Type specimens of Mollusca in the collection of the Hebrew University of Jerusalem 2. Type specimens of recent *Marginitidae*" by H. K. Mienis (No. 1 appeared in *Argamon*, published by the Malacological Society of Israel, in 1974), 3 pp.; "Schilden van *Sepiella japonica* aangepoeld bij Zandvoort" by C.O. Van Regteren Altena, 4pp, 6 figs.; "Waar komen onze kleine alikruken (*Littorina neritoides*) vandaan?" by Wim Vader, 4pp. The last two articles are written in Dutch, with English summaries.

**Journal of Conchology**, published by the Conchological Society of Great Britain and Ireland, usually two per year, c/o Secretary Mrs. E.B. Rands, 51 Wychwood Ave., Luton, Bedfordshire LU2 7HT. Membership is \$18 per year (includes this *Journal*, plus quarterly *The Conchologists' Newsletter* and, at irregular

intervals, *Papers For Students*). Vol. 29, Part 1, April 1976. Articles in this number: *Limax grossi* Lupu 1970, A Slug New to the British Isles" by June E. Chatfield, 4pp, 1 fig.; "Studies on Food and Feeding in Some European Land Molluscs" also by June E. Chatfield, 18pp, 2 plates, 6 figs., 2 tables; "A Nomenclatural List of the Land Mollusca of the British Isles" by Henrik W. Walden, 5 pp; "A List of the Fresh and Brackish-Water Mollusca of the British Isles" by M.P. Kerney, 3pp; "*Charonia lampas* (L.) (Gastropoda: Cypræidae) Living off the Cornish Coast" by Stella M. Turk, 2pp; "Secondary Brooding of Temporary Dwarf Males in *Ephippodonta* (*Ephippodonta*) *oedipus* sp. nov. (Bivalvia: Lepetacea)" by Brian Morton, 11pp, 1 plate, 5 figs.; "Type Specimens in the Jane Saul Collection, University Museum of Zoology, Cambridge" by M.J. Bishop & Kathie Way, 6pp, 1 plate; "Mollusca from an Interglacial Tufa in East Anglia, With the Description of a New Species of *Lyrodiscus* Pilsbry (Gastropoda: Zonitidae)" by M.P. Kerney, description of new species, *Retinella* (*Lyrodiscus*) *sketchlyi*, 4 pp, 3 figs.; "The Marine Mollusca of Liverpool Bay (Irish Sea)" by Peter F. Lingwood, 6pp, map, 3 tables; "The Mollusca of Some Poor Fens in Co. Cork, Ireland" by M.J. Bishop, 4pp, map; "A Rediscovery of *Potamopyrgus ciliatus* (Gould) (Gastropoda: Hydrobiidae)" by B. Verdcourt, 2pp; "*Trapania maculata* Haefelfinger, a Doridacean Nudibranch New to the British Fauna" by Gregory H. Brown and Bernard E. Picton, 2pp, 2 figs.

**La Conchiglia** (The Shell), yearly subscription \$10, single copy \$1.80. Via C. Federici, 1 00147 Roma, Italy. Year VIII, N. 87-88, May-June 1976 issue contains: "The Pectinoidea of the European coasts" by M. Lucas, 12 pages (plus four additional pages of color illustrations of worldwide Pecten); "New species of marine mollusks from Pitcairn Island and the Marquesas" a reprint, with addition of color illustrations, of Publication No. 203 of "Smithsonian Contributions of Zoology" by H. A. Rehder and B.R. Wilson, 3pp; "Volutes from southern India" by P. Clover, ½ page with color illustration.

**Natural History**, ten issues per year, \$10 per year, published by the American Museum of Natural History. Subscriptions to Natural History Membership Services, Box 6000, Des Moines, IA 50340. Vol. LXXXV, No. 7, August-September 1976 includes articles on deep-sea fishes, sea otters, lobsters, red tides and other articles of interest.

