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NORTH CAROLINA SHELL CLUB BULLETIN

1967

NO. 4

10th Anniversary

COVER:

Kreb's Wentletrap (Epitonium krebsii Morch 1874)
Off-shore North Carolina - depth about 90 meters.
Collected by Dr. C. E. Jenner and Mr. H. J. Porter
while aboard the Duke Univ. Research Vessel
"Eastward"

Drawing by Porter about 5 times actual size.

NORTH CAROLINA SHELL CLUB BULLETIN 1967, No. 4
Editor - Hugh J. Porter

1967 Officers

President . . . . . Mr. Wade Gillis Brown
Vice-President . . . . . Mr. Hugh J. Porter
Secretary . . . . . Mrs. Ruth S. Dixon
Treasurer . . . . . Mrs. Elizabeth T. Mathews
Historian . . . . . Mrs. Charlotte Johnson
Executive Committee members
at large . . . . . Mr. Harry Davis
Dr. John H. Ferguson

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PRESIDENT'S MESSAGE

Wade Gillis Brown

It has been my privilage to have been your President when we celebrated our tenth anniversary, and to have received undeserved compliments on the accomplishments of the North Carolina Shell Club. Therefore, I take very great pleasure in giving credit to those people to whom we are all so much indebted - even though I realize I will overlook many others.

I should like to recognize our first President, Rev. G. Scott Turner, from Shallotte, by dedicating this Tenth Anniversary Bulletin to him, with our gratitude and best wishes. And of course, we are very greatly indebted to our Past Officers who have furnished the wonderful and continuing leadership which has built the fine Club we all take too much for granted.

The Programs - including our field trips - have been exceptional. Something for everyone, beginner to advanced

collector, with lots of fun and conviviality along with serious moments! Surely, I think, we owe very special debts to John Ferguson and his "right-hand man" Jack Upchurch; and to Hugh Porter for myriad tasks well done - Secretary and Vice-President, Bulletin Editor, Programs and arrangements for field trips. And how about Lib Mathews, our ever faithful Treasurer? How can we really give credit to so many who worked so hard under Paul Jennewein's leadership being host to the best A. M. U. Meeting ever held? And, -well, it's simply impossible to recognize everyone who has earned our thanks!

Undoubtedly the most noteworthy and long lasting accomplishment of our first decade was the assembly and presentation of a collection of North Carolina shells to our State Museum. This Collection was presented in memory of and named for one of our most loved and enthusiastic members, Lula M. Upchurch, and, accompanied by a handsome plaque suitably engraved, was accepted by Commisioner of Agriculture Jim Graham for the State at our December Meeting. However, while we can be proud of this achievement, we must remember that the Upchurch Collection is only begun, and we must all continue towards our goal of the best State Collection!

I sincerely believe we have a very wonderful and precious organization. We do not always agree, but there is no disagreeableness. I am confident that we will be unanimous in our desire to continue to build, and to preserve the warm and friendly spirit which has meant so much to us all. Therefore, let me conclude on --

A sober note: R. Tucker Abbott was our special guest at our December Meeting Tenth Anniversary Banquet in Raleigh. While Dr. Abbott was warmly complimentary, he warned us that our very success could lead us into complacency - that we've "got it made" - that we can relax and bask in the sunshine of past achievements. Let us resolve that we've only made a real good start, and our second decade will prove how well we have built. Are YOU with us???

NORTH CAROLINA SHELL CLUB ACTIVITIES - 1967

Ruth S. Dixon, Secretary, North Carolina Shell Club

Since we have not published a North Carolina Shell Club Bulletin since the A. M. U. meeting in North Carolina, the following facts should be included:

The 32nd Annual Meeting of the American Malacological Union was held at the University of North Carolina in Chapel Hill, August 22-26, 1966. The North Carolina Shell Club was the host.

There were 151 delegates in attendance from all over the United States, the Virgin Islands, and Canada.

Excerpts taken from the AMU Reports for 1966 include the following: "They call North Carolina the Tar Heel State, Land of the Long Leaf Pine; of late it is the Scotch Bonnet State. There may have been earlier appellations, but to those who attended the 32nd Annual Meeting, North Carolina will always be the Hospitality State. Seldom has this national organization enjoyed such a smoothly conducted meeting; never have its members been made to feel more welcome than at the University of North Carolina at Chapel Hill".

Under the leadership of Mr. Paul Jennewein, President for the year 1966, Co-Chairman of arrangements, Carl Withrow and Jim Wadsworth and many committees, this meeting was a huge success despite the temporary heat wave. Business and the presentation of papers proceeded and were followed by Shell Club Night on Tuesday.

Certainly one of the most delightful events of the meeting was the Shell Auction during which Carl Withrow and Karl Jacobson talked the audience out of more than $400.00. This money along with several hundred dollars more was sent to the AMU treasurer.

On Wednesday there were two field trips. 1. Excursion on the Duke University Research Ship, the Eastward, at Morehead

City, N. C. 2. Freshwater collecting at Umstead Park and local habitats.

Another real highlight of the meeting was the Annual Banquet held at the Carolina Inn Ball Room on Thursday Evening under the able direction of Mrs. Smith Whiteside, better known as Jeanne, and her committee.

The spring meeting (March 10-12, 1967) was held at Myrtle Beach, S. C. at the Chesterfield Inn with Mr. Clay Brittain as host. Friday evening featured Dr. John Ferguson as speaker and Dr. Jack Upchurch illustrated with slides made by the cooperative effort of the two on "Shells and How They Got That Way." There being no organized field trip, the members shelled on the beach in the vicinity of the Inn. At the business meeting the President, Mr. Gillies Brown, led a discussion on a proposed Shell Club trip to Sanibel Island by chartered bus with accommodations and prices being quoted.

The summer meeting (May 5-7) was held at the Oceanana Motel at Atlantic Beach, N. C. The Friday evening meeting featured speakers were Dr. Robert J. Menzies, Director of Duke University Oceanographic Program who spoke on the investigations on the Genus Neopolina belonging to the primitive molluscan class-Monoplacophora and Dr. John Ferguson who had charge of a Shell Club Workshop which the members had requested. The Saturday morning Field Trip was at Bogue Inlet in the vicinity of Swansboro, N. C. with Miss Marguerite Thomas and Phoebe Meadows in charge. Five new members were welcomed into our club at this meeting. A banquet was held at the Rex Restaurant on Saturday evening preceded by a social hour and followed by a delicious buffet dinner.

The fall meeting (September 29-Oct. 1) was held again at Atlantic Beach with Oceanana Motel as headquarters. On Friday evening Dr. John Ferguson spoke on fresh water shells found on the field trip to Fitzroy Harbour Provincipal Park on Ottawa River, Ontario, at the 33rd Annual meeting of the American Malacological Union meeting at Ottawa, Canada. Following the talk Paul Jennewein, Past President, showed slides on the personalities around Carleton University attending the A. M. U.

and Ottawa. Hugh Porter and Jim Wadsworth added bits of information concerning the activities at Ottawa such as the fact that sixteen N. C. Shell Club members attended the meeting in Canada. Dr. Arthur Clarke, Jr., Vice President of A. M. U., and Mrs. Clarke and their assistants rolled out the red carpet for this meeting and had planned well for the comfort and entertainment of those in attendance. The Wednesday meeting was held at the National Museum of Canada with all members provided bus transportation to the Museum. Following a group photograph and the presentation of papers, a picnic lunch was held on the lawn as a courtesy of the National Museum. On Thursday evening all present were guests of the Museum at a reception and annual banquet at the Riverside Hotel in Ottawa. It was on this occasion that the Treasurer, Mrs. Baker, praised the N. C. Shell Club for its generous gifts of more than $700.00. On Saturday evening three bus loads were transported to Expo '67 in Montreal. The North Carolina members will long remember the 33rd A. M. U. meeting at Ottawa and the hospitality that was extended to them.

On Saturday evening of the Fall N. C. Shell Club meeting, Gillies Brown, President, told of his shelling experiences in South America and illustrated with slides of the beautiful places that both he and Nancy visited. Plans were also made for the 10th Anniversary Meeting to be held at the North Carolina Museum of Natural History in Raleigh on December 2, 1967.

It had been a sort of wild dream to have the one and only Tucker Abbott speak to us on this occasion. To the delight of all, he accepted Hugh Porter's invitation and brought his lovely wife, Sue. They were house guests of Dr. and Mrs. Kenneth L. Johnson.

A collection of North Carolina Shells (150 specimens) was presented the N. C. Museum of Natural History in memory of Mrs. Lulu Upchurch, a former member. Mr. James Graham, Commissioner of Agriculture for North Carolina accepted this gift. Mr. Graham then honored Tucker Abbott by inducting him into the Order of the Long Leaf Pine.

