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NOTES ON THE NATURAL HISTORY OF FORT MACON, N. C., AND
VICINITY. (No. 2.)

BY ELLIOTT COUES.

As the identification of the Fishes and Insects that were collected seems likely to be delayed, our "Notes" are continued¹ with lists of the Crustacea Decapoda, and of the Shells, mostly marine, as well as of a few other marine Invertebrates.

CRUSTACEA DECAPODA.

The identifications of most of the species were made by Prof. S. I. Smith, of the remainder by Dr. Wm. Stimpson. The majority of the specimens referred to, including all those taken with the dredge alone, were collected by Dr. A. S. Packard and myself.

Libinia canaliculata.

Dredged in various parts of the harbor, and found common on Bird Shoals. (*Cf.* Streets, these Proceedings, 1870, pp. 104-5.)

Cancer irroratus, Say.

Beach and elsewhere.

Menippe mercenaria. "Stone Crab."

Common, and highly esteemed as an article of food. It is much less generally distributed than, not so abundant as, the common edible crab.

Panopaeus herbstii, Edw.

Panopaeus herbstii var. *obesus*.

Pilumnus aculeatus.

A few specimens, dead on the beach.

Platyonychus ocellatus, Latr.

Dredged, and dead on the beach.

Callinectes hastatus, Ordway.

Exuviae found in great numbers in shallow pools in the marsh, middle of April.

Achelous spinimanus.

¹ From p. 49 of these Proceedings for 1871.

Achelous gibbsii.

Achelous depressifrons.

Arcnæus cribrarius, Dana.

Sesaima reticulata, Say.

Sesaima cinerea, Say.

Gelasimus pugilator, Latr.

Gelasimus minax, Lec.

Gelasimus pugnax, Smith.

The fiddler crabs occur in immense numbers throughout the marsh, and the muddier banks of the harbor. The three species given above were taken together, and appear to associate indiscriminately. They form a considerable part of the food of various birds, especially the herons, rails, gulls, fishcrows, and grackles, and many are destroyed by the larger crabs, as the Stone, and the common edible species. They may be found at all seasons, but are much more numerous during the warmer months than in winter, when, however, some are seen abroad; and they may always be taken by digging into their holes. Of their numbers one who has not seen them can form no adequate estimate: they gather about decaying substances until the ground for several square yards may be completely covered; and troops running through the scant herbage of the marsh make a rustling sound. They doubtless exercise great influence upon the natural economy of the localities they frequent, in devouring decomposing matters, both vegetable and animal. They swim with ease, but in general avoid the water, and appear to prefer rather dry and sandy places to the heaviest mud. This preference is especially marked in the selection of places for boring the holes; this is done chiefly, I think, during the night, at least I do not remember to have seen the animals so engaged; and frequently places I had walked over the day before, when there had been no holes seen, were riddled through in the morning. The holes average in diameter little over half an inch, and look exactly as if punched by the end of a walking-stick; they are sunk at all angles with the surface, are oftener tortuous than straight, and generally a foot, or less, deep. Little piles of sand near the entrance show the fresher excavations, as they are soon levelled by natural causes. The tunnels are

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probably at first the exclusive right of the individual digging them, but the proprietorship is not observed, at least on an occasion for alarm, when the crabs tumble promiscuously into the nearest one, often with struggle for precedence; and it is particularly amusing to see some large individual, caught away from his own habitation, stick in a hole too small for him, or try several such in desperate hurry. I noticed that the animals went in either side first with equal facility. Without alluding to what may have been the specific characters used to separate the above species, I should judge that specimens incontestably the same varied indefinitely in coloration. The great claw of the larger individuals is sufficiently strong to bring blood from the finger. Although pretty active, they are much less swift-footed than the next species, and may be easily captured by hand. The only use to which I knew of their being put, was to bait hooks for fish, for which purpose they are well adapted, being greedily taken by sheepshead, sea-trout, and other smaller kinds.

Ocypode arenaria, Say.

While the preceding kind is confined to the marsh and adjoining soil, the sand-crabs are equally restricted to the beach and the clean dry sand of the dunes, there forming one of the most conspicuous features of the locality. Although they do not occur in such immense numbers as the fiddlers, they are numerous enough to act as efficient scavengers in their own territory; and, particularly during the summer months, hundreds may be seen in a few minutes' walk. At times they gather in troops of considerable size, though never very closely aggregated, and march together to near the water's edge. Each one throws up a little embankment of sand or digs a slight pit for himself, and they all lie in wait for their prey. When disturbed at such times they scamper *en masse* into the surf, and such is their custom, also, whenever caught too far away from home. But they are apparently not at ease under water, and seek the first chance to creep safely out. Whenever a shark or other large fish is rotting on the beach, they fairly invest the carcass, encamping closely about it, and not raising the siege as long as anything edible is left. I think their holes, the mounds around which dot the neighboring sand, usually or often connect with the meat under ground; because in digging out remains of cetaceans, the crabs are often turned out with the

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spade. The holes are usually just large enough to admit the hand a little way, and pass in every direction downwards; may be straight or tortuous, and from a few inches to a yard or more in depth; two or three feet may be an average excavation. Usually the sand is heaped up about the entrance, and forms quite a conspicuous mound. It is apparently simply pushed out in most instances; but in one instance that I examined with particular care, this was not the case. The hole was in perfectly dry and drifting sand, and all around, at varying distances, from a foot to over a yard from the entrance, lay little separate piles of fresh wet sand brought up from below; a different set of tracks leading to each heap. This showed that the animal had repeatedly brought up an armful of sand, and dumped it at some distance. The holes, I may add, are almost invariably placed above ordinary high-water mark, mostly in the flat dry shingle separating the beach proper from the adjoining sand-drift dunes. A small proportion of the crabs live in the sand-drifts still back of this, and a few others come about the houses near the fort, digging in odd corners, and to all intents and purposes replacing the house-rats. Their remarkable swiftness of foot is well known; and when brought to bay, their pugilistic attitudes and actions are as noticeable as is the sly cat-like aspect they present when crouching closely, in hopes the intruder will pass them unnoticed, or in lying in wait for prey. The large claws are of porcelain-like whiteness and hardness, and capable of inflicting a wound not to be overlooked in a moment; but the general covering is so soft that the animals are disabled, or even killed outright, by being simply dropped upon the hard sand from the height of a man's head. The young, which are at first spotted, and bear little resemblance to the adults except in shape, begin to appear in the latter part of April; and they are an inch or more wide before they begin to assume the general dull yellowish color of the adults. These crabs are put to no use, except to afford excellent sport to boys and boyish men, who bait them with their canine companions.