**The Nautilus**, quarterly, Mrs. Horace B. Baker, Business and Subscription Manager, 11 Cheltenham Rd., Havertown, PA, 19083. Subscription is \$7 per year for individuals, \$12 for institutions and begin in January. Vol. 90, No. 3,

July 1976 contains: "Northern Range Extension of the Florida Marsh Clam *Cyrenoida floridana* (Superfamily Cyrenoidacea)" by W. Leathem, P. Kinner and D. Maurer, 1½pp, 3 figs.; "Two New Species of Non-Marine Mollusca from the Fort Union Group (Paleocene) of North Dakota and Montana" by David Bickel (new species are *Eupera missouriensis* and *Bellamyia campaniformis*), 4½pp, 8 figs.; "A New *Humboldtiana* (Pulmonata: Helminthoglyptidae) from Coahuila, Mexico" by A.L. Metcalf and D. H. Riskind, (new species is *Humboldtiana plana*), 2pp, 3 figs.; "Anomalous Land Gastropods from Texas (Polygyridae and Urocopidae)" by R.W. Neck and R.W. Fullington, 3½pp, 11 figs.; "Notes on Some Land Snails of the Eastern United States" by Leslie Hubricht, 3 pp; "Status of *Succinea ovalis* chittengoensis Pilsbry, 1908" by Alan Solem, 7pp, 17 figs.; "Growth Rate of Four Species of Euthecosomatous Pteropods Occurring off Barbados, West Indies" by Fred E. Wells, 2½pp, 2 tables; "The Invasion of the Asiatic Clam (*Corbicula manilensis* Philippi) in the Altamaha River, Georgia" by J.A. Gardner, Jr., W.R. Woodall Jr., A.A. Staats, Jr. and J.F. Napoli, 8½ pp, 7 figs.; "*Succinea raoi* New Name for *Succinea arboricola* Rao, 1925 (Stylommatophora: Succineidae)" by N.V. Subba Rao and S.C. Mitra, ½ page.

**Oceans**, published six times per year by the Oceanic Society, membership in Society is the way to obtain magazine, \$12.00 per year (add \$1 outside U.S.), P.O. Box 65, Uxbridge, MA. 01569. The current issue: Vol. 9, No. 4, July-August 1976 contains articles with emphasis on winds and currents in the world's seas; other articles concern tuna fishing, PCB pollution, "Johnny Coconut" about a man who has planted more than 8,000 coconut sprouts throughout the Grenadines.

**Oceanus**, quarterly publication by Woods Hole Oceanographic Institution, Woods Hole, MA. 02543. Annual subscription \$8, single copy \$2.25; foreign subscriptions \$10. Volume 19, No. 3, Spring 1976 is concerned mainly with articles on ocean currents; "The Biology of Cold-Core Rings" by Peter Wiebe, 8pp, 7 figs. (including drawings of the fourteen most frequently encountered Euphausiid species in the western North Atlantic where the cold ring phenomenon occurs).

**Pacific Search**, monthly (except Jan. & Aug.) by P.S., Inc., 715 Harrison St., Seattle, WA. 98109. \$9.00 per year (or with membership in Seattle Zoological Society, Tacoma Zoological Society or Oregon Museum of Science and Industry). Vol. 10, No. 10, Sept. 1976 issue contains a number of articles in holding with publication's motto: About Nature and Man in the Pacific Northwest, including:



"The Web of Life in a Tidal Marsh" by Hap Leon; "Let 'Em Eat Wood" by Ann Saling, concerning the *Teredo* or shipworm mollusks; "Fossil Hunting on Oregon Beaches" by Russ Mohney. Single copies are \$1.00.

**PennAr Bed**, Bulletin Trimestriel de la Societe pour l'Etude et la Protection de la Nature en Bretagne, Brest, France. 35 francs per year. No. 85, June 1976. Articles Include: "L'ostreiculture en Presqu ile de Rhuys" by C. Bastille, G. Guillevic and R. Maheo; other articles deal with the geography, natural history and the protection of nature in the northern region of France.

**Smithsonian**, published monthly by the Smithsonian Associates. Subscriptions are \$12 in the U.S. and possessions, \$15.50 elsewhere; single copies \$1.25; address: P.O. Box 5300, Greenwich, CT. 06830. Vol. 7, No. 6, September 1976 issue contains an article on the giant kelps of the west coast.