Dr. John Ferguson and Dr. Jack Upchurch combined their talents again to give a beautifully illustrated program on the

Chitons, slit shells and tooth shells.

The following officers were elected for 1968:

President:
Mr. Wade Gillies Brown

Vice-President:
Mr. Hugh J. Porter

Secretary:
Mrs. Ruth S. Dixon

Treasurer:
Mrs. Elizabeth Mathews

Members-at-large:

Mr. William Hamnet and Dr. John Ferguson

The Anniversary Banquet was held at the College Inn in Raleigh. Cornelia McInnes, Ann Yelvington and their committees did a great job of decorating and arranging.

The guest speaker, Dr. R. Tucker Abbott, Pilsbry Chair of Malacology, Academy of Natural Sciences of Philadelphia, illustrated his talk on "Shells I want most to find in my lifetime." This talk by the author of many books including "American Seashells" was a wonderful way to celebrate the 10th Anniversary of the N. C. Shell Club for the 65-70 members present.

On Sunday morning, Kenneth and Charlotte Johnson gave a "Brunch" for the Abbotts, the Shell Club officers, the Executive Committee, and the Local Committee. A caravan of shellers escorted them to the plane and watched as they disappeared into the blue sky heading north from the Raleigh-Durham Airport.

Under the leadership of our president, Wade Gillies Brown, the North Carolina Shell Club has had a good year with an increase of 20 members and we are looking forward to one even better in 1968.

ANNUAL FINANCIAL STATEMENT - N. C. SHELL CLUB
Period Dec. 1, "66 - Dec. 1, "67
Elizabeth T. Mathews - Secretary

Balance on hand 12-1-66		$571.31
RECEIPTS:		
Dues from 12-1-66 to 12-1-67	$151.00	
Sale of Scotch Bonnet Hats	9.00	
Total Receipts for the year		160.00
TOTAL		$731.31
DISBURSEMENTS:		
Contribution to American Malacological Union	$210.00	
Postage, envelopes, paper and memeograph supplies	79.74	
Two scrap books on A.M.U. meeting at Chapel Hill	15.66	
Door prizes	4.00	
Bank service charges	1.20	
Total Disbursements		310.60
BALANCE ON HAND 12-1-67		$420.71

CONSTITUTION OF THE NORTH CAROLINA SHELL CLUB
(revised 1965)

This club shall be called the North Carolina Shell Club.

Membership shall be open to any persons interested in the collection of shells or the study of Malacology. New members may be received by the consent of the club at any regular meeting. Annual dues for Adult Members shall be $1.00, for Junior Members $0.50. Junior membership shall include all individuals of grade school age or younger. Those members three or more* years behind in their dues shall have their membership terminated after due notice. Honorary Memberships may be granted by a majority vote of the members present at a meeting following recommendation by the Executive Committee. Honorary members will not be eligible to hold an elected Shell Club office, vote or be required to pay dues.

The following officers shall be elected annually, by ballot on the last meeting of the year: President, Vice-President, Secretary, and Treasurer.

An Executive Committee shall consist of the above officers, all past presidents and one member who shall be elected annually. It shall be the duty of the Executive Committee to arrange programs for the meetings and supervise the affairs of the club.

The constitution may be altered by a majority vote of the total membership at any regular meeting, but written notice shall be given for any proposed change.

*Changed to two years in 1967.

Mr. Harry T. Davis
(Carteret News-Times Photo by Walter Phillips)

BIOGRAPHY OF A SHELL CLUB MEMBER - MR. HARRY T. DAVIS
William L. Hammett, (Director of
N. C. State Museum of Natural History)

Harry Davis, director emeritus of the North Carolina Museum of Natural History, was born at Cape Hatteras and spent his boyhood in the then remote settlement. Little did he realize, as he looked across the Pamlico Sound, that in his time he would come to know the natural history of North Carolina as well as any one probably could. His knowledge, coupled with his commanding interest, had launched him into that orbit of the few who are professionally recognized as being among the best.

Harry has said he was one of those early "drop outs" because he did not finish high school. However, even though he lacked a year or so of completing his schooling, he went on to Chapel Hill anyway and entered the University. He proved himself academically qualified and graduated in 1919, serving as a laboratory assistant in geology his senior year. A year later he received his M. A.

Because he felt that there was a challenging opportunity in Raleigh instead of Oklahoma, in which state he considered working, Mr. Davis joined the staff of the State Museum on July 1, 1920, and there he worked until his official retirement as director on December 31, 1965.

Upon joining the museum staff, the total number of employees was increased to two. He and Mr. H. H. Brimley did all the work. Appropriations, resources, exhibits and interest were on the thin side, and the pair did not even have stenographic help. But Harry Davis worked long enough to see the museum staff increase to twelve.

Under his directorship from 1937 to 1965, the museum increased in size and stature, with an annual attendance exceeding the 200,000 mark.

Recognized as a scholar and a scientist by those who respect and know him, he also manifests humility and modesty as few men do. Not from Harry Davis, but from others, do we learn of his gentleness, benefactions, and consideration for others. He sold his property on the Outer Banks and put much of the income into a fund for UNC-CH scholarships for students from our coastal counties. He has not forgotten the difficulties he faced in obtaining his own education.

In recognition for his years of interest and counseling in the Boy Scout program, he has received the Silver Beaver. For 18 years he served as secretary-treasurer of the Raleigh Rotary Club. Mr. Davis has a folder full of commendations and rewards for his service and membership in professional organizations.

Harry Davis lives in Raleigh with his wife, the former Roberta Phillips, whom he married in 1924.

It is not unlikely that this week-end he may jump into his station wagon and drive down to Beaufort to see the person most responsible for planting his feet in the right direction years ago - his mother.

The N. C. Shell Club is proud to recognize one of its charter members and stalwart supporters.

*Editor's note:
It is fitting to take note that Mr. Davis, along with Rev. G. Scott Turner, to whom this volume is dedicated, were the two individuals probably most responsible for the formation of the North Carolina Shell Club in 1957. Mr. Davis then served as the elected member of the club's Executive Committee during the years 1957, 1959-1961, and 1963-1967.

SHELLS, AND HOW THEY GET TO BE THAT WAY (PART II)
Dr. John H. Ferguson
(Talks to the N. C. Shell Club, March 1967 meeting)

Part I of this series of talks was published in the North Carolina Shell Club Bulletin, Vol. 3, 1966, p. 12-21, to which the following additions and corrections should be made.

Page 12. There are now SIX (instead of five) CLASSES of Mollusca, the first being MONOPLACOPHORA ('bearing one plate', i.e. the limpet-like shell). This was created for the 'living fossil' genus: NEOPILINA, type N.(N.) galatheae, Lemche 1957, dredged in deep water off the Pacific coast of Central America. It may be a missing evolutionary link between the segmented worms (Annelida) and the typically monsegmented Mollusca. Neopilina is classed with some FOSSILS belonging to the Family: Tryblidiidae, based on Tryblidium reticulatum, Lindstrom 1880, discovered on the Baltic island of Gotland.

Page 15, following . . . .(a) Scaphella junonia, Shaw . insert . . . our Juno Volute, has a distinctive brown protoconch, while (b) Zidona dufreesneyi, Donovan, the. . . angular Volute . . .

Page 15, . . .(1) Cerithidea ('i', instead of 'e')

Page 16, . . . Olivancillaria (o) auricularia (not 'aurocula').

Page 19, . . . Substitute: Fissurellidea (for 'Fissurella') (Pupillaea) aperta . . .

Part II follows, and deals chiefly with certain aperture features and with some typical sculpturing of gastropod shells.

In Part I we related how a gastropod mollusk grows by laying down more shell to extend the margins of the aperture. A very curious thing happens to the aperture of the Tube-forming Coral Dweller, Magilus antiques, Montfort. Living among coral in warm tropical seas, this snail has become a lazy fellow. Hating to move, he finds the coral growing up all around him until he is firmly embedded. This doesn't bother him a bit. He simply lays down more shell to extend the aperture and keep ahead of the coral growth, so that he can continue to take in water and food in order to live. It's not easy to chip him out of the coral to get a good specimen for your collection.

Ordinary gastropods vary in the shape and features of the aperture. The simplest form is a smooth evenly-rounded opening, which the scientist calls 'entire'. A good example is the West Indian Magpie Shell, Cittarium pica, (Linne), whose round aperture is closed by a circular horny operculum (see Part I).