Pinnotheres ostræum.

The oysters furnish the usual numbers.

Persephona punctata.

Common, on the sand-bars, &c.

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Hepatus decoris.

Dredged, and found on the beach.

Hepatus angustatus, White?**Hippa talpoides, Say.**

Very common, in sheltered portions of the sandy shore, the sand-bars, clear tide pools, &c. They often gather in large numbers in the pools among the stone jutties along the beach, actively swimming about in a manner that forcibly recalls the similar sports of the *Notonectes*, and burying themselves in the sand with remarkable speed. Females with eggs were taken early in May.

Eupagurus pollicaris, Stimp.**Eupagurus longipes, Stimp.**

These two hermits are found in every locality about the harbor, except it be, perhaps, along the open beach, and in the muddiest parts of the marsh. They were dredged in the deepest portions of the channel, and are numerous in the tide-pools along the shore and on the sand-bars. The smaller species is much the most abundant, and finds ample accommodation in *Nassa obsoleta*, of which there are thousands dead everywhere, *Littorina*, and shells of similar shape; the other is usually taken in young *Busycons*, *Fasciolarix*, and the *Cancellaria reticulata*.

Palæmon vulgaris, Say.

(? *Palæmonopsis carolinus*.)

Peneus braziliensis, Latr.

The smaller shrimp I only noticed about the pools in the marsh, where it is extremely abundant. It is not, to my knowledge, used in this locality, as the other frequently is. The latter occurs in great numbers along the inner shores of the harbor and about the sand-bars, and more sparingly in clearer parts of the marsh.

Homarus americanus.

One specimen was taken during the summer of 1870, the first I ever heard of in this locality; and it was a question whether it had not been lost overboard from some vessel coming southward.

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ENTOMOSTRACA.

Limulus polyphemus.¹

Common, but much less abundant than further north. It may be taken at any season, but is especially numerous in May, when it resorts to the shoal water about the harbor to spawn. About the middle of this month hundreds were noticed on Bird Shoal, these mostly copulating or seeking to do so; and all the females examined were laden with eggs. One specimen taken presented a curious monstrosity, having the tail bifurcated at the extremity for over an inch. One of the forks was rather smaller than the other, and stood out more obliquely from what appeared to be the proper termination.

CIRRHIPEDIA.

Balanus eburneus?

In profusion, on all hard submerged objects.

Two other species of cirrhipeds occur, chiefly, it would appear, on wood, &c., that has floated from some distance southward.

ANNULATA.

BRACHIOPODA.²**Lingula pyramidata, Stimp.**

This animal can be procured in any desired numbers, with little trouble, in a particular part of the harbor. After numerous trials, the best place was found to be the southern side of Bird Shoals (side next the fort), and in a straight line between the flagstaff upon the fort and the large building at the eastern extremity of

¹ On the development of this animal, see Lockwood, S., "A Contribution to the Natural History of the King Crab," read October, 1869, N. Y. Lyc. Nat. Hist.; and "The Horse-Foot Crab," Am. Nat., IV., July, 1870, p. 257; and A. S. Packard, jr., abstract of a paper read before the 19th meeting of the A. A. A. S. in the Am. Nat., IV., October, 1870, p. 468.

² Mr. E. S. Morse's discussions of the position and relations of the group, as "a division of *Annelida*," which have attracted so much attention, will be found in the Am. Nat., IV., July, 1870, p. 314; Am. Journ. Sc. and Arts., 1870, (abstract from Pr. Bost. Soc. N. H.); Am. Nat., IV., Oct. 1870, p. 493 (abstract from Proc. of 19th Meeting of A. A. A. S.). An abstract of a paper by W. H. Dall in the same number of Nat., p. 510, gives an opposite view of the case. Prof. W. C. Kerr (abstract of a paper in Am. Nat., Nov. 1870, p. 571) ascribes the origin of the Carolina phosphates to *Lingula*.

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the town of Beaufort. This is a solid and apparently nearly stationary part of the shoals, where the sand is somewhat packed and matted with a scant growth of some marine grass. No specimens whatever were found, although carefully sought for, in more exposed and shifting parts. As the shoal is flooded over with two or three feet of water at high tide, and the animal lives only about at or below low-water mark, it can be gathered only during an hour or two when the tide is fully out. They will be found a few inches below the surface, and may readily be procured by the expedient devised by Mr. Morse, of digging up spadefuls of sand, and sifting it through a coarse sieve held partly under water. It will be found most convenient to wade into the water where it is a foot or less deep, and dig there, as there is then no necessity of carrying the sieve back and forth. In this way Mr. Morse, Dr. Packard, and myself once procured over fifty in about an hour, and I several times took twenty or thirty in the same time. They should be carefully picked out from the stems and roots of the grass in which they are found entangled after sifting, and placed in a basin or bottle of water with some clean sand, where they may be kept alive for an indefinite length of time. Mr. Morse wrote me that all the specimens he took north in May, were alive several months subsequently. Other interesting specimens may be procured along with the *Lingulas*, in the same way; as numerous tubicolous worms, an ophiuran, *Renilla*, and the rare and highly prized *Branchiostoma*.

CEPHALOPODA.

I have not the means of identifying the following species, and merely presume that the names may be correct, from the circumstance of their occurring in Kurtz's list.

Octopus granulatus, Lam.

One specimen, measuring about three feet across the tentacles, was brought to me in winter by some fishermen, who considered it a rarity.

Loligo brevipinna, Lesueur.

