

Article XXVIII.—OBSERVATIONS ON THE HABITS AND DISTRIBUTION OF CERTAIN FISHES TAKEN ON THE COAST OF NORTH CAROLINA.

BY RUSSELL J. COLES.

The notes presented in the following pages are based on the writer's observations made while fishing at different seasons and at various points off the North Carolina coast between the years 1902 and 1910. Many of the specimens on which they are based have been donated to the Government Fisheries Laboratory at Beaufort, N. C., and to the American Museum of Natural History in New York, where the identifications have been corroborated.

I. ELASMOBRANCHII.

***Narcine brasiliensis* (Ölfers).**

(SMALL ELECTRIC RAY.)

In July, 1909, I first saw this electric ray and captured two specimens which were presented to the Laboratory of the Bureau of Fisheries at Beaufort, N. C. They were the first recorded on our Atlantic coast north of Florida. In July, 1910, I captured and preserved eleven specimens at Cape Lookout and know of the capture of more than a dozen others by the native fishermen during the same week; and none were seen either before or after that week. This ray can give a very powerful electric shock. I have been knocked down many times by this shock while experimenting with the fish, yet could make no record of this peculiar form of electricity as it had no effect on my battery-testing ammeter and it would not light a little electric lamp which only required two and a half volts. Probably it might have been recorded with a volt meter, but I had none with me.

Several specimens which I found buried in the sand in shallow water with only the eyes and a little of the head and back showing were speared, and others were caught in the haul net.

Several bare-foot native fishermen were knocked down by accidentally stepping on them in shallow water. These rays remain soft and rubber-like in a formalin solution which hardens other specimens.

***Dasyatis hastata* (De Kay).**

(STING RAY.)

My experience with this ray is confined to a specimen weighing sixty-four pounds caught in a haul seine in July, 1910. Many native fishermen stated that they had never seen a ray like it. All rays seem to possess a degree of intelligence very great for such sea creatures and this one appears to be second in intelligence only to the *Mobula olfersi* which is referred to later. When the specimen was prodded with a lance it exhibited great fury and time and again threw itself on its back as it slashed at me with its barbed tail. It would give forth a loud, harsh, discordant bark of baffled rage at its failure to reach me; and it showed unusual strength in being able to throw itself on its back and then right itself. While killing this ray it gave birth to five living young about six inches wide and fifteen inches long; it also contained five eggs about the size of 00 buckshot, five about the size of BB shot and five about the size of No. 1 shot.

***Aëtobatus narinari* (Euphrasen).**

(SPOTTED STING-RAY; LADY-RAY.)

To the above names and many others by which this ray is called might be added most appropriately the name of "Sea-hog"; for after the manner of that quadruped this ray spends most of its time in plowing up the bottom of the sea with its tough hog-like snout in search of clams and other shellfish. Although it feeds in very shallow water at high tide, I have found it very difficult to harpoon owing to the fact that it keeps the water thick and clouded with sand by its continual rooting, making it almost impossible to locate its form with sufficient accuracy to strike true with the harpoon; and at the too near approach of the boat it suddenly darts away with great speed.

For many years I have given much time to the study of these rays and am thoroughly convinced that the shellfish consumed by the entire human race are as nothing to the countless thousands of bushels consumed each year by this ray. I have known of beds, containing many bushels of planted clams, being attacked by schools of these rays and every clam in them destroyed in less than a week; and on several occasions I have had a pile containing a half bushel or more entirely destroyed during a single tide by one or more of these rays. Clams appear to be almost, if not entirely, the only food of the ray. I have opened more than fifty specimens and

carefully studied the contents of the stomach and have never found that they contain any other food.

The mouth of this ray is especially interesting in that the upper jaw holds a quadrangular plate of stone-like hardness made up of a succession of thin plates on edge, and the lower jaw holds a long tongue-like plate of similar structure. Further, the thin plates at the back are more or less partly formed and soft, and, as the edge of the front thin plate becomes dull or broken it becomes loose and drops off, giving a new thin plate in front with knife-like edge; and the whole structure is forced forward and another plate becomes hard and stone-like. In fact it becomes so hard as to withstand a heavy blow from a hammer and to give out a sharp sound as if a very hard stone were struck. No ordinary blow of a hammer will fracture one of these plates.