At the other extreme is the Japanese Writhing Shell, Distorsio (Rhysema) horrida, Kuroda & Habe. Here the aperture is very irregular due to the tooth-like projections on both outer and inner lips. Details of apertural 'tooth' patterns help to identify various species of Distorsios, and (as we noted in Part I) are a special feature which often tells us what kind of a gastropod we are dealing with. In the Writhing Shells, you can trace the lines of the 'teeth' round the body whorl and easily see that they are simply the ends of a series of ridges, forming a spiral 'sculpture' which is part of the typical pattern of the shell surface. In laying down the shell

features, it is remarkable how the mantle always reproduces a particular pattern, characteristic of the type of shell. In Distorsio, we also observe another feature, namely, the 'callus', which is an overlay of extra shell extending from the inner margin of the aperture on to the parietal region of the body whorl. We mentioned this 'parietal shield' in Part I, especially on the Bonnets and Helmet Shells of the Family: CASSIDIDAE. Distorsio, however, is in the neighboring Family: CYMATIIDAE. Distorsio horrida also has a shaggy brown periostracum (see Part I).

Gastropod surface sculpturing, as you might suspect, is commonly in ridges that run (a) in the axial (or longtitudinal) direction of the shell, or (b) in the radial or spiral direction, around the whorls. Distorsio shows both patterns, best seen under the thin callus area. When the two ridge patterns cross at right angles (more or less), it is called 'Cancellate' sculpture. When they cross, they form little knobs, called 'nodules' or 'tubercles'. Another species, Distorsio (Rhysema) clathrata, Lamarck, occasionally occurs on our Carolina coasts. 'Clathrate' sculpture also crosses at right angles, but here the ridges fuse together at the crossings to form squares. A third Writhing Shell, from the Phillippines is Distorsio (Rhysema) reticulatata, Roding.

When the criss-crossing is more diagonal, like a net, it is called 'reticulate' sculpture. The common Atlantic Nutmeg Shell, Cancellaria (cancellaria) reticulata, (Linne), is also named upon this feature. Notice how often shell names are based upon some conspicuous feature, such as the sculpturing.

The Chinese Precious Wentletrap, Epitonium (Epitonium) scalare, (Linne), has an aperture which is 'entire' and just a bit oval, with a close-fitting horny operculum. 'Peristome' is from the Greek, meaning 'around the mouth', and is a more scientific term for aperture. It is particularly appropriate in the Wentletraps because of the way in which they thicken the lips of the aperture by a thin leaf of shell. This deposit occurs during dormant periods of growth, between the times when the shell extends from the aperture in a more rapid growth that simply extends the spiral with the normal thickness of shell. When each growth spurt occurs, it leaves behind the last thickening of the ovifice lip and this persists as what we call a 'varix'; plural 'varices'. These successive varices, in the Wentletraps, form the 'spiral staircase', which is what the German word Wentletrap means. What is remarkable, however, is that each rapid growth period stops, and the next thickening of the aperture rims starts, almost precisely under a preceding

varix. Hence the varices line up in a number of continuous longtitudinal ribs, just interrupted at the sutures. How the mollusk knows when to stop so as to line up the varices in this way is something of a mystery. Perhaps the mantle can sense the old ridge above the new aperture and plan the new lip thickening, which seems remarkably intelligent for such a lowly creature as a mollusk.

An even more exciting example of the same sort of thing is seen in the case of the Maple Leaf Shell, Biplex perca, Perry, from the Indopacific. Again there is a neat oval 'entire' aperture, which in some specimens may be found extending out in the rapid growth phase. The fact that you don't find many shells in this phase is probably due to the fact that mollusks often creep away and hide under rocks, etc., during the rapid growth phase. In Biplex, the conspicuous feature is the leaf-like (or 'foliate') sculpture. The unique aspect of this is that the leaflets extend just from the two opposite sides of the shell, parallel to the orifice of the aperture. At almost precisely these points, with just a tiny bit of overlap, each foliate varix lines up with an earlier one or the preceding whorl. This gives the whole shell a flattened appearance, since the axial leaflets are quite extended. If you look between the foliate varices, you'll notice several nodular (nodose or tubercular) axial riblets (little ribs); the radial sculpturing forms 'nodules' where they cross the axial ridges. The somewhat irregular spacings between these tuberculate ribs indicate that they were formed at varing intervals of growth, probably depending on environmental conditions. Again we wonder how the shell-secreting of the mantle just stopped so as to make little tubercles (nodules), but when it came around to a big varix as on the preceding whorl it laid down a big new 'leaf' proportionately larger with each increasing whorl. Among close relatives of Biplex perca are (a) Biplex microstoma, Fulton, from Japan, and (b) Biplex pulchella, Forbes, from Australia. 'Down under' they call this locally the Kookaburra Shell, because, when it is looked at sideways, with the operculate aperture forming the eye, and the pointed anterior canal forming the beak, it strongly resembles the Australian Crested Kookaburra bird. We'll return to the topic of varices after mentioning a few other features connected with the aperture. In the Tun or Cask Shells, Family: TONNIDAE, it is easy to see that the 'undulate' (or wavy) margin of the aperture is simply due to the circular (radial) ribbing of the body whorl. In some species, a temporary thickening of the outer lip occurs, but does not persist as a varix, since it gets reabsorbed by the mantle activity when the next rapid growth phase occurs. The Grinning Tun, Malea ringens, Swainson, from the Pacific Coast

of Mexico, typically has a thickened outer lip. The inner lip, on the other hand, is somewhat callused and is set with a couple of big blunt columellar 'teeth'. This accounts for the appearance responsible for its popular name.

In the Unicorn Shell from Panama (Pacific) whose proper name is Opeatostoma pseudodon, Burrows (1815), the last spiral ridge juts out beyond the edge of the aperture to form a sharp little 'false tooth', which is just what 'pseudodon' means. A year later (1816), Lamarck called it Monoceros cingulata (= Synonym). 'Monoceros' means 'Unicorn' and 'cingulata' means 'girdled' (referring to the spiral ridges round the shell). The sturdy little horn is actually used by the animal to pry open the bivalve mollusks on which it feeds. The term shouldered or keeled (carinate) --like a sail-boat's keel -- are used when the periphery of a gastropod whorl is flattened into something of an edge (or angled). Opeatostoma has a conspicuous shoulder due to a thickened spiral ridge at this location. The Unicorn Shell belongs to the same Family: FASCIOLARIIDAE as our Tulip Shells and Horse Conchs. A close relative, from the West Indies, is Leucozonia (Leucozonia) nassa, (Gmelin), var. leucozonia (Lamarck). 'Leuco' - means 'white', referring to the white ridge or zone that makes a 'carina' encircling the shell. There is just a suspicion of a 'false tooth' where this reaches the outer margin of the aperture. A simple, sharp, smooth, and well-defined angular 'shoulder' (higher up) is seen in the Wonder Shell, Thatcheria mirabilis, Augas dredged off Japan. This is a member of the TURRIDAE (Turret Shell Family) and is hard to beat for geometrical grace and sheer beauty of form.

An extremely conspicuous 'carina' is seen on Atlanta peroni, Lesueur, dredged by Jim Moore in the Gulf of Mexico. This is an open-ocean or pelagic mollusk. The word for 'keel' is used in the species names of the following shells: (a) Nitidella carinata Sowerby, the Keeled Dove Shell from California; (b) Trichotropis (Iphinoe) unicarinata (Broderip and Sowerby), from Japan; (c) Trichotropis (Trichotropis) bicarinata, Sowerby, from the arctic regions of North America; and (d) Trichotropis (Amathina) tricarinata (Linne), another type from Japan. As their names indicate, these last three shells have one, two, or three 'keels', respectively. 'Trichos' means 'hair', and 'tropos' means 'directed toward', from the Greek words. These refer to the characteristic way in which the periostracum (see Part I) of these shells is directed toward the forming of little hairy spikes. You'd never guess it from the shells, but Family: TRICHOTROPODAE is quite closely related to Family: CALYPTRADIDAE (the Coolie Hats and Slipper Lumpets), in the same Super-Family: CALYPTRAEACEA.

In a far-removed Family: CANCELLARIIDAE (Containing the Nutmeg Shells) is Trigonostoma (Trigonostoma) antiquatum (Hinds), also from Japan, and superfically looking rather like Trichotropis unicarinata, particularly from its keel (or shoulder) and its little spines. Close examination, however, reveals that these thin spines are a genuine part of the shell structure. You may be able to make out that each spine is formed by a varix or axial fold developed on the aperture margin at a resting period of the shell growth. The spines remain after the rest of these varices become reabsorbed during the periods of rapid growth. 'Trigonostoma' simply means three-cornered (triangular) mouthed, which aptly describes the aperture.

Varicoid spines are conspicuous also in the Star Turrets, Ancistrosyrinx pulcherissima (=most beautiful), Kuroda, from Japan, and Ancistrosyrinx radiata, Dall, from the Caribbean.