**Sterkiana**, quarterly, Editor Aurele La Rocque, 102 W. Beaumont Rd., Columbus, OH, 43214. Yearly subscription \$2.00. Number 61, March 1976 contains: "The Freshwater Nalads of the Lower End of the Wabash River, Mt. Carmel, Illinois to the Mouth" by Clarence F. Clark, 14pp, 1 fig., 6 tables; "Land Snails From

Northern Missouri" by Richard L. Reeder and Charles D. Miles, 4pp; "*Cecilioides acicula* (Muller): Living Colonies Established in Texas" by Raymond W. Neck, 2pp.; reprint (continued) "Reproduction and Artificial Propagation of Fresh-water Mussels" by Lefevre and Curtis (six other issues contain portions of this important paper), 30pp, 2 figs., 1 table.

**The Veliger**, A Quarterly published by California Malacozological Society, Inc. Subscriptions for Vols. 18 and 19 are \$25 per volume plus postage (\$1 in USA, \$2.50 to P.U.A. S. and \$3.50 to all other countries, including Canada). Mrs. J. DeMouthe Smith, Manager C.M.S., c/o Department of Geology, California Academy of Sciences, Golden Gate Park, San Francisco, CA. 94118. Vol. 19, No. 1, July 1, 1976 contains the following articles: "Ultrastructural Effects of Centrifugation on Eyes of a Snail, *Helix aspersa*" by C. Reed & R. Eakin, 2+pp, 1 plate; "Two New Species and Five Common or Rare Species of the Genus *Dermatobranchus* from Japan (Nudibranchia : Arminoidea ; Aminidae)" by Kikutaro Baba, 9

pp, 11 text figs., new species described are *Dermatobranchus (Pleuroleura) albopunctulatus* *Dermatobranchus (D.) primus*; "*Helicacis trochoides*: An Indo-West-Pacific Architectonicid Newly Found in the Eastern Pacific (Mainland Ecuador)" by Robert Robertson, 6pp, 1 plate, 1 map, 1 table; "Contributions to the Biology of *Melibe leonina* (Gould, 1852) (Mollusca : Opisthobranchia) by R.A. Ajeska & J. Nybakken, 8pp, 2 plates, 5 text figs.; "The Structure and Function of Neogastropod Reproductive Systems: with Special Reference to *Columbella fuscata* Sowerby, 1832" by Roy S. Houston, 20pp, 1 plate, 10 text figs.; "Temperature Relations of Puget Sound Thalds In Reference to Their Intertidal Distribution" by M.D. Bertness & D.E. Schneider, 12pp, 9 text figs.; "A Quantification of some Aspects of growth in the Deposit-Feeding Bivalve *Macoma nasuta*" by V.F. Gallucci & J. Hylleberg, 9 pp, 6 text figs.; "A New *Homalopoma* from Southern California Resembling *Parviturbo acuticostatus*: A Case of Mimicry?" by P.T. LaFollette, 9pp, 2 plates, 2 text figs. (new species is *Homalopoma mimicum*); "The Writter