Rather common; several specimens obtained at different seasons.

The collection of *Marine Shells* was referred to Sanderson Smith, Esq., for determination; and the names in the following
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list, with a few exceptions, rest upon his identifications of the specimens. His critical observations are introduced between quotation marks. My own notes, though merely those of a collector, may prove of some use to future observers in this locality; their general accuracy is believed to be unquestionable.

In May, 1870, Dr. Packard and Prof. Morse visited Fort Macon, bringing a dredge; and all the species exclusively obtained with its use are among the results of our joint collecting.

The list is restricted to the species actually collected, and contains a few not previously recorded from this locality.

I cannot do better than to reproduce in this connection a part of the prefatory remarks in Dr. Stimpson's article.¹

"The vicinity of Cape Hatteras, the most projecting point of our coast south of New York, has peculiar interest to the student of zoology. This Cape, which divides the Areniferous region into two nearly equal parts, the Virginian and Carolinian provinces, is remarkable for the exhibition of a fauna more tropical in character than that of either of these provinces. * * This is an evident result of its proximity to the gulf stream, the warm waters of which are even said to be deflected directly upon the cape after violent southeast gales.

"* * The harbor of Beaufort is situated at one of the southern outlets of Pamlico Sound, where it joins Bogue Sound. It is shallow, and much obstructed by extensive shoals. * * The bottom is generally sandy, but that of the deeper channels is shelly, and that of the shallower channels often muddy. Outside the harbor, and off the coast, the depth never exceeds eight fathoms within a few miles of the land, with a variable bottom, sometimes 'sticky' or clayey. * * In following the beaches, we observed a decided increase of the tropical character as we proceeded eastward toward the Cape.

"Geologists will be interested to notice the occurrence of several species hitherto only known as Tertiary fossils, such as species of *Axinæa*, *Lucina*, *Astarte*, *Amphidesma*, *Tellidora*, *Myalina*, *Panopæa*, *Entalis*, and *Columbella*. These were found either alive or in such condition as showed them to be recent shells, which would doubtless have been found alive upon further search. The occurrence of *Myalina subovata* is interesting, although our specimens

¹ American Journal of Science, May, 1860.

of this species, as of *Amphidesma constricta*, are not certainly recent, being only single valves. Of the beautiful *Tellidora lunulata* we obtained several living examples, some attaining a length of nearly two inches. Among the shells of a tropical character several species will be noticed which have not hitherto been found north of the West Indies, and do not exist upon the South Carolina coast."

Beaufort, Fort Macon, and the Morehead Depot are nearly equidistant, and about two miles from each other. Vessels of ordinary tonnage reach Morehead by the nearly direct ship-channel, but none larger than schooners of the lightest draught can reach Beaufort, between which and Fort Macon lies a small island. The entrance to the harbor is comparatively narrow; and as a large body of water passes through it twice a day, the current in the main channel is strong. This sweeps sharply close past the projecting extremity of Bogue Banks, but its erosive action seems to be about counterbalanced by that of the S. to W. winds which almost constantly prevail, depositing sand as fast as it is removed. I can account only in this way for the permanence of this, the most exposed point in the harbor. The waters that pass through the main outlet are collected from several widely separated directions from E. through N. to W.; and this is one evident cause of the numerous shoals that now obstruct the harbor, deflecting the different currents, and increasing as well as continually varying their conflict with each other. As a result, the hydrography of the harbor is notably inconstant, and surveys can be relied on in detail only for comparatively short periods. The channels and minor water-lines are especially susceptible of change, because the land consists almost entirely of loose sand. No better illustration of general instability is required, than the present condition and situation of what was once the site of Fort Hamilton; now a slight shoal indicated by breakers between Fort Macon and the western point of Shackleford, nearly a mile from the present Fort. This last has only been preserved from the encroachment of the sea, which once washed the base of the glacis, by a system of stone breakwaters laid down on the outer beach, which have carried the water-line outward one or two hundred yards. Details of the contour of the beach change noticeably with every considerable storm; and within the harbor, the shoals have very perceptibly varied in extent and shape during the short

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time they have been under my observation. Bird Shoals, the most extensive of these, is believed to be now cutting in two; and it will probably in time form two islands, covered with vegetation, like the "town marsh," above mentioned as now lying between Beaufort and Fort Macon. A current directly across it, in a line from Beaufort to the point of Shackelford, is already perceptible during a part of each tide.

The formation of the long, narrow islands that girt so large a portion of the southern coast, is excellently shown here. Along a considerable part of Shackelford and Bogue Banks the loose sand is blown by the prevailing off-sea winds, and heaped up to such extent, in some places, as to bury trees twenty feet high. At other points the reverse action of the elements is witnessed, in the stumps of trees, apparently cedars, that are denuded at low tide.

The general character of the shells that are so abundantly strewn on the outer beaches, may be gathered from the list; of these, as distinguished from those not likely to be procured except by dredging, the list is believed to contain very nearly all; the exceptions being chiefly such as only occur nearer Hatteras, alluded to in Dr. Stimpson's article. The abundance of fossil species found on the beach, as the several *Arcas* and others, is especially noteworthy. I should judge that nearly half the number of individual shells (not, of course, of the species) are not certainly recent. In the harbor, Bird Shoals will be found the most fruitful collecting-grounds when the dredge is not used. This is a mile or so long, by half as wide, almost perfectly flat, alternately covered with two or three feet of water and completely exposed. The edges are loose and shifting, but most of the surface is somewhat fixed, and supports a slight sparse growth of marine plants. This portion affords the best things. A considerable proportion of the living shells of the locality may be found there. The sand is full of tubicolous worms of several different species. Several Echini, star-fishes, and jelly-fishes lie just about its edges. It is the favorite spawning-ground of *Limulus* and two or three *Busycons*. An Ascidian, an Ophiuran, *Renilla reniformis*, and *Synapta* (?), are abundant. Two or three specimens of the rare *Branchiostoma* were secured in sifting for *Lingula pyramidata*; of which last, as stated elsewhere, any desired quantity can easily be procured

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In forming the present collection of marine invertebrates, every part of the harbor was pretty thoroughly explored with the dredge, which, however, was not used outside. Nearly everywhere the depth of water proved less than we had been led to expect, and the bottom freer of everything except shelly detritus. Upon the whole, the results of dredging were not in a usual ratio, in interest and importance, with those of collecting by hand on the shoals, &c. I mention this fact, which surprised us at the time, as it goes to show the changeableness of the locality. Probably some of the dredging-grounds worked over by Drs. Stimpson and Gill, in 1860, are not now such.