The so-called 'stromboid notch' is a special feature of the lower (=anterior) part of the outer lip of the aperture in which the Strombo (Family: STROMBIDAE). One example is Strombus (Conomurex) luhuanus, Linne, from Japan. Our common Florida Fighting Conch is Strombus (Strombella) alatus, Gmelin. Besides its stromboid notch, and a very elongate (ungulate), horny operculum, the adult conch shell has typical nodular spines on the shoulders of each whorl. Immature fighting conchs lack these nodules, but have spiral ridging, which makes them look like a different shell. The True West Indian Fighting Conch Strombus (Strombella) pugilis, Linne, is similar, but is usually distinguished in the adult by having the largest spines on the next-to-last ('penultimate') whorl.

The last feature of the aperture that we'll discuss is the topic of apertural spines. These are most conspicuously developed in another group of the Family: STROMIDAE, Namely the Scorpian Shells of the Indopacific. The first-named Scorpian Shells is Lambis (Millipes) scorpius (Linne), with its purplish interior, crossed by white horizontal lines. The stromboid notch is distinct, and there are seven upturned, nodulose, claw-like spines round the margins of the aperture, including one which extends from the anterior canal, and another from just below and to the left of the apex. Lambis (Millpes) millipeda, (Linne), has a wider aperture, with a smoky-purple interior, again crossed by the wrinkly white lines. Here, the spines are closer set and more numerous, usually about twelve, including some small ones below the center. Lambis (Lambis) crocata. (Link), is the Golden Scorpian Shell, with a rich orange color inside the aperture. Its spines number seven and are curved, especially the long anterior one. Lambis (Lambis) lambis, (Linne), the strict genotype, is sometimes called the Spider Conch or Smooth Scorpian Shell. It lacks the revolving ridges

on the body whorl and has a smooth interior of the aperture. Of its seven claws, the anterior one is longest. Lambis (Harpago) chiraga, (Linne), is the Arthritic Scorpian Shell, with a distinctive brown and white color patterr and heavy shell. The whorls are encircled by raised concentric ridges, about six of which are nodular on the body whorl. There are six extended curving spines.

If you look carefully at the spines of all these scorpion shells, you'll notice that they have a central furrow. This is understandable if you remember that they were formed by folded finger-like extensions of the mantle as it laid down the shell in the mature phase. In immature Lambis there are no spines, but the apertural margin just shows wavy folds. Lacking the spines, these juveniles seem to be different shells.

Spines are a conspicuous feature also in many of the Murex or Rock Shells, Family: MURICIDAE, where they show a great variety of forms. Usually, the grooved center of the spines can also be made out here, but sometimes additional shell is deposited later to fill up the hollow and so make a solid spine. Murex (Murex) tribulus, (Linne), is the strict genotype. It has grooved triangular spines of moderate length, and its apt popular name is the Bramble Murex. It comes from the Mediterranean and Red Sea, like the Dye Murex, Chicoreus (Bolinus) brandaris, Linne. As the popular name indicates, this was one of the species from which the Tyrrhians of antiquity extracted the precious Tyrrchian purple to dye the togas of the Roman emperors. Brandaris has short triangular spines, mostly retaining the groove. The Indopacific Venus Comb Murex has long delicate spines curved a bit at the ends, and again showing the groove. Jutting out like three rows of oars in an ancient galley, its correct name, Murex (Aranea) triremis, Perry, is very appropriate. It was long known by the synonym: M. (Acupurpura) tenuispina, Lamarck. In Cabrit's murex, Murex (Murex) cabriti, Bernardi, from off the Florida Keys, the three rows of spines are less extended and the grooves have been filled in with shell. Other axial rows in between have been reduced to small nodules. Chiconeus (Euphyllon) cervicornis, Lamarck, is named for the "stag's horn". The long delicate spines are bifid (2-pronged) and a better popular name, therefore, is the Two-pronged Murex. A close relative is C. (Euphyllon) cornucervi, Roding, which is better Latin for "horn of the stag". It is often referred to by the synonym (later name), 'M.' (E.) 'monodon,' Sowerby. With its remarkable back-curved spines, this is one of the most prized of the Murex shells. Because the mantle rippled the surface of the developing spines into little subfolds, these also have a frond-like (frondose) appearance. The Lace Murex, from Southern

Florida and the West Indies, Chicoreus (Chicoreus) florifer, (Reeve), and its subspecies, C. (C.) f. arenarius, Clench and Turner, show a typical development of frondose spines. The Indopacific Anatomic Murex, Murex (Homalocantha) anatomica, Perry, and its subspecies zamboi, Burch and Burch, have a bizarre development of the spines, which probably serves as a camuflage when they live among the coral. The two Rock Shells which occur in North Carolina, but not very commonly, have relatively weak development of spines. The Giant Eastern Murex, Murex (Muricanthus) fulvescencens, Sowerby, is reasonably common in Shallotte Inlet, while the Apple Murex, Murex (Phyllonotus pomum, Gmelin, is occasionally found on our Carolina beaches, but is much more common in Florida.

Another group of shells in which some members have noteworthy spines is for the Star Shells, forming Subfamily: Astraea (Astralium) phoebia, Roding. The names 'short-spined' (brevispina) and 'long-spined' (longispina) do not have real validity. Some individuals have an umbilicus, while others do not. The really long-spined Star Shells come from Japan and the Pacific and include (a) Guildfordia (Guildfordia) triumphans, Philippi, best known of the Japanese Star Shells, and (b) Guildfordia (Pseudastralium) abyssorum, Shepman, which is rarely dredged in deep water off Japan.

Our last example of spinous sculpture will be the Florida Crown Conch: Melongena (Melongena) corona, Gmelin, which has a variable pattern of triangular curled in spines. A fossil form from Florida, is Melogena (Rexmela) subcoronata Heilpoin.

Nodular or tubercular sculpture may be illustrated by two members of the Periwinkle Family LITTORINIDAE. Echininus (Tectininus) nodulosus, Pfeiffer, is the False Prickly Wrinkle, while the true Caribbean Prickly Wrinkle is Nodilittorina (Echinolittorina) tuberculata, (Menke). Both are found together on many of the islands of the West Indies. Of many other types of sculpture which have names, we will only mention 'umbricate' (overlapping, like tiles on a roof) and 'scutellate' (like a little shield), as in the large and very pretty Mexican Cup-and-Saucer limpet, Crucibulum (Crucibulum) scutellatum, (Wood), in Family: CALYPTRAEIDAE.

Finally, we'll return to the topic of 'varices' and mention a few more examples. Occasional varices, which stand out conspicuously and somewhat irregularly among the nodular axial ridges, are common in the Frog Shells (Family: BURSIDAE) and their near relatives the Tritons (Family CYMATIIDAE). In the former, is Argobuccinum (Bugyrina) gemmifera, (Euthyme), which is a South African Frog Shell, but not nearly as common

as Argobuccinum (Argobuccinum) argus, (Gmelin). In general these varices are white-banded and stand out clearly in the Indopacific Cymatium (Septa) rubeculum, (Linne), and its red subspecies hepaticum, Roding. In the Caribbean, a very similar shell was given the subspecies name C. (S.) rubeculum occidentale by Clench and Turner in 1957. The well-known Triton Horn of the Pacific, Charonia (Charonia) tritonis (Linne) and its Caribbean counterpart, C. (C.) variegata (Lamarck) have conspicuous varices. Close to the Cymatiidae, but now put in a separate family: COLUBRARIIDAE, is the Genus: Colubraria, Schumacher 1817, with a relative large representation, Colubraria castanea, Kuroda, from Japan, and a small one, C. lanceolata, Menke, from the Caribbean. The spire is apt to be somewhat distorted in the Colubrarias. Their varices are obvious and like those in the other shells we've been considering, do not line up in successive growth periods, but are irregularly spaced along the whorls. As compared with the varicoid axial sculptures which are spaced somewhat unevenly, because of variable fast-growth periods, the Harp Shells e.g. Harpa (Harpa) harpa, Linne, from the Indopacific, have marked, sharp-edged, smooth, symmetrical, and conspicuous longitudinal varicoid ribs, which line up evenly and are shouldered as they dip into the sutures.

This has just been an introduction to the topic of shell sculpture, but it serves to show how important it is to the identification, naming, and classification of shells.

CONCHOLOGICAL DAFFYNITIONS
Carl Withrow

Abalone:	Slang retort - equivalent of "aw nuts", but more refined.
Acuminated:	Piled up money; a speical kind of genus.
Buccal:	What holds the belt together.
Buccinum:	There's money in them shells.
Clam:	To shut up: take the fifth.
Codakia:	A kind of shell that photogrpahs well.
Conch:	To clobber, usually over the head.
Conus:	Ice cream receptacle.
Costa:	How much: like "the costa the meal."
Cowrie:	A cow's dowry.
Cuspidaria:	Old-time spittoon. (Obsolete).
Cypraea:	Some kind of mild drink, to be imbided slowly.
Dredge:	Cover with flour.