The muscular development of these jaws is truly wonderful. I have found in these rays clams which with their shells on must have weighed more than three pounds and to crack which a pressure of perhaps a thousand pounds would be required. And I have found in the stomach of these rays on a number of occasions more than half a gallon of freshly opened clams, with the flesh of each clam less broken than the most expert human clam opener could possibly have turned out; and the writer has often spread out these clams on a clean board and carefully examined them and found that they were absolutely free from any pieces of broken shell.

Aetobatus narinari is a dweller in the warm seas, yet every summer it comes as far north as Cape Lookout, N. C., in great numbers, and it is occasionally reported on the Virginia coast but considered very rare there. In going from one good feeding ground to another they at times move in large schools. On or about July 20, 1909, the writer while on his yacht about ten miles south of Cape Lookout noticed a large school containing many hundreds of them on one of these migrations, passing swiftly but silently along under the yacht about three feet under water going south in regular, close marching military formation. Furthermore there is absolutely reliable information that others have seen these migrations on a number of occasions just as this one was seen.

During 1909 they were remarkably plentiful at Cape Lookout. I captured more than fifty specimens and saw a great many more, in addition to the above mentioned school. During July, 1910, the writer probably saw as many as forty or fifty specimens but killed only eight; the largest of which was 5 ft. 9 ins. wide; total length including tail 8 ft. 9 ins.; length of tail 5 ft. 9 ins.; length of body 3 ft.; weight 132 lbs. This was a female without eggs or embryos. My largest specimen of this ray was captured at Cape Lookout in July, 1904; its weight was estimated by myself

and others who assisted in handling it to be between five and six hundred pounds. Unfortunately I made no measurements of this specimen. It was, however, by far the largest I have ever seen.

For a number of years, members of my crew and other deep sea fishermen have been telling me that in giving birth to its young the female ray leaps high in the air as each of its young is born; but as this leaping seemed so unnecessary I had questioned their tales. However, on about the 15th of July, 1910, I was suddenly called on deck by two of my crew and then saw a large female *Aëtobatus narinari* leaping high in the air and falling back into the water within twenty yards of the yacht. After she had thus leaped several times, I distinctly saw a young one about six or eight inches wide thrown from her body; and, after she had leaped again several times without result, another young one was born; and the men told me that two had been born before I had come on deck.

The *Aëtobatus narinari* carries near the base of its tail from two to four barbed spines. The largest, which is the one used in stinging, is the one farthest from the body. From my personal observations I know that, if the tip of this sting becomes broken, the sting soon gets loose and drops out and the one in front grows larger and takes its place; and where this change is taking place another small, half-soft, sting is forming under the skin behind the dorsal fin to take its place later on should the two or three behind become injured or damaged and have to be cast off.

The barbed spine of this ray is covered with a mucous slime containing a violent poison and a person stung by the *Aëtobatus narinari* suffers the most horrible torture for many days; and there are many authenticated cases in which permanent disability, loss of leg or arm, or even death has resulted. I can write most feelingly on this subject as in my work of collecting and making studies of rare fish, I have been for years more or less exposed to this danger and have been experimenting and trying to find the proper treatment in such an emergency. On the morning of July 12, 1910, while handling a large specimen of *Aëtobatus narinari* which had been just caught, it suddenly threw its body against me and drove its poisoned sting into my leg above the knee for more than two inches, striking the bone, and producing instantly a pain more horrible than I had thought possible that man could suffer. The only sensation comparable to it, which I have ever experienced, is that produced by coming in contact with the long filaments of the Portuguese Man-of-War. I braced myself against the body of the creature and tore its barbed spine from my flesh. In less than five minutes I had attached a long needle to a hypodermic syringe, inserted the needle to the bone in the wound and injected a syringe of full strength antiseptic solution called Formolid. This was repeated until

the wound had been thoroughly cleared of the poisonous slime carried in by the spine. The result was magical, the pain did not subside; it stopped instantly; and the wound had entirely healed in less than 24 hours.

***Mobula olfersi* (Müller and Henle).**

(SMALL DEVIL-FISH.)