Continued on page 150

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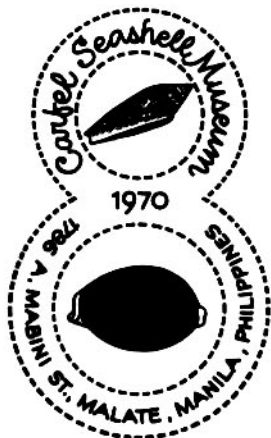
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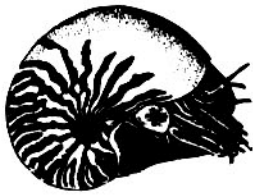
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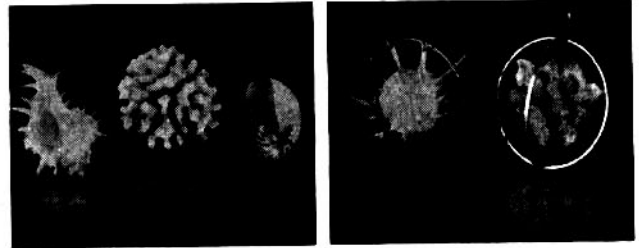
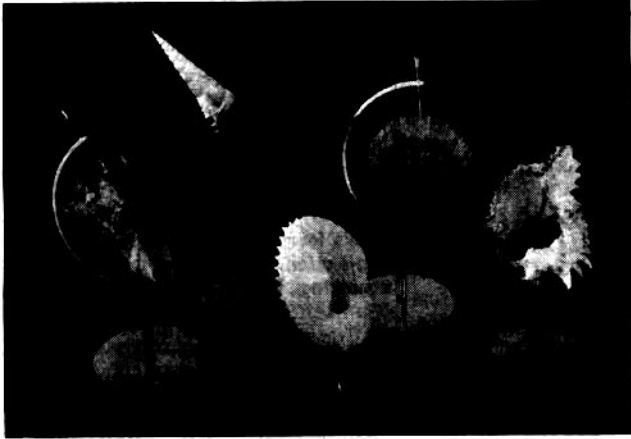
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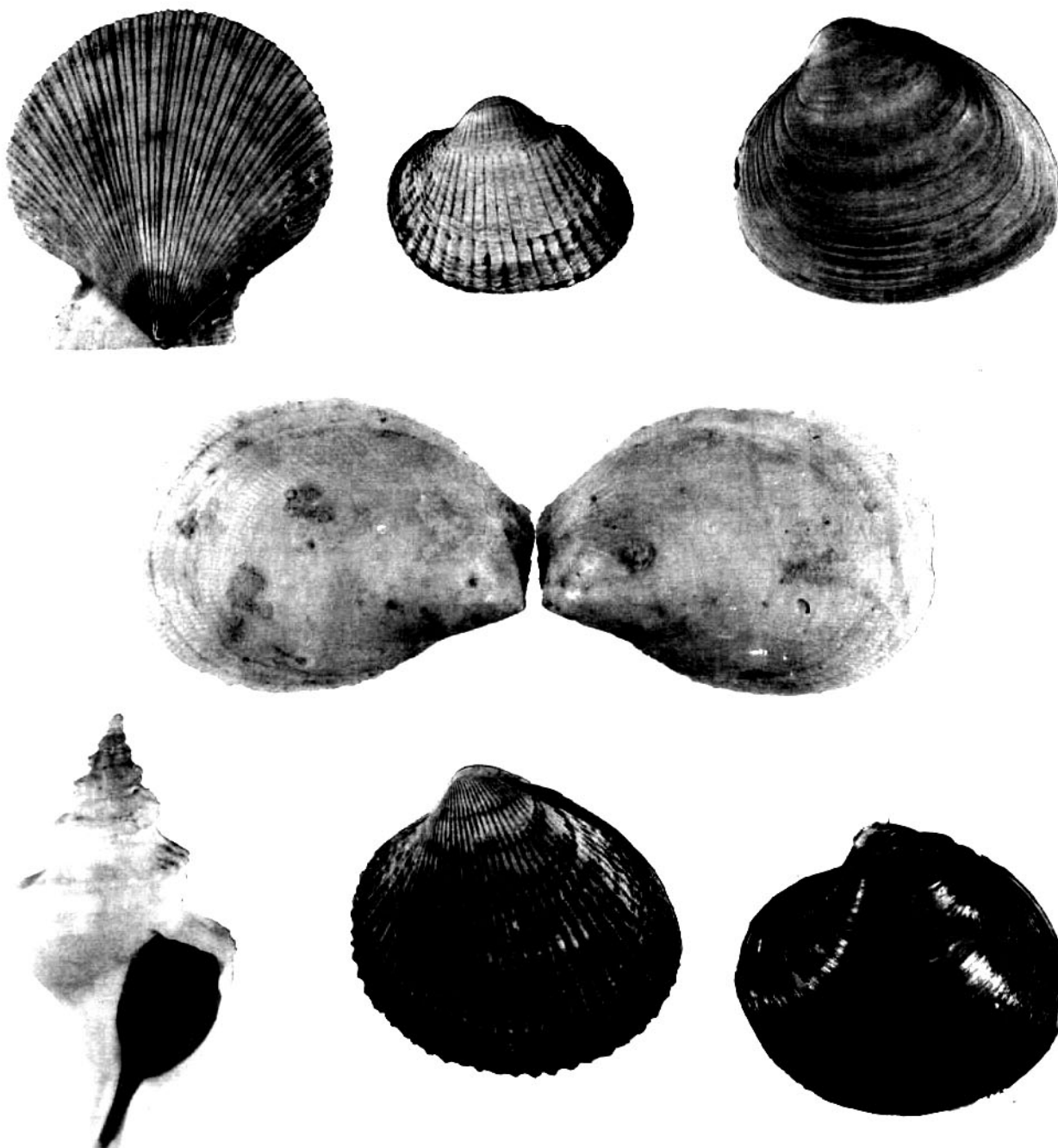
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## SOME OF ICELAND'S SHELLS