Gastropod:	Too much acid in a big stomach.
Genus:	A smart cookie.
Girdle:	What holds chitons and plump women together.
Haliotis:	A mollusk with bad breath.
Intergraded:	O.K. with the Dept. of Health, Education and Welfare.
Lambis chiragra:	Vitamin deficiency in sheep.
Latiaxis:	Old coalition of nations.
Lip:	Back talk
Inner lip:	Back talk indoors.
Outer lip:	You guessed it!
Marginella:	Girl on the brink.
Murex:	Patent medicine eye drops.
Mussel:	Wrestler's stock in trade.
Northiaa Northiae:	Farther north than north.
Olive:	One for each martini.
Ostrea:	Half of the old Austro-Hungary kingdom.
Patella:	Some kind of cigar; probably a big panatella.
Penultimate:	Ten dollar word for "almost over".
Periostracum:	Disguise for Perry Mason
Phyllum:	Put 'em away in a cabinet.
Prunum:	Gardner's job in spring.
Pterynotus:	"Look, Terry!"
Rangia:	Wide open spaces in Texas.
Rostrate:	Flat on one's rostrum; to fall down.
Sinum:	Sign only after you read the find print.
Sinus:	Hoel in the head.
Strombus:	Family car of South Carolina senator.
Sub-genus:	Just average in mentality.
Textile cone:	Some gadget in the cotton mill trade.
Tibia:	One of the leg bones - or is it in the arm?
Tridacna:	Pimples on three sides of your face.
Umbilicus:	Snob's bellybutton.
Wentletrap:	A trap for wentles, of course!
Whorl:	Give it a try.

MOLLUSCS IN RADIOBIOLOGY AND RADIOECOLOGY

Douglas A. Wolfe
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Research in radiobiology and radioecology is concerned with the behavior of radioactive materials in biological and environmental systems. These fields of study are comparatively new, having developed after the inception of the nuclear age some 25 years ago. It was then that man discovered that the energy in the atom could be released and used--at first for weapons, and more recently for the production of electricity and power to light homes across the country and to drive huge ships across and under the oceans. The major by-products of this power production are radioisotopes--radioactive materials which provide powerful research tools and a useful means in medicine of diagnosing and treating certain ailments. Radioisotopes are produced in quantities much greater than the demand requires, however, thereby giving rise to a waste disposal problem.

The major source of radioactive contamination in our environment has been fallout from nuclear weapons tests. Part of the radioactive by-products of the explosion are injected far up into the atmosphere by the blast. These radioisotopes then slowly settle out onto the surface of the earth as fallout. Waste disposal from nuclear power plants is very carefully controlled, but some radioactivity is nonetheless released into the rivers which supply the water required by the reactors. The radioisotopes, whether from fallout or from reactor effluents, enter the environmental scheme, where they may be cycled continuously through sediments, water, plants, and animals. The Radiobiological Laboratory, located on Pivers Island in Beaufort, N.C., is maintained by the U.S. Fish and Wildlife Service and U.S. Atomic Energy Commission for the study of those processes which affect the distribution and movement of radioisotopes in the estuarine environment and also for the study of the effects of atomic radiation on estuarine organisms. Molluscs, especially bivalves, have played a central role in this research.

Biological Concentration of Chemical Elements and Radioisotopes

Bivalve molluscs are very effective concentrators of chemical elements. Different species accumulate elements to different degrees, and exhibit different anatomical distribution even for the same element. In most instances, the physiological

or metabolic explanations for the accumulation are unknown. Notable examples of mineral accumulation by molluscs are the oysters (Crassostrea and Ostrea), the scallops (Aequipecten Pecten, etc.) and freshwater mussels (Unionidae). Oysters concentrate zinc to about 100,000 times the concentration of zinc in sea water. In a typical sea water, therefore, which contains one-millionth of one percent (0.000001%) of zinc, an oyster meat may contain one-tenth of one percent (0.1%) of zinc. This zinc appears to be distributed rather evenly throughout the tissues and organs of the oyster. Similarly, both scallops and freshwater mussels concentrate primarily in the kidney, an organ of excretion, whereas in the mussels the manganese is largely in calcareous tissue whose function seems to be the storage and mobilization of calcium for shell deposition.

If radioisotopes of zinc and manganese are present in the environment, the oysters, scallops, mussels, and other organisms will be unable to distinguish these from non-radioactive forms of the element, and the radioisotopes will be accumulated also. Thus, radioactive zinc and manganese from fallout are presently detectable in shell fish even though their concentrations in sea water are generally too low to measure. Because they have such effective concentrating abilities, these organisms are sometimes considered biological indicators of radioactivity in the environment.

Estuarine Radioecology of Fallout

Molluscs have served as biological indicators to elucidate chemical cycles in the estuary at the mouth of the Trent and Neuse Rivers near New Bern, N.C. The brackish-water clam Rangia cuneata was collected periodically for 18 months from several locations over a 30-mile stretch of the river, and the concentrations of various fallout radioisotopes in the meats of the clams were measured. Several other molluscs occur with Rangia over this area, but they were either too small or too sparsely distributed for routine sampling. Among those other species were: Elliptio complanatus, Anodonta cowperiana, Anodonta imbecilis, and Lampsilis cariosa, all from the fresh water of the Trent River; Polymesoda caroliniana and Congeria leucophaeta from the low salinity waters near the mouth of the Trent River; and Macoma phenax and Macoma balthica from the more brackish waters farther downstream in the Neuse River. The fallout radioactivity in Rangia provided some insight to the general distribution of radioisotopes in the estuary. Nine fallout radioisotopes were detected in Rangia and of these, four (zirconium 95- niobium 95, cerium 141, ruthenium 103, and barium 140-lanthanum 140) appeared suddenly

(within 10 days) after the Chinese nuclear tests on May 9 and December 28, 1966. Thus Rangia is a very prompt indicator of new fallout radioactivity in the environment. In differences in the concentration of certain radioisotopes by Rangia from freshwater and brackish water, indicated differences in either environmental concentrations or in the availability of the isotope to the organism in different parts of the estuary. As an illustration of this, ruthenium isotopes were much more concentrated (2-10 times) in Rangia from downstream in the Neuse compared to Rangia from the Trent River. This finding is consistent with the theory that ruthenium, which dissolves in freshwater, becomes insoluble in brackish waters and sea water. Thus the Rangia in downstream samples were probably consuming small particles containing ruthenium with their food, whereas in upstream samples, much of the ruthenium simply flows in solution right by the clams. Similar conclusions could be made concerning the distribution of other fallout radioisotopes in the estuary.

Use of Radioisotopes to Determine Feeding Rates of Molluscs

Bivalve molluscs feed on microscopic algae which are filtered from the water pumped through their siphons and across their gills. In experiments conducted at the Radiobiological Laboratory, single-celled algae were reared in the presence of various radioisotopes. The cells containing radioactivity were then placed in aquaria with bivalve such as a quahog (Mercenaria mercenaria). As the clam removed algal cells from the water by filtration, the radioactivity associated with the algae in the water decreased. Thus, the filtering rate of the clam could be learned by following the loss of radioactivity from the water. In this way, the average filtering rate of clams was determined as 5 quarts/hour and that of bay scallops as about 15 quarts/hour. Also by feeding the bivalves different species of radioactive algae and measuring the filtration rates, it was possible to learn something about the feeding selectivity of molluscs.

Radiation Sensitivities of Molluscs

Radiation emitted by radioisotopes has harmful effects when absorbed in sufficient quantities by a living organism. It is important, therefore, to know how much radiation different organisms can successfully tolerate, so that concentrations of radioactivity in the environment can be controlled at safe levels. By irradiating animals with highly radioactive materials under laboratory conditions, it is possible to estimate dangerous doses for different kinds of organisms. In general the more highly evolved forms of life (ultimately man) are most

sensitive to radiation. Molluscs successfully tolerate relatively high doses of radiation. For example, when a population of oysters is irradiated with a radiation dose of 150,000-160,000 rads, 50% of the population will die within 30 days. About 110,000 rads is required to kill 50% of a clam (Mercenaria) population in the same time. Only 40,000-50,000 rads kills 50% of a population of mud snails (Nassarius obsoleta) or oyster drills (Urosalpinx cinerea). For means of comparison, the dose required to kill 50% of irradiated white laboratory mice in 30 days is only 400-600 rads. Mammalian systems (including man) are therefore much more sensitive to radiation than are molluscs, and most other marine animals, and it is generally assumed that so long as environmental radioactivity is safe for man, other animals will not be endangered.

Selected References for Additional Reading

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Schelske, C. L. 1966. The fate of fallout radioactivity in an estuary. American Biology Teacher 28 (5): 373-380.