The following names occur in Dr. Stimpson's list and not in the present one:—

Cynthia vittata; *Molgula* sp.; *Ascidia* sp.; *Plicatula* sp.; *Lima* sp.; *Axinæa* sp.; *Arca cælata*; *Pinna carolinensis*; *Modiolaria lateralis*; *Lucina cribraria* and two other species; *Felania*; *Lepton lepidum*; *Astarte undulata*; *Trigona* sp.; *Venus rugosa*?; *Chione pygmæa*; *Lucinopsis* n. sp.; *Semele reticulata*; *Tellina fausta*, *versicolor*, *constricta*, *T. sp.*, *T. n. sp.*; *Strigilla carnaria*; *Tellidora lunulata*; *Solen viridis*; *Saxicava distorta*; *Lyonsia* sp.; *Pholadidea cuneiformis*; *Tornatella punctostriata*; *Dentalium* sp.; *Clypidella pustula*; *Scalaria turbinata*, *multistriata*, *novangliæ*?; *Turbonilla* sp.; *Volva uniplicata*; *Mangelia rubella*, *filiiformis*; *Columbella* sp.; *Nassa ambigua*?; *Cerithiopsis*? n. sp.; *Acus concavus*.

Additional ones of the present list are: *Pecten* sp. (fossil?); *Arca occidentalis*, *transversa*, *limula* (fossil?); *A. sp.* (fossil?); *Modiola castanea*?; *Gemma tottenii*; *Strigilla* sp.; *Cochlodesma leana*; *Crepidula*, var. *intorta*; *Pleurotoma plicata*; *Marginella apicina*; *Cypræa exanthema*; *Nassa*?; *Rapana cinerea*.

Some of the undetermined names in the two are presumably the same, and several of those in Dr. Stimpson's list have without doubt been also found by me, but, in consequence of the miscarriage of a box containing them, were never finally determined.

ASCIDIA.

A species we have not determined is very common on Bird and other shoals

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LAMELLIBRANCHIATA.

Anomia ephippium, Linn.

Abundant in all situations.

Ostrea virginiana, Latr.

Abundant, of excellent quality; worth, according to season, from 25 cents to 50 cents per bushel.

O. equestris, Say.

Abundant; adhering to rocks, with *Modiola* and *Mytilus*.

“Prof. Stimpson informs me that this is not a N. C. species, although it is in his Beaufort list. The specimens seem to me to agree exactly with Say’s description and figure; they are short and small, with from six to twelve denticulations on the upper valve near the beak, received into corresponding depressions on the edge of the lower valve.”

Plicatula depressa, Lam.

Frequent. Beach.

Lima scabra, Born.

Nos. 2615–6–7, dredged in the channel.

Pecten dislocatus, Say.

Abundant. All the live ones I saw were on the sand-bars and somewhat muddy flats about the harbor; the worn and variously discolored valves are strewn everywhere. The scallops bring a high price in the market; the muscle is considered the only edible part. These molluscs, and the large *Cytherea*, furnish some part of the food of the herring gulls in winter.

“Distinguished by the interrupted and dislocated colored markings from *P. irradians*, Lam., which has concentric bands of color. Some of the specimens probably belong to this last species; but all the perfect ones I examined, even though showing prominent concentric bands, display the zigzag markings, especially when placed in water, so as to bring out the colors.”

Pecten concentricus, Say. (*P. irradians*, Lam.)

Among the interminable variations in color of worn specimens, some are pure white, or with only faint coloration in apparently perfectly regular and concentric bands.

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Pecten nodosus, Lam.

Apparently very rare; one valve only (No. 2584); beach, worn, in winter.

Pecten, sp. indet.

One specimen (No. 1687), fragment of a large species. "Probably fossil."

Pectunculus, probably *charlestonensis*, Holmes.

A few specimens (Nos. 1704, 2504, 2640) from the beach.

"I think there is another species, much smaller. There ought to be a good many fossil *Pectunculi*, of which eleven species are given by Conrad in his list of the miocene shells of the Atlantic slope, most of them from North or South Carolina. Living or fresh specimens would be of great interest."

Arca americana, Gray.

Very common, beach and elsewhere, both living and dead.

Arca holmesii, Kurtz.

Beach and elsewhere; very common.

"I have seen no detailed description nor authentic specimen of this species, and am uncertain whether a detailed description has ever been published. I feel no doubt, however, of the correctness of the identification" (of Nos. 2500, 49, 50, 1, 3, 4, etc.).

Arca lienosa, Say.

Beach, frequent; all the specimens I gathered were discolored and more or less worn.

"Fossil? Say described it as fossil, but Stimpson has it in his recent list."

Arca noæ, Linn.

More abundant than the next, to judge from specimens gathered indiscriminately. Beach; generally much worn.

"*A. zebra* Swainson, according to Say. Whatever is the proper name of this, it is certainly the shell that Say describes and figures (Conchology, Binney's Reprint, p. 229, fig. 66)."

Arca occidentalis.

Beach, common; usually worn.

"Prof. Stimpson says this is different, and I see a very plain distinction; in *noæ* the ribs are alternately large and small, while

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in *occidentalis* the larger ribs are comparatively few and distant, with three or four smaller ribs between each pair."

Arca transversa, Say.

"I find some small specimens that I think are this species, but am uncertain whether they are not the young of some of the others, especially as Stimpson does not include it in his Beaufort list. Kurtz, however, gives it from both N. and S. C." I should add, that Prof. Stimpson, in looking over an early lot of shells I sent to the Smithsonian, made the same identification, presumably from the same specimens that Mr. Smith subsequently received.