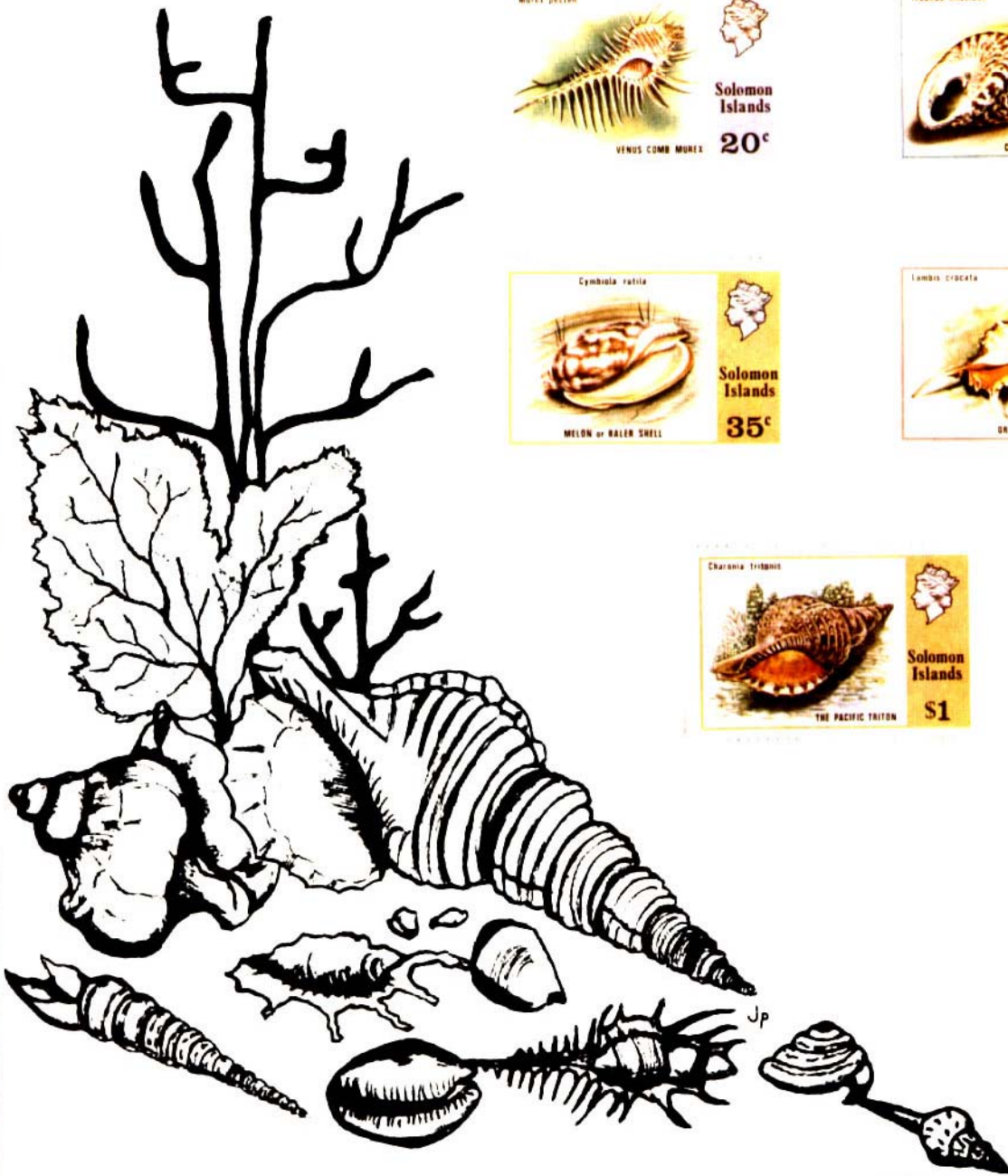
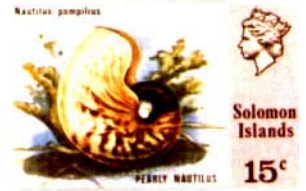


Top row: (left to right) *Conus aurisiacus* Linne from the Molluccas Islands and *Acteon eloiseae* Abbott from Muscat Oman both from the collection of Avis Sosa and photographed by Charles Sammons; *Melongena corona altispira* Pilsbry & Vannatta from the collection of M. Ellen Davis. The second row (left) shows two specimens of *Conus colubrinus* Lamarck from Reunion and *Cypraea cruickshanki* Kilburn from South Africa. The third row has on the left a growth series of *Conus barthelemyi* Bernardi and then three *Cypraea broderipii* Sowerby both from Reunion. Photos in rows two and three are from M. Veillard collection (also from Robert collection in last photo) of Reunion, all photographs in row two and row three are taken by Benard.