White, J. C., Jr., and J. W. Angelovic. 1966. Tolerances of several marine species to Co 60 irradiation. Chesapeake Science 7 (1): 36-39.

Wolfe, D. A., and C. L. Schelske. In press. Accumulation of fallout radioisotopes by bivalve molluscs from the lower Trent and Neuse Rivers. Proceedings of the 2nd National Symposium on Radioecology, held at Ann Arbor, Michigan, May 15-17, 1967.

BOOK REPORT

Dance, S. Peter. Shell Collecting, An Illustrated History. 1966: University of California Press, Berkeley and Los Angeles. $10.00.

Shells have been collected for various purposes since prehistoric times and, since the early years of the Renaissance, shell collecting as an aesthetic pursuit has delighted countless persons in all walks of life. Shells were associated with such cultures as pre-Dynastic Egypt and pre-historic Mexico. Personal adornment, legal tender, musical instruments, dye, good luck charms and artistic forms were early uses of mollusks.

For 2,000 years Aristotle's "History of Animals" was practically mollusk gospel. Works of monks in the thirteenth century also contained shell descriptions, but it was not until the Renaissance when the enthusiasm for "cabinets" brought forth many texts with illustrations.

With trade to the East and West Indies, the sea route to India and the newly discovered American continent, Europeans of the fifteenth and sixteenth centuries came into contact with new natural wealth. Scholars and persons of means accumulated cabinets of curiosities, including shells, some carefully repaired and repainted by artisans.

In the second half of the seventeenth century, the foundations of the modern science were laid by Buonanni of Italy, Lister of England and Phumphius of the Netherlands with their writings. Adanson of France ushered in a new period when he employed a consistent binomial nomenclature, preceding by one year the publication of the first volume of the tenth edition of "Systema Naturae" by Linnaeus, who enumerated and described every animal known to him.

The author continues with discussion of the Lamarckian system; Hugh Cumming, the prince of shell collectors; and the Golden Age of mollusks, including fine collections of the world.

Since collecting is motivated by beauty and novelty, four consistantly rare shells are described: the Precious Wentletrap, Epitonium scalare L.; the Matchless Cone, Conus cedonulli L.: the Glassy Nautilus, Carinaria cristata L.; and the Glory of the Sea, Conus gloriamaris Chemnitz.

Apendixes include listings of conchological cabinets of the early eighteenth century, deep-sea collecting, a guide to currently importantcollections and their locations, plus three color plates, thirty-two monochrome plates and thirty-one line drawings.

This book would be interesting to the serious collector who might like it as an addition to his shell library.

- Dorothy P. Porter

SHELL POETRY - as suggested by MRS. CHARLOTTE JOHNSON

IT'S NOT NASSARIOUSLY SO! *
by C. Van Housen

We are Nassarius obsoletus,
And you're surely gonna meet us
Whenas and where you travel to and fro
O'er the intertidal regions
Where we propagate in legions,
And your nose will tell you it is so!

Oh, we're ugly, and we're grimy,
And we're weedy, and we're slimy,
But as scavengers, admit we can't be beat!
For our favorite blue-plate platter
Is some very lifeless matter,
And this helps to keep the atmospherics sweet!

So, when you talk of shelling
Don't forget us in the telling,
Give us winkle-folk our really hardearned dues!
We're a Mollusk institution
With a worldwide distribution;
The Wizards of that Land, the Land of Ooze!

*In the above which has been printed in "Proceedings of the Philadelphia Shell Club 1961-1962 and in "News of the Western Association of Shell Clubs" July 1962, the first verse has been slightly changed following the suggestions of the author (personal communication to the editor).

EDITORS BOOK NOTES

I came across the following paper-back during a recent trip to the American Museum of Natural History in New York City. Think it might interest some of you not wholly addicted to marine shell collecting.

Burch, John B. How to Know the Eastern Land Snails. 1962. Wm. C. Brown Company, 135 South Locust Street, DuBuque, Iowa. 214 pp. $2.50.

During a trip to a branch of our local Craven-Pamlico-Carteret Library, I came across the following book. I would like to recommend it because of its amazing amount of tips on shell collecting and the interest it should stir up. The "know-it-all" collector will not agree with everything in it but just might leatn something new and I know will enjoy the antidotes about their kind of people. I particularly enjoyed the chapter on how to dress for collecting. The author is an experienced writer having contributed popular scientific articles to a number of popular but non-scientific magazines. Don't expect the book to identify all of your precious shells because that is not its purpose.

Hoyt, Murray, Jewels from the Ocean Deep. The complete guide to shell collecting. 1967. G. P. Putnam's Sons, N. Y. 258 pp. $5.95.

It is worthy to note that the following papers have been published by club members:

Beetle, Dorothy E. 1967(October)
Mollusks of the Outer Banks, N.C.
The Nautilus Vol 81 No. 2, p 61-65.

Beetle, Dorothy E. 1968(January)
Laevapex fragilis on the Outer Banks of N.C.
The Nautilus Vol. 81, No.3, p. 117

Wolfe, Douglas A. 1967(October)
Cassis madagascariensis and C. m. spinella
offshore at Beaufort, North Carolina.
The Nautilus Vol 81, No. 2, p.47-48.

SEAFOOD RECIPES FROM THE WASTEBASKET
of PAUL JENNEWEIN

Clams once were common in seafood markets. You could get them for about a penny each.

But have you noticed lately? Unless you order some well ahead of time, you don't find them.

It's possible the insulting term "clamdigger" got under the skins of too many good clamdiggers. Or the welfare department has been paying them so well that this form of employment is no longer attractive.

There's always the possibility, too, that some of our shell collectors are stocking up on clams, hoping, as the dollar declines in value, that clams will return to be the basis of exchange -- as in the expression: "How many clams is that worth?"

Dr. R. Tucker Abbott might have had an explanation, but we forgot to ask.

Oh well, if you're lucky enough to find a batch of clams in the market or know the spot on a low tide mud shoal to dig a mess yourself, here are a few choice concoctions that may tempt you:

CHICKEN WITH CLAM SAUCE

Brown with 3 tablespoons of olive oil or cooking oil a 1 to 2 pound cut-up fryer.
Season with salt, pepper.
In 8 x 12-inch or rectangular baking dish place browned chicken.
Pour over chicken - fresh clams, enough that when chopped or fed through a meat grinder (after they have been removed from the shells --of course) will be about eight ounces or a cup, with juices
or
1 can of minced clams with juice (7½ ounces).
Add 1 can cream of celery soup, undiluted.
Bake covered in oven (325) degrees) until done -- about an hour.
Serves 4.

SPAGHETTI WITH CLAM SAUCE

Heat in saucepan until melted:
¼ cup olive oil ½ cup butter or margarine
Add and bring to boiling point:
6 cloves of garlic, (finely chopped) ½ cup parsley, finely chopped (or flakes)
1 tablespoon sweat basil 3 tablespoons of grated Parmesan cheese
Pinch of crushed red pepper Pinch of freshly ground black pepper
Add and bring to a boiling point:
10-12 cherrystone clams, chopped coarsely with juices
or
2 cans chopped clams with juices