One night in July, 1910, I captured my first *Mobula olfersi* in a great drift net, near Cape Lookout, N. C. It was a female which had thoroughly tangled itself up in the net and was easily taken into the boat and preserved for the American Museum of Natural History. The next morning I caught a male *Mobula* in a haul seine and likewise preserved it for the museum. A school of them was then found containing certainly as many as 25 or 30, and possibly 100 or more; and for two days I gave up all other fishing for the purpose of devoting my entire time to their study; and having already secured two specimens, I withheld from harpooning and shooting any others as they leaped near the whale boat, in which I was following and keeping as close as possible to them. The following facts were noted.

In capturing minnows for food *Mobula olfersi* exhibits what appears to be great reasoning power. They fish in squads of three or more, as I saw them do while standing for several hours, on the evening of the second day, on a point of beach where there was a great school of minnows (*Fundulus majalis*). First a squad of four Mobulas came towards the beach, through the shallow water, and as they neared the school of minnows the one nearest the shore stopped; the other three wheeled around in a semicircle, rushed in on the minnows until they were right up on the sand, where I and a dozen or more native fishermen were standing, until their bodies were nearly half out of the water; but in an instant they were off and scattered out to sea. Then in a few minutes the minnows would again congregate and back would come the Mobulas. During a period of two hours they returned on an average of about every seven minutes; and as there was a slight difference in their sizes, I was soon able to note that each one kept its relative position and the same one (which was slightly smaller than the others) was always the one that stopped first, nearest the sand.

I harpooned one and it rushed off with great speed, making two hundred feet of small rope burn my hands, but I soon had it on shore. After this the two remaining ones returned twice, and then came again bringing three others with them. After watching the five fish several times, I had a large, strong seine run around them and hauled them on shore; and with the seine set around to prevent their escape, I took one of them into the water

with me and handled it and studied the details of its movements for some time. I noted especially its eyes. *Mobula* can see nothing small directly in front or behind; but it can move the eyes freely upward and downward so that it can see directly below and above just as well as on both sides. The point of peculiar interest is that the eyes move absolutely independently of each other, giving the fish at the same time two distinct fields of vision. This point I verified a number of times as I stood with the fish in three feet of water. I saw it watching the movements of my hands above its head with one eye and watching my foot, which kept moving close under it, with the other eye. This same peculiarity I had noted the day before while passing over one in a whale boat.

The horns are not movable and cannot close and grasp anything between them. I tested this repeatedly by striking the fish between the horns with both my leg and arm; but there was not the least contractile movement of the horns. The tales that come up from the sea of ships' anchors being grasped by the horns of the Manta and the vessels towed many miles to sea are not based on fact. But after seeing the Great Devil-fish in 1909 and studying numbers of small ones, it seemed to me possible for some of these great rays, if accidentally striking head-on against the cable of a ship of small tonnage, to drag it for a short distance to sea until the fish falls exhausted or even dead. That the fish might exert itself until it falls dead is supported by the fact that on several occasions I noted that some varieties of shark (notably *Sphyrna zygaena*) when hooked and properly played with rod and reel, will continue their mad rushes until they suddenly drop dead from overexertion. The same thing might occur with the Great Devil-fish.

The mistaken idea that the Manta grasps and holds things between its horns comes from the fact that it carries wide, thin appendages, or flexible flaps, folded around them. *Mobula*, when charging upon a school of minnows, opens wide its great mouth and unfolds these appendages until they meet together below the mouth and form a great funnel into which it scoops the minnows; but the instant that the rush is over it curls them back tightly around the horns again. It also folds and unfolds them after capture, but when lying on the bottom or swimming slowly, keeps them tightly curled up.

All the nine *Mobulas* caught by me, of which two were males and seven females, were carefully examined and it was found that their stomachs contained only very finely masticated minnows. Moreover, the structure of their teeth and jaws absolutely precludes the possibility of their ever crushing and eating shellfish. None of the specimens examined contained embryos or eggs.

Their flesh, when the sunlight shone through thin steaks of it, had a brilliant light red color. I had some of it prepared for the table on board my yacht and my crew and I found that Small Devil-fish makes very fine eating; in fact I had never eaten flesh of any kind that came out of the sea that equals it.

When fishing for minnows the Mobula rushes through the water with a speed that is almost inconceivable and even when very near the surface makes scarcely a ripple on the water; and their lines and movements might be studied with possible results, by naval and air-ship constructors, as the stroke of their "wings" is very different from that of other rays and many times more rapid. Every stroke changes the color of the white below and the black above so rapidly as to produce the optical illusion that the color of the back is gray. When first caught the back is a perfect black, which very quickly changes to a beautiful very dark blue.