Arca limula, Conr.

Beach, frequent. The specimens were without exception grayish or rust-colored, with a chalky appearance in places.

"Fossil? Conrad quotes it as a miocene fossil from the Neuse River, below New Berne, and from Wilmington, N. C. It agrees perfectly with Conrad's description and figure (Mioc. Foss. U. S., p. 60, pl. 31, fig. 3)."

Arca ponderosa, Say.

Beach; fresh or living specimens, common.

Arca incongrua, Say.

Beach; the most abundant of the genus, apparently; and, with the last, oftenest found alive.

Arca.

"Numerous specimens, all I think fossil; and I have not the means of determining them."

Nucula proxima, Say.

Dredged, in the channels.

Yoldia limatula, Say.

Beach, occasional, and dredged.

Leda acuta, Conr.

In the sand, frequent, Bird Shoals.

Pinna seminuda of Kurtz's list.

Abundant. There may have been another species among the many specimens gathered, only a few of which were forwarded.

Avicula atlantica, Lam.

Not common; only two specimens secured.

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Modiola plicatula, Lam.

Very abundant, in the muddier parts of the marsh, below high-water mark, and thence part way out to the beach; but no live ones seen in the sand of the beach itself. In the former situations, the shells closely assimilate in color to the ground in which they are partly imbedded; in the sand, they are clearer, and show the purplish hues. The larger ones are generally found singly, anchored to bits of stick, the roots of plants, etc.; the smaller, in masses, along with *Mytilus*, adhering to plats of raccoon oysters, the stones of the wharves at Beaufort, and the jutties of rock on the beach.

Modiola americana, Leach.

Rather uncommon, on the beach only; none found alive, and most somewhat worn.

“Krebs gives ‘*M. americana* Tarvart d’Herbigny (*M. americana* Leach? *M. tulipa* Link, etc.)’ and does not quote *M. tulipa* otherwise. Stimpson gives in the Check List *M. americana* (Leach), and among the doubtful species, *M. tulipa* Lam. In the Beaufort List, he gives both *M. americana* and ‘*M. tulipa*.’”

Modiola castanea, Say?

A single specimen, dredged alive in the channel.

“I have never seen an authentic specimen of this species, which Kurtz in his catalogue gives only from S. C. It seems to differ from *M. americana*, and to agree exactly with Say’s description.”

Mytilus carolinensis.

Abundant; adhering in masses to rocks and bunches of oysters.

Mytilus edulis, Linn.

Beach.

Mytilus cubitus, Say.**Chama arcinella**, Linn.

Beach; rather uncommon.

Chama macrophylla, Chemn.

Beach and elsewhere, abundant. Dr. Stimpson informs me that this is near its northern limit.

Cardium magnum, Born.

The most conspicuous shell on the beach, by reason of its size
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and striking variegated colors, as well as its abundance. Dead shells are strewn everywhere; and live ones (mostly young) may be found in every part of the harbor.

Cardium muricatum, Linn.

Beach; rather common.

Cardium isocardia, Linn.

Beach; common.

Liocardium lævigatum, Lam.

Beach; not uncommon; almost always worn, and with slate or blackish discoloration.

"*Cardium lævigatum* Lam. is given by Hanley as a syn. of *C. serratum* (Linn.), and *C. lævigatum* (Penn., and Linn?) as = *C. serratum* Lam. The first named is our species, the other coming from England."

Liocardium mortoni, Conn.

Dredged, and on the beach; but apparently not abundant.

Lucina strigilla, Stimp.

Extremely abundant everywhere; but no live ones seen. This is a favorite with the population in the vicinity for what they consider ornamental purposes—as, to paste on picture-frames, along with *Donax variabilis*, *Tellina alternata*, *Sigaretus perspectivus*, and *Scalaria humphreysii*.

Lucina chrysostoma (*L. radula* of Kurtz's list).

Very common, beach and elsewhere; no live ones seen.

Diplodonta ? punctata, Say.

Dredged.

Astarte lunulata, Conr.

Dredged; apparently rare.

Cardita tridentata, Say.

Dredged, one or two specimens.

Mercenaria violacea, Schum.

The representative species, and extremely common.

Mercenaria violacea var. notata.

Several specimens, among numbers of round clams indiscriminately gathered.

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Mercenaria mortoni, Conr.

The quahogs with prominent recurved concentric laminæ are common, and, so far as I am able to judge, readily distinguishable from the more usual kind. Very large specimens (five to six inches) are scattered over the sand, half buried, on Bird or other shoals, where I did not notice *M. violacea*. I have seen boat-loads brought for sale, consisting entirely of the ridged kind, and was assured that they occurred in certain localities to the exclusion of the other species. The fishermen seem to make a distinction, and certainly I saw none that I hesitated to discriminate. Young specimens (two to three inches) are quite smooth between the fewer and sharper laminæ; in the largest ones the ridges become blunter and more crowded, and the whole surface is rugged.

Gemma totteni, Stm. (*Venus gemma*, Tott.)

Dredged.

Chione cancellata, Linn.

An abundant shell.

Cytherea convexa, Say.

Strewn in numbers over the beach. Of the many examples gathered, all show gray or olive discoloration, and are much eroded.

“Fossil? Stimpson does not give it, and Kurtz marks it ‘N. C., fossil?’ If fossil, the specimens are probably *C. sayana* Conrad, which he described and figured in his Miocene Fossils of the United States as identical with Say’s *convexa*; but in his Catalogue of the Miocene Shells of the Atlantic Slope (Pr. A. N. S. Phila., 1862, p. 575) he states it to be different. I have seen no notice of the differences. It would be well to search for living shells.”

Cytherea gigantea, Chemn.

An abundant and conspicuous species of the sand-bars and half muddy flats in the harbor; also dredged in the channel; not seen on the beach. The colors of equally fresh specimens vary much, in the general hue, and in the distinctness of the radiating dark lines; the young are generally brightest. They are always more or less scratched about the most convex part, where much of the epidermis may be worn off. This mollusc is a favorite article of food with the gulls; the birds hold them under foot much after the manner of hawks with their prey, and

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break in one valve by repeated blows with the beak—a tedious process, it seemed, in some cases that I watched. The fracture of this shell is clean, sharp, and almost vitreous.