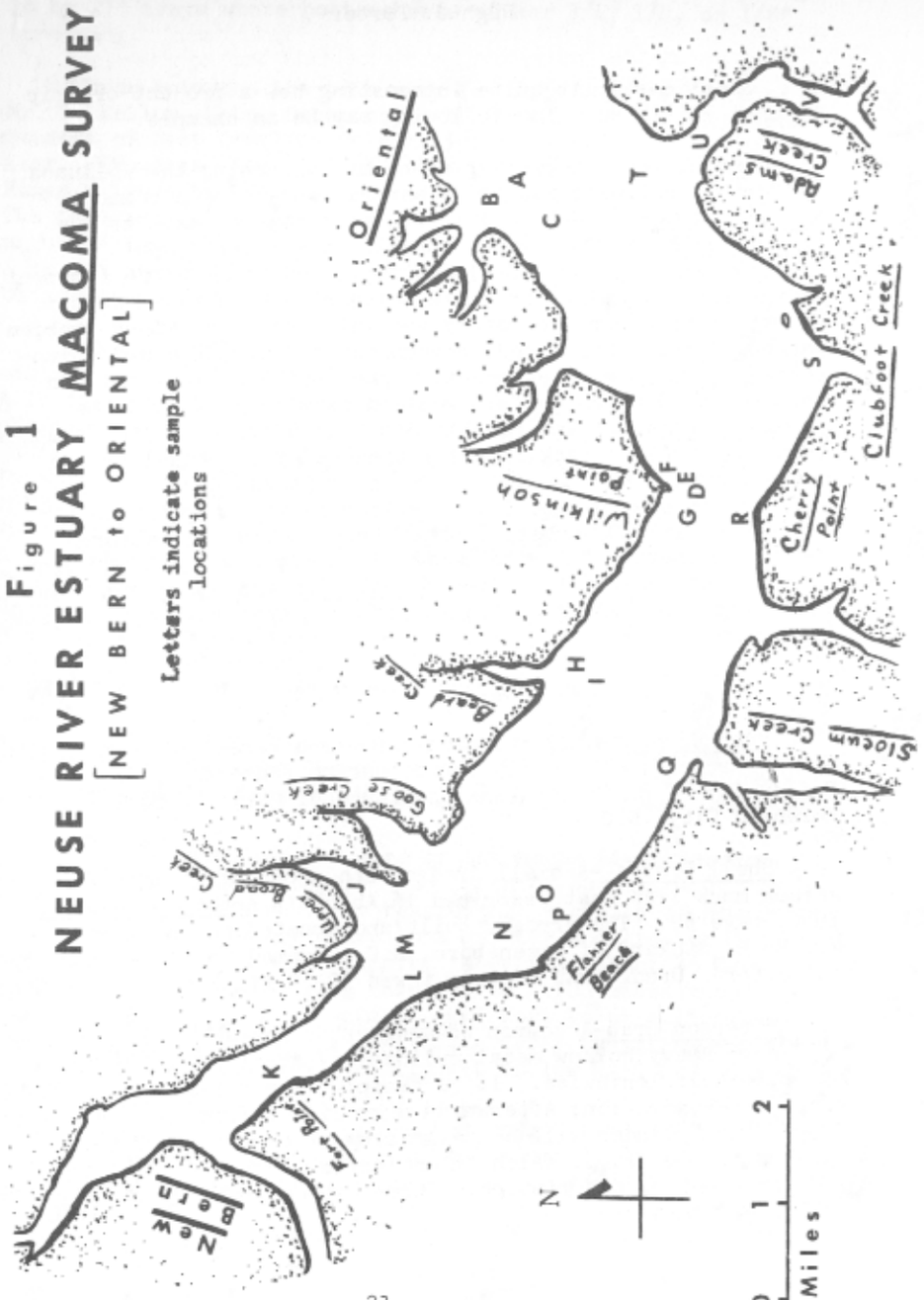
Of course with a large group, you can expect to lose a few, but keep this number to a minimum. I wonder if those missing from our last trip are still on that Island?

Boats: When the journey includes boat travel, there are new and different problems. The unsung hero of each voyage on the trackless ocean is the pilot. Too often, we overlook his talents not only in charting our correct course, but in his extensive knowledge of boats and the sea. He sees that life preservers are on board and possibly Dramamine tablets for some of us faint-hearted sailors. He checks carefully on his fuel so no one will need to hitchhike. One of the most skillful mariners of the N.C. Shell Club is Bryan Dixon of Durham. He not only knows how to handle boats but he is also a boat builder. He never worries because he knows he can always call on Admiral Phoebe Meadows for assistance.

Shell Identification: It is difficult to convince some shellers that it is not necessary to identify everything on the spot. As a matter of fact, if you ask four or five different persons "What is it?", you might get three or four different answers. Again the heavy packer can settle any argument by pulling out his copy of Abbott's "North American Sea Shells." Good ole Tucker!!

Exploring: The Thrills of looking into the shallow water of a tropical beach are amazing. You may ask if this is a world of fantasy or if these brillantly colored and diverse organisms are real. Although you may be cold, thirsty, and hungry, this all seems so insignificant when the shelling is good. Whether the huntins is good or not so good, many new adventures await you in the Wonderful World of Shells. Of course this is true only if you resolve to have fun and think pleasant thoughts. Incidentally, I believe a pleasant thought might be for us to go back to that Island and look for the shellers who are A.W.O.L.

Figure 1
NEUSE RIVER ESTUARY MACOMA SURVEY
[NEW BERN to ORIENTAL]
Letters indicate sample locations



A COLLECTING TRIP ON THE NEUSE RIVER ESTUARY

Hugh J. Porter

Sometimes it is quite interesting how a project or trip becomes initiated. The following may be an example.

One of the interesting problems concerning the mollusca of North Carolina's estuarine waters concerns the common Macoma balthica Linne - Is it or is it not the same as the Macoma balthica Linne which inhabits the Balthic Sea? Several month ago Drs. Carl Schlieper and Hans Theede (eminent marine physiologists) from the University of Keil in West Germany toured our laboratory and while here the above problem was mentioned. Dr. Theede became quite interested and volunteered to run some biochemical tests (while he was still in this country) which he felt would determine if we had the Macoma balthica of the Balthic Sea. As previous bottom samples from some of the brackish water areas of North Carolina had shown numerous shells of that species, it was assumed that live specimens could easily be procurred for shipment to him. Later, in early November, a short trip aboard the research vessel "Machapunga" to the mouth of Adams Creek, N.C. dredged up numerous shell but no live M. balthica. Thus a more extensive trip was planned to try to find the species in the Neuse River area.

EQUIPMENT USED FOR TRIP

"Machapunga"-A 48 ft. diesel-powered vessel with hydraulic winches specifically built for estuarine research by the University of North Carolina Institute of Marine Sciences in Morehead City, N.C.

Shell Dredge -A small dredge with a bag of ¼" mesh wire screen much like that described in Abbott's American Seashells 1954, page 59. The dredge, built and donated to the lab. by Mr. B. B. Stokard of Greensboro, N.C., seemed to be an excellent collector. Dredge was usually towed 10-20 minutes.

Peterson Grab-A common oceanographic sampler consisting of a very heavy hollow metal cylinder of about 1/3 m^3 volume, split in half lenthwise. It is dropped from a boat in a spread-open position; afterwards when lifted from the ocean floor, the cylinder will close grabing up a portion of the substrait. See P. S. Welch "Limnological Methods" 1948 page 170 for a better description. Three bottom grabs constituted each grab sample.

Sampling screens -Series used consisted of interfitting 16 by 27" trays whose bottoms were either 3/4, 1/4, or 1/8" screening.

Those going on the trip were Mr. John Wagner, Captain: Mr. T. Kellum, Mate, Cook, etc.; Mr. Frank Holland, Graduate Student of East Carolina University; and myself, trip organizer. Two days (Nov. 7-8, 1967) were spent sampling the Neuse River between New Bern, N.C. and the mouth of Adams Creek. The trip originated and terminated at Morehead City while the night of the 7th was spent tied up at the beautiful public dock and park in New Bern. Excellent calm weather occurred both days much to the constirnation of the Captain!

The following locations were sampled (SDS=Shell dredge sample; PGS=Peterson Grab sample) as shown in figure 1: A. 19 ft. depth offshore Oriental - PGS; B. 10 ft. depth offshore Oriental - PGS; C. 17 ft. depth offshore Oriental -SDS: D. 25 ft. depth offshore Wilkenson Point - PGS; E. 21 ft. depth offshore Wilksenson Point -PGS; F. 17 ft. depth offshore Wilkenson Point - SDS; G. 21 ft. depth offshore between Wilkenson Point and Beard Creek - SDS; H. 7 ft. depth offshore Beard Creek - PGS; I. 12 ft. depth offshore Beard Creek - SDS; J. 7 ft. depth in Upper Broad Creek-PGS; K. Offshore Fort Point - PGS; L. 13-14 ft. depth offshore Johnson Point; M. 10-14 ft. Upper Broad Creek - SDS; N. 10 ft. depth between Lights #17 & 15 offshore Riverdale -SDS; O. 12 ft. depth offshore Flanner Beach - PGS; P. 7 ft. depth offshore Flanner Beach - PGS; Q. 11 ft. depth offshore Slocum Creek -SDS; R. 10-12 ft. depth at mouth of Clubfoot Creek - PGS & SDS; T. 10-13 ft. depth offshore mouth of Adams Creek - SDS; U. #4 buoy in Adams Creek - PGS: V 7 ft. depth between markers #9 & 10 in Adams Creek-SDS.

As noted, sampling was done in the Neuse River estuary. The Neuse River, which begins just north of Durham, N.C., is a fresh water stream until it reaches the vicinity of New Bern, after which it gradually mixes to a greater and greater degree with ocean waters. Ocean salinity is usually about 35 0/00 and fresh water runs as less than 1 0/00 (o/00 means grams of salt in 1,000 grams of water). Off Fort Point salinities usually are 2-3 0/00 whereas off Adams Creek they frequently run about 13 0/00 but occasionally get as low as 6 0/00 and as high as 26 0/00.

RESULTS:

Only seven species of molluscs were collected throughout the trip. They were: Retusa canaliculata Say; Sayella chesapeakea Morrison; Macoma balthica Linne; Macoma phenax Dall; Mulina lateralis Say; Phacoides multilineata Tuomey and Holmes; and Rangia cuneata Gray.