One of my most interesting observations was on the sound they make when taken out of the water: they give forth at frequent intervals a musical bell-like bark, something like the bark made by the beagle hound when it has its game treed. It is entirely different from the harsh, discordant grunt or bark made by some of the rays; although many varieties of rays make no sound at all when dying.

I also noted that the Mobula leaps in the air more often and leaps higher, than other rays; and as they leaped a great number of times very near my boat, during the two days that I studied them, I had the opportunity of noting details closely and came to the conclusion that this leaping was done purely for sport and not to detach pilot fish (*Remora*), or to give birth to young; which latter event I had the opportunity of observing during the summer of 1910, in a large spotted sting ray (*Aëtobatus narinari*), as recorded on a preceding page of this paper.

By far the most interesting observation that I made, however, was that on the copulation in this species. My attention was first called to it by seeing a number of native fishermen out in their boats, watching something and signaling to me; and as we hurried to them in a whale boat we saw that it was a male and female Mobula *in copulo*. Being afraid to disturb them I did not go very close to them, but saw them soon separate and for more than half an hour I observed one or both of them frequently leap high in the air. Then they came together again, so as to give me a good opportunity of observing them at close range. The male was above with back just showing above the water and his wing-like pectorals curved upward until they stood straight up above his back; while the female was oriented so as to plainly show the white side uppermost, with pectorals standing up, firmly grasping the male; and apparently by a movement of the ventral

fins they were gliding very slowly through the water in circles and figure eights. Again after about ten minutes *in copulo*, they separated; and for nearly an hour they frequently leaped near the boat as I slowly followed them; and then they again came together. Copulation was not accomplished by a vertical motion, but by a graceful, serpentine lateral curvature of the spine, as the male alternately advanced one of the mixopterygia as he withdrew the other.

II. TELEOSTEI.

Ophichthus ocellatus (*Le Sueur*).

(SPOTTED SNAKE-EEL.)

There is no record of this eel having been taken on the North Carolina coast before I captured a specimen at Cape Lookout in April, 1910. It is a rare member of quite a large family of eels. It lies buried in the sand with only the head showing and only at very rare intervals does it come out of the sand and drift about in the sea in an almost perpendicular position with head uppermost. At such times it offers an easy prey to other fish, as I had an opportunity of observing in July, 1908. An eel of this family (*Bascanichthys scuticaris*) had come out of its bed and was drifting along. As I neared it in my skiff a school of *Aurix thazard* came rushing by and I saw several of them snap at the eel and bite off several inches of its tail. They would soon have eaten it entirely if it had not been scooped into my skiff.

Albula vulpes (*Linnæus*).

(LADY-FISH.)

In nine years' summer fishing at Cape Lookout, N. C., I have secured only one specimen, in July, 1910. It is unknown to most of the native fishermen; but two reliable men reported that on one occasion in the fall, they caught quite a number of them in a seine and that they cooked and ate some of them and found them of excellent flavor, but the fish were too bony to have a commercial value.

Synodus foetens (*Linnæus*).

(LIZARD FISH.)

Fairly common at Cape Lookout in July; solitary in habit, as I have never seen two near each other. Have caught them with hook, haul seine,

and spear. At night they come into shallow water and I have speared them as they were lying motionless under eel grass, alongside a piece of timber or partly buried in the sand.

***Sphyræna borealis* De Kay.**

(NORTHERN BARRACUDA.)

Very rare at Cape Lookout, many native fishermen never having seen it. I have seen but three specimens — one of them captured in July, 1909, and two in July, 1910.

***Polydactylus octonemus* (Girard).**

(THREADFIN.)

This fish appears to be entirely unknown on the North Carolina coast. When the specimen which I caught at Cape Lookout in April, 1910, was shown to nearly a hundred native fishermen and fish dealers, all said that they had never seen a fish like it. It is almost the only fish that I ever caught at Cape Lookout that neither I nor some native did not recognize and have some name for. Smith's 'Fishes of North Carolina' contains no record of this fish.

***Vomer setipinnis* (Mitchill).**

(MOON-FISH.)

Rather rare at Cape Lookout; and it is a very rare occurrence when more than two are taken at a single haul of the seine. But in July, 1910, I caught about 100 pounds of them at a single haul of the seine.