Dosinia discus, Reeve. (*Artemis concentrica*, Born.)

Very abundant; the dead ones, almost always with the hinge intact, are conspicuous on the beach; and some live specimens were procured about the harbor.

Lucinopsis, sp. indet.

Dredged.

Petricola pholadiformis, Lam.

Dead shells are common everywhere, but especially on the beach.

Raeta canaliculata, Say.

Beach, very abundant.

Raeta lineata, Say.

Not ordinarily common; but occasionally, after storms that seem to disturb some special situations they inhabit, they are strewn on the beach in large numbers.

Mactra raveneli, Conr.

Strewn in profusion on the beach and elsewhere. Most of the worn specimens are variously discolored.

“Probably what is catalogued as *M. oblonga*, Say, by Kurtz and Stimpson.”

Mactra similis, Say.

With the last; not so common.

“I find among the specimens some that I think are this, but it is a doubtful species.”

Mactra lateralis, Say.

Abundant, with the first.

Donax variabilis, Say.

Very abundant; living a few inches below the surface of the sand, chiefly of the beach itself. At certain states of the tide, &c., they are in the habit of coming to the surface, and of disporting with considerable agility. They must, however, be somewhat cautiously watched, as they have a sense of observation, whatever it may be, that informs them of probable danger, and causes them

to disappear below with a degree of celerity that astonishes one who observes it for the first time.

This species is very appropriately named. In looking at some hundreds, I have found very few alike in color. After death the valves, like those of *Dosinia*, long remain joined.

Cumingia tellinoides, Conr.

Dredged; apparently not common.

Semele orbiculata, Say.

A few specimens, dredged in the channel.

Amphidesma constricta? Philippi.

Dredged? (Label misplaced.)

Abra æqualis, Say.

Common; valves on beach and elsewhere; and dredged.

Tellina alternata, Say.

The largest and most conspicuous, if not also the most abundant, species of the genus noticed. Valves everywhere; and dredged.

Tellina tenera, Say.

Tellina tenta, Say.

Tellina iris, Say.

These three species are common; *tenta* apparently less so than the two others; the specimens of it were all, I think, picked up on the beach, where both *tenera* and *iris* also occur. The two last, however, are more abundant on the sand-shoals, and in shallow dredging-ground; and, in particular, numbers of them were taken among eel-grass with *Bittium* sp., which see. Some of the several other species of the genus given by Stimpson may also have been taken; but if so, were not identified.

Tellina polita, Say.

Strigilla flexuosa, Say.

Dredged.

Strigilla, sp. indet.

Solen ensis, Linn.

Abundant. Younger shells, living, are very numerous on Bird Shoals. *S. viridis* was not obtained.

Siliquaria gibba, Spengl. (*Solecurtus carri bæus*, Lam.)

Very common; dead valves are plentiful on the beach, but still

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more so on the shingle at the mouths of the estuaries that make from the marshes into the harbor, where the best specimens may be found.

Siliquaria bidens, Chemn.

Common, on the beach only, where all the numerous specimens were gathered.

Solemya velum, Say.

Not uncommon; living specimens dredged, and taken on Bird Shoals, a few inches below the surface.

Mya arenaria, Linn.

Not common, comparatively; occasional valves occur anywhere, but the species is not known here as an article of food.

Corbula contracta, Say.

Dredged; a few specimens.

Myalina subovata, Conr.

Dredged; a few specimens.

Panopæa americana, Conr.

Apparently rare; two specimens; one valve (No. 1818), very large, worn, was found on the beach, in winter; another (2494a), fresher and smaller, was taken the next winter, after one of the storms that threw up numbers of *Raeta lineata*.

Gastrochæna, sp.

Dredged; one specimen. I do not find the name among Mr. Smith's mss., and think it was an identification of Mr. Morse's.

Cochlodesma leanum, Conr.

Lyonsia hyalina, Conr.

Dredged, I think (label misplaced).

Pandora trilineata, Say.

One specimen (No. 2618); beach.

Pholas costata, Linn.

Beach, very common.

Pholas truncata, Say.

Beach, frequent. As in the cases of several other species, I found valves quite plentiful at intervals, between which none were seen.

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GASTEROPODA.

Polycera ? sp.

One specimen, dredged in the deeper part of the channel, about an inch long, noticeable for its bright blue and yellow tentacles.

Aplysia ? sp.

Two specimens of another nudibranch were taken Aug. 3, 1870, as they were floating on the surface of the water in the harbor, and the same species was subsequently several times seen. The animals were quite lively, moving about freely, especially if irritated, by a regular waving motion of the free edges of the tunic. When most contracted, they were of a flattened and somewhat irregularly oval shape, some three inches long; and were capable of stretching out between six and seven inches. Placed in water, the color appeared of a clear warm brown, pellucid-punctate all over; these whitish dots gathered in irregular patches, changing their contour with the animal's motions; when it was closely contracted, an open network of dark lines appeared all over the surface. Out of water, the whitish patches confer a general glaucescence upon a dull brown ground. The animal is tinted, especially behind, with carmine, from the deep lake-colored, viscid, glairy fluid it emits in a stream, apparently at will. Black eye-specks, distinct at the base in front of the posterior pair of tentacles. I have not the means, at present, of identifying the species, which seems to be not at all rare, but presume that it may be recognized by the above description.

Utriculus canaliculatus, Say.

Dredged, and on the beach.

Bulla solitaria, Say.

Dredged.

Chiton apiculatus, Say.

Fragments on the beach, and one perfect specimen, dredged.

Entalis pliocena, T. & H.

Numerous specimens, all dead; beach, and dredged.

Crepidula fornicata, Linn.

Very abundant, and the one oftenest found alive; one, or several together, upon the outside of other larger shells.

Crepidula fornicata, var. intorta, Say.