Retusa canaliculata Say (fig.2a). A few empty valves were found at stations A, B, and D. It is of interest, but I think of doubtful importance, that they were found only on the northern side of the Neuse River between Wilkenson Point and Oriental. Acteocina candei Orbingy, a similar looking but marine species, differs by having its nuclear whorls raised above succeeding whorls instead of being mostly submerged in the whorls as in Retusa (see Wells & Wells, 1962. The Naut. 75(3):87-93).

Sayella chesapeakea Morrison (fig. 3a). Several empty valves were found at stations B and D. It was interesting that these and the Retusa, the only gastropod were both found in a rather restricted area. Appreciation is here expressed to Dorothy Beetle who had the specimens identified by Dr. Morrison.

Macoma balthica Linne (fig. 2b). Numerous valves and recently dead specimens (recently dead specimens indicated when both valves were attached by the ligament and or the periostracum was present) were found at stations A, C, D, E, G, I, J, K, L, M, N, O, Q, U, and V. These stations had a muddy silty substrait, whereas such stations as B, F, H, P, R, S, and T, where Macoma was not noted, had sandy bottoms. No live specimens were found anywhere in the sampled area. From this it can be inferred that until recently a large population of the species has existed in the silty areas of the Neuse River area from off Upper Broad Creek (only a few valves were found off Fort Point) to and possibly beyond Oriental.

Macoma phenax Dall (fig. 2c). Numerous valves and recently dead specimens were found in the same locatities as the above Macoma but in fewer numbers. No live specimens were found. (M. phenax can easily be missidentified as M. tenta Say (fig. 2d). In phenax the dorsal shell margin posterior to the beak is convex while it is concave in tenta. Also, the distance between the anterior muscle scar and the pallial sinus is less than the width of that muscle scar in phenax while it is greater in tenta.)

Mulina lateralis Say (fig. 2c.). Live specimens were found at the following stations: C, D, E, F, G, R, S, and T. Dead shell was also found at station J. From this it might be speculated that this species is not found living in the Neuse River much further upstream than off Wilkenson Point.

Phacoides multilineata Tuomey and Holmes. Only one valve was found and this at station A.

Rangia cuneata Gray (fig. 2f). Live specimens were found at the following stations: H, L, N, P, R, and T. Dead shell were taken in addition from I and M. It is interesting to note that the species was common in the silty substrait from Johnson Point to Riverdale but were found only in the hard sandy bottom further East. (Gross examination of Rangia, particularly of small specimens, may cause them to be confused with Mulina lateralis. The best separation point I have found is that the dorsal surfaces of the lateral teeth are corrugated in Rangia whereas in Mulina they are smooth. Exteriorly, Rangia does not have Mulina's prominent hairy posterior radial ridge and itsbeak is closer proportionally to the anterior margin than in the other species.

What was accomplished by the trip? You might say the trip was a failure since we did not come back with live Macoma balthia - but that's biology. Several interesting points concerning the overall ecology of the area were however suggested.

It was surprising to me to find numbers of the semi-commercial species Rangia cuneata living also in one of the silty areas of the estuary.

The density of the Macoma community throughout much of the silty areas in the estuary, if it is real, might mean that the two Macoma species are a significant food item to crabs or fish and or that they are a significant item in the ecological energy cycles of the area. The inability to find any live specimens of Macoma balthica or phenax where only recently there must have been a large population might be explained by several different ideas. The Shell Dredge and the Peterson Grab may not have dug deeply enough to find the living forms. Also possible is that what was seen was part of a normal winter mortality for the species in this area. A similar collecting trip to the Neuse River area in April or May 1968 may help answer some of these possibilities.

Fig. 2a
Retusa canaliculata Say
(from Wells & Wells 1962)

Fig. 2b
Macoma balthica Linne

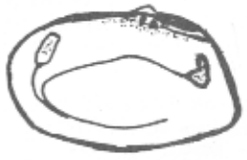


Fig. 2c
Macoma phenax Dall

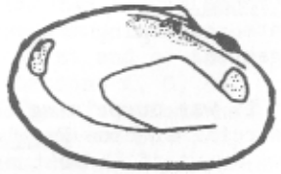


Fig. 2d
Macoma tenta Say

Fig. 2e
Mulina lateralis Say

Fig. 2f
Rangia cuneata Gray

Fig. 3a
Sayella chesapeakea Morrison
(about 10X)

COLLECTING SEA SHELLS IN A SUPERMARKET!
Wade Gillies Brown

Whoever heard of such a silly thing? But it really happened to me, and the shells were "rare" and very beautiful!

You too can find these lovely shells, and I will share my secret with you. First, buy a plane or boat ticket to Lima, the capital of Peru. Then take a bus or "collectivo" to San Isidro outside Lima, and ask directions (in Spanish) to the "Supermarket." Go to the left rear of the store and if you are lucky you will find a bushel or two live and very slimy and dirty scallops!

These mollusks will be Chlamys (Argopecten) purpurata Lamarck 1819. This delicious scallop is dredged on a very hit and miss basis off the coast in the cold waters of the Peruvian Current; I found them for sale on only one occasion during a stay of a month. I pulled up my sleeves and went through the pile. Most of them were dark and drab - and with broken shells! But here and there were a few beautiful color variations, mostly lovely lavenders. I found one orange shell - a real prize. Then, hands dripping I bore my loot back to our boarding house and cleaned them in our bathroom with my thumbnail!

I consider these scallops as colorful and beautiful as any of the pectens; they are not rare because we know where they can readily be found, but there appears to be no source of supply . . . Shells are where you find them!

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Withrow, Mrs. Carl C., (Elizabeth), 2010 Dalehurst Drive, Charlotte 5, N. C. 28205. Phone 376-4117. (World-wide Marine, particularly the Wentletraps).

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Wolfe, Dr. and Mrs. Douglas A., Radio Biological Lab., Bureau of Commercial Fisheries, Beaufort, N. C. 28516.

Wood, Mr. & Mrs. Carl S., (Mozelle Virginia), P.O. Box 1232, High Point, N. C. Phone 888-4954. (World-wide shells).

Woodward, Miss C. Lee, 410 South Front St., Wilmington, N. C.

*Wooten, Mr. & Mrs. Edward F. Wooten, (Nancy), 2539 Lullington Drive, Winston Salem, N.C. 27103. (World-wide Marine shells).

Worrall, Mrs. Wallace W. (Jenny Frye), Bath, N. C. 27808. Phone 923-3641. (World-wide shells).

Wright, Mr. Tommy, 708 Brookside Drive, High Point, N. C. (Junior Member).

Yarbrough, Mr. & Mrs. T. W., (Moss), 1117 Montpelier Drive, Greensboro, N.C. 27410. Phone 299-6626.

Yelvington, Miss Ann, Rt. 1, Box 208, Clayton, N.C. 27520.

NEW MEMBERS VOTED IN AT MARCH MEETING

Fulghum, Mr. and Mrs. James S., Housing Office, N.C. State University, Raleigh, North Carolina.

Hammer, Mrs. Leo (Inez), 1300 Arrow Wood Rd., Asheboro, N.C.

Murray, Mrs. E. O., 3209 Sussex Rd., Raleigh, N.C. 27607.

Pate, Mrs. Dorothy, 300 Robbins St., Greensboro, N.C. 27406.

Perrine, Mrs. Maxine L., 1 West Bayshore Blvd., Jacksonville, N. C. 28540.

Shelburne, Mrs. Katherine, 1819 Bivins, Durham, N. C. 27707.

Sproul, Miss Avard Pauline, 211 N. 13th Street, Wilmington, N. C. 28401.

Templeton, Miss Mary Susan, 2629 Lawndale Ave., Durham, N. C. 27705.

Watson, Miss Jessica Cleveland, 2825 Rothgeb Drive, Raleigh, N. C. 28401 (Junior Member - age 13 yrs.).

York, Mrs. Claude (Aileen), 334 S. Ridgecrest Rd., Asheboro, N.C.

Lawrence, Miss Patricia A., 4711 Easley St., Durham, N. C. 27705.

HONORARY MEMBERS

Chestnut, Dr. A. F., Univ. of North Carolina, Institute of Fisheries Research, Morehead City, N. C. 28557.

Daniels, Mr. Moncie, Box 86, Manteo, N. C.

Menzies, Dr. Robert J., Duke University Marine Laboratory Beaufort, N. C. 28516.

O'Hanlon, Mr. I. H., 3605 Morganton Road, Fayetteville, N. C.

Williamson, Mr. Odell, Shallotte, North Carolina.

NECROLOGY

Mrs. Elsie H. Formyduval
April 9, 1966

Mrs. H. C. MacDonald (Sallie Wynne)
February, 1968

Mrs. Marcus Musaus
February 23, 1967