It is not generally known that this fish is a good food fish, but I have found it to be one of the most delicious food fish that I have ever tasted.

***Trachinotus carolinus* (Linnaeus).**

(CAROLINA POMPAÑO.)

Adult specimens of this fish are quite rare at Cape Lookout but the young are more often seen there in July.

***Rachycentron canadus* (Linnaeus).**

(CRAB-EATER.)

Not very rare at Cape Lookout, but always appearing as a lone straggler and usually found in company with *Scomberomorus maculatus*. It has not

the appearance of being a food fish, but a surprise is in store for the man who eats one for the first time, as it is really a most excellent food fish.

***Lobotes surinamensis* (Bloch).**

(TRIPLE-TAIL; FLASHER.)

This fish appears rarely at Cape Lookout and then only as a straggler. In July, 1909, I secured a specimen weighing 26 pounds in a seine, and as the seine was being hauled up into shallow water, it rushed from one side of the net to the other, making a wake in the water greater than any other fish of many times its weight could make. It is from this peculiarity that it has derived its local name of "Steamboat." In July, 1909, another large specimen was seen. It was lying on its side on top of the water alongside a box drifting at sea, and I thought it dead or might have captured it with a light harpoon; but when the boat came within a few feet of it the fish suddenly darted away. Native fishermen say that on a number of occasions they have seen a single specimen acting in a similar way alongside a piece of drifting wreckage. In July, 1910, only a single specimen was seen and captured and that of only about one pound.

***Cynoscion nothus* (Holbrook).**

(BASTARD WEAKFISH.)

A very rare and interesting fish of which I have caught only two specimens, one in January, 1910, at New River Inlet and one at Cape Lookout in April, 1910. It always appears as a solitary straggler and native fishermen say that they have never caught more than one in a haul of the seine.

***Menticirrhus americanus* (Linnæus).**

(CAROLINA WHITING.)

This fish is found at Cape Lookout during every month of the year, being caught in sink nets in late winter and early spring in great numbers, and only occasionally and in small numbers at other times. It is distinctly a bottom feeder and remains in one locality long enough for its color and flavor to be entirely changed by the bottom on which it is feeding. I have often taken these fish with the hook and eaten them and may note that specimens caught in deep water on a hard sandy bottom, are good food fish, while those caught on a soft muddy bottom are much darker in color and the flesh has such a rank mud flavor as to be almost unfit for food.

***Menticirrhus littoralis* (Holbrook).**

(SURF WHITING.)

A most delicious food fish which would at all times command the highest market price but for the fact that all market fishermen and fish dealers consider it the same as the *Menticirrhus americanus*; and the latter kills the reputation which the former makes as a food fish.

***Iridio bivitatus* (Bloch).**

(SLIPPERY DICK.)

The name "Slippery Dick" by which this fish is commonly called but faintly describes its slipperiness. Small eels would be easy to hold in the hand in comparison, as it can come just out between the fingers of a tightly closed hand. It is comparatively rare at Cape Lookout, although in July, 1910, several specimens were secured in the eel grass in shallow water.

***Lagocephalus lævigatus* (Linnaeus).**

(SMOOTH PUFFER.)

This peculiar puff-fish with the rabbit face is rare at Cape Lookout and is so considered by native fishermen. It appears there only as a straggler and I have caught only three specimens of it, two in July, 1909, and one in July, 1910; all taken with the seine.

***Astroscopus y-græcum* (Cuv. and Val.).**

(STAR-GAZER.)

I have found only three specimens of this fish at Cape Lookout. It is very rare there. In July, 1904, while spearing flounders by firelight in shallow water at night, one of these fishes was observed buried in the sand with only part of its back and head showing. It was speared and found to be much the largest specimen that I had ever seen, being more than fifteen inches long. In July, 1909, a small one was secured in the seine; and in the same way another was secured in July, 1910.

All three specimens gave me their electric shock a number of times. While the shock is very distinct it is only about one-tenth the strength of the shock that a *Narcine brasiliensis* of the same weight would give.

Ancylopsetta quadrocellata Gill.

(ROUGH FLOUNDER.)

One of the rarest of a number of flounders found at Cape Lookout. It does not feed in very shallow water at night as other flounders do and is rarely, if ever, speared. I have never taken one with the hook; the few specimens that I have seen were caught in the seine.

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