Several specimens.

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Crepidula convexa, Say.

Common.

Crepidula unguiformis, Say.

Common; dead, anywhere; and alive, adhering to the *inside* of shells, such as *Neverita*, etc.

Fissurella alternata, Say.

Common; chiefly on the beach.

Zizyphinus, sp.

Very rare; a single specimen, dead, on the beach (No. 2516).

Turbo crenulatus, Gm. ?

A single *worn*, incrustated specimen (No. 2595), from the beach, evidently transported from a distance.

“Exactly like Cuban specimens marked *T. hippocastaneus* = *T. castaneus* (Chemn.), which, however, I do not find recorded from our coast.”

Littorina irrorata, Say.

Extremely abundant, in the marsh; generally seen crawling up the culms of reeds and grasses, from which they drop at a touch. During summer they are so numerous in some places, that they almost give color to the herbage.

Scalaria humphreysii, Kiener.

“Blood-shells,” so called often, from the purplish color of the soft parts that appear at the opening. Very abundant, chiefly on the beach, where occasionally they may be found touching each other, if not heaped. The purity of color and pleasing form of this shell render it a great favorite for those peculiarly ugly fabrications called “shell-frames.”

Scalaria lineata, Say.

Common everywhere.

Solarium granulatum, Lam.

Vermetus radricula, Stimps.

Common.

Cerithium, sp.

Some specimens, as 1782, which apparently Mr. Smith did not receive, were mentioned to me by Dr. Stimpson as “*Cerithium ferrugineum*?”

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Bittium nigrum, Tott.

Bittium greenii, C. B. Ad.

Dredged.

Bittium, sp.

Extremely abundant in the shallowest and most sluggish parts of the harbor, adhering to marine plants. On forcing a boat through beds of this vegetation, where the water hardly covered the dredge, we took scores of specimens in a few minutes; and the same haul showed the following: *Tellina tenera*, *T. iris*, *Columbella avara*, *Abra*, *Nucula*, *Corbula*, *Obeliscus*, *Turbonilla interrupta*, *Arca holmesii*, *Nassa vibex*, *obsoleta*, &c. The *Bittiums* were blackish, and covered with vegetable matter.

Triforis nigrocinctus, C. B. Ad.

Dredged.

Odostomia seminuda, C. B. Ad.

Dredged, in deeper waters.

Odostomia impressa, Say.

Dredged, with the last.

Turbonilla interrupta, Tott.

Beach and dredged.

Turbonilla? sp.

Specimens in a large miscellaneous lot gathered on the beach.

Obeliscus crenulatus, Holmes.

Dredged.

"I have not access to Holmes's description, but think this must be his shell."

Eulima oleacea, Ktz. and Stm.

Dredged? (Label misplaced.)

Sigaretus perspectivus, Say.

Very common. Dead shells are plentiful everywhere; and on Bird Shoals the live animals are frequently found. The largest animals measured about four inches across, with a shell of an inch or more.

Natica pusilla, Say.

Not common. Two or three specimens dredged.

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Neverita duplicata, Say.

Abundant.

Cypræa exanthema, Linn.

Rare; one specimen (No. 1810), a worn fragment, so identified by Dr. Stimpson.

Pleurotoma cerina, Ktz. and Stm.

Dredged.

Pleurotoma plicata, C. B. Ad.

Dredged.

Marginella apicina, Menke.

Dredged, and frequently found on the beach.

Oliva litterata, Lam.

Very common; called "Key-shells."

Olivella mutica, Say.

Very abundant; "Bead-shells."

Columbella avara, Say.

Common; beach, shoals, and dredged in various parts of the harbor. "Some are of unusually bright colors."

Columbella ornata, Ravenel?

Several specimens.

Columbella lunata, Say.

Several specimens dredged.

Dolium galea, Linn.

Beach, frequent.

Semicassis granulosa, Brug.

Common.

Cassis cameo, Stm.

Common; but I never saw it alive, and nearly all the specimens noticed were worn, and usually also with slate discoloration.

Purpura floridana, Conr.

Rare, I should judge, having obtained but few specimens—Nos. 1757 and 2588 (a broken one), and two live ones.

Ilyonassa obsoleta, Say.

I should judge this to be the most abundant shell of this locality, *Littorina*, even, not excepted. Myriads cover the sand-1871.]

shoals and mud-bars of the harbor, and the mud of the marshes, in some places so thickly that no step can be taken without treading them under foot. They may be dredged at all depths; and bleached shells are heaped in some places. Such numbers, in devouring decaying vegetable substances, must exercise decided influence in the natural economy of the locality. The dead shells of this as well as of the species of the next genus afford the most usual accommodations of the smaller *Eupaguri*. Many specimens may be found with the apex perfect; but in such cases it is usually lighter colored and more fragile than the rest of the shell, as if already devitalized.

Nassa vibex, Say.

Common.

Nassa trivittata, Say.

Common.

Nassa ——— ?

Several undetermined specimens; and others marked "*Nassa vibex*?"

Cerithiopsis terebralis, C. B. Ad.

Dredged, in the channel.

Acus dislocatus, Say. (*Cerithium petiti*, R.)

Very abundant. The species lives mostly on the shoals and in the shallower dredgings; dead shells are found everywhere.

Rapana (Fusus) cinerea, Say. (*Buccinum plicosum*, Menke.)

Common on the beach and dredged in various places. The shells are too numerous to be likely to escape ordinary observation (and the species may have been accidentally omitted from Dr. Stimpson's list). "I have some doubt about this identification, as there appears to be some difference in the canal and outer lip; but if not this, I do not know what it is."

Busycon pyrum, Dillw. (*Fulgur pyruloides*, Say.)

Not common; two or three specimens only, dead, from the beach.

Busycon canaliculatum, Linn.

Common, but less so than the next. While the many specimens examined seemed to me constant in form, the colors are notably variable. Nearly all are white, more or less pure, outside, but the older ones have a rough brownish epidermis; inside, the

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tint varies from nearly white or pale delicate yellow to bright salmon-color.