# Shells on Stamps

## SOLOMON ISLANDS



## MOLLUSKS ON STAMPS

We had planned to continue up-dating our list of postage stamps featuring or containing somewhere in the design, mollusks and marine life. The illustrations on the opposite page show a 1976 issue from the Solomon Islands.

Our next issue will contain information on a new booklet - "A Checklist of Mollusks on Postage Stamps". This booklet will list all 1,533 stamps with shells (543 where the mollusk in the main feature of the design).

Among the issues released since our "A Checklist of Aquatic Life on Postage Stamps" concluded are: two issues from Afars and Issas, (*Cypraea erythraensis* and *Conus taeniatus* are shells featured); Austria, early this year, issued one stamp with a fossil ammonite (Scott

number 1032); Brazil has issued a series of stamps, one of which has a native mask, the mouth of which is a *Cypraea* (zebra?); two issues by the Congo Republic featured native money, one was *dzeke* (cowry money); Ecuador issued an archaeological-subject stamp, a painted shell is the subject; the shell issue of Grenada/Grenadines illustrated in our Spring 1976 issue\* has been given Minkus Catalog numbers 137-144; Guinea has two 1976 issues in which natives have cowry-shell head-dresses and necklaces; a 1976 Papua New Guinea 25¢ value has carved shell disks, called *kapkaps*; the Scott numbers for the Solomon Island issues illustrated are 321-329; Spain's #1931 has a pilgrim wearing a scallop shell; Yugoslavia has issued a 2.10d stamp with a live, crawling *Viviparus viviparus* - pond snail.

\* this issue has just been re-released with inclusion of the year "1976" in the lower margins of each stamp.

BOOKS, continued from page 168

cism is that New Zealand is so far away from Coconut Grove, Florida. Now if I could be there without 21 hours of flying time and could STAY there a reasonable length of time - like say the two warmest months of their year - then I'd give some shell club programs with my New Zealand collection that you'd really enjoy. Like Tom, I have given many such programs with my shells (and a few other bits of sea life) from the August, 1975, Of Sea and Shore Shelling Tour to Australia. Take a tour, enjoy it!  
CORINNE E. EDWARDS

## MOLLUSKS ON MONEY



In our last issue we mentioned a couple of coins and currency which had shells on them. A number of readers have sent in more information - thank you to Rev. Marlin B. Stewart of Elmira, New York and Mrs. M. Ellen Davis of Wilmington, Delaware for information used in this report.

As with shells on stamps, the Bahamas lead in the use of shells on coins and currency. The \$1 and \$5 coin and the ½ and \$1 currency have *Strombus gigas* (Queen Conch) in the design. The currency also has a watermark using *S. gigas*.

(we'd like to hear of other examples)

Barbados, another British Commonwealth member in the Caribbean also includes mollusks on one of its coins. The \$5 coin depicts the shell fountain in Bridgetown; four scallops are also in the design.

The \$1 note of the East Caribbean Currency Authority, which issues monies for several of the British Commonwealth islands in that area, has a Queen Conch, *Strombus gigas*, in the upper left corner on one side.

In 1976 the Gilbert and Ellice Islands split into two separate governments. The Tuvalu Islands is the new name for what were known as

the Ellis Islands. The 50¢ coin for Tuvalu has an octopus depicted on one face. This coin is shown on a 1976 stamp issued by Tuvalu.

The 92 islands in the Seychelles Archipelago are now known as the Republic of Seychelles and their first coinage and currency issues have numbers which include shells in their designs. The 1 rupee coin has, on one face, a *Charonia tritonis* feeding on a Crown-of-Thorns sea star. The 10 rupees note has a *Charonia tritonis* in the lower left of the design on one side.

A larger number of coins, not enumerated in this short article, from these and other countries, have other marine life as subjects.