Busycon carica, Linn.

Abundant; probably there are ten or more of this to one of the last or of the next. They are used for food by the lower classes.

This pyrula spawns in May. I have observed and taken numerous specimens with the egg-case issuing from them. At this season the females resort to the shoals covered with a foot or so of water at high tide, and exposed at other times. They bury themselves a few inches below the surface of the sand, and doubtless remain stationary during the whole process, which appears to require considerable time (not ascertained, even approximately). The case is thrust upward through the sand, and at length appears above the surface, lying exposed, and thus indicating the whereabouts of the animal. The string begins as a simple shred of the substance, two or three inches long, without proper cases. The first few cases are imperfect, smaller than the rest, and of decidedly different shape; one or more may not contain young shells. They regularly increase in size, and assume with equal regularity the perfect shape. The string is spun out to an average length of between two and three feet; the cases are largest and most closely packed at or just beyond the middle; the series generally terminates more abruptly than it began.

These egg-cases have the form of those ascribed to *Pyrula canaliculata* by Mr. Smith (Ann. Lyc. Nat. Hist. N. Y., vol. vii, p. 150), and by Mr. Geo. H. Perkins (Proc. Bost. Soc. Nat. Hist., vol. xiii, p. 115). Mr. Smith writes: "I have determined the species to which each form of egg-cases belonged simply by comparison of the young shells contained in them with adult specimens of *P. carica* and *canaliculata*; and have ascertained from Mr. Perkins that he made his determination in the same way. I have made a comparison of the young shells contained in the broad-edged cases coming from Fort Macon, with similar ones from Rockaway, L. I., and find them to agree exactly. Mr. Perkins and myself are therefore evidently wrong, the broad-edged cases belonging to *P. carica*, and the sharp-edged to *P. canaliculata*." Egg-cases of the broad form are abundantly strewn on the beach and elsewhere, especially during the summer months; but I do not now call to mind that I ever noticed the sharp-edged ones.

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Specimens of this species, or of one closely resembling it, vary remarkably in color, and to a notable degree in general contour, number of spines to a whorl, their length and stoutness, &c. Younger individuals, up to three or four inches in length, are much variegated, but pretty regularly so, with the brown bands; the full-grown ones are too different in this respect to be concisely described. The oldest lose distinctive coloration, from the growth of rough dark epidermis, and are usually incrustated with foreign substances, as well as often with balani, ostreae, &c. Inside, the shells appear to have no determinate color; this varying from indefinite whitish, with some variegation from the colors outside showing through (in young specimens), to yellowish or tawny; and finally, in mature spring specimens at any rate, to brilliant salmon—almost red. I should judge that the coloration could afford no reliable specific characters. The shells bleach pure white in time, passing through a tawny or rusty stage; others present slate, or almost black, discoloration. The upper surface of the foot in life is jet black, contrasting strongly with the vivid color of the under side.

This species, and the last, as well as, doubtless, the others, are carnivorous, and apparently rapacious, animals; they also prey upon each other. I have found younger shells of both *carica* and *canaliculata*, enwrapped and half hidden in the folds of large individuals of their own and the other species.

“There are probably several species of *Busycon* on our coast, but they are not well made out. No. 1771, as well as some of the smaller ones (thus 1732, &c.), having numerous rather low spines and dark brown bands, is probably *B. spinosum* (Conrad, Pr. A. N. S. Phil., 1862, p. 553).”

***Busycon perversum*, Linn.**

Common; about equalling, I should judge, *canaliculatum* in numbers. It generally passes, hereabouts, for a “she conch,” *carica* being the “he.”

***Cancellaria reticulata*, Linn.**

Common? Two or three specimens, dead.

***Fasciolaria tulipa*, Linn.**

One mutilated specimen (2126).

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Fasciolaria distans, Lam.

Common. This and young *Busycons* are favorite residences of the larger *Eupagurus*.

Fasciolaria gigantea, Kiener.

Two specimens, from the beach, much worn and discolored (slate), each over a foot long.

Ranella caudata, Say.

Common.

Murex spinicostata, Val.

Not common (two or three specimens).

Strombus pugilis, Gm.

Frequent. Of about a score of specimens examined, all were much worn, and had evidently been transported from a distance.

[NOTE.—I append to the foregoing list the names of a few air-breathers that were collected.]

(GASTEROPODA *Pulmonata*.)

Limax, sp.

Observed under decaying wood, &c., on Bogue Island.

Helix albolabris, Say.

Helix thyroides, Say.

Helix multilineata, Say.

These three species were obtained, the two first in large numbers, from the beach of Shackleford, but no one of them was seen on Bogue Island.

Helix postelliana, Bland.

“Interesting on account of the locality, neither this species nor any other of the group to which it belongs having hitherto been found here” (*Bland*, in epist). Very abundant on Bogue Island, in moist grass, &c., about the edges of the marsh.

Melampus bidentatus.

Melampus obliquus, Say.

Rather common, on the beach, and dredged in shallow water among marine plants.

RADIATES.

The few specimens that have been determined, out of a considerable number collected, furnish the following names, mostly 1871.]

given upon Dr. Stimpson's authority: A species of *Physalia*, and another allied form, are of frequent occurrence along the beach. Two or three jelly-fishes were noticed, one of them occurring in large numbers about the harbor. Several corals and sea-fans also occur.

Ophiophragmum wurdemanni?

Bird Shoals, common.

Asterias arenicola.

Abundant.

Luidia clathrata.

Very abundant.

Astropecten articulatus.

Abundant. Fresh specimens are of a rich purple, edged with golden yellow.

Melita quinquefora.

The most abundant echinoderm of all, found everywhere.

Schizaster lachesis.

Rather common.

Echinocidaris punctulatus.

Lytechinus variegatus?

This and the last are two common species, found about the edges of the shoals throughout the harbor.

Actinia? sp.

A medium-sized plain grayish sea-anemone occurs in abundance on the rocks of the jutties along the beach.

Renilla reniformis.

Rather common. Specimens ranged from a few lines to over two inches in breadth.

(To be continued.)

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