FISHING WITH A HAMMER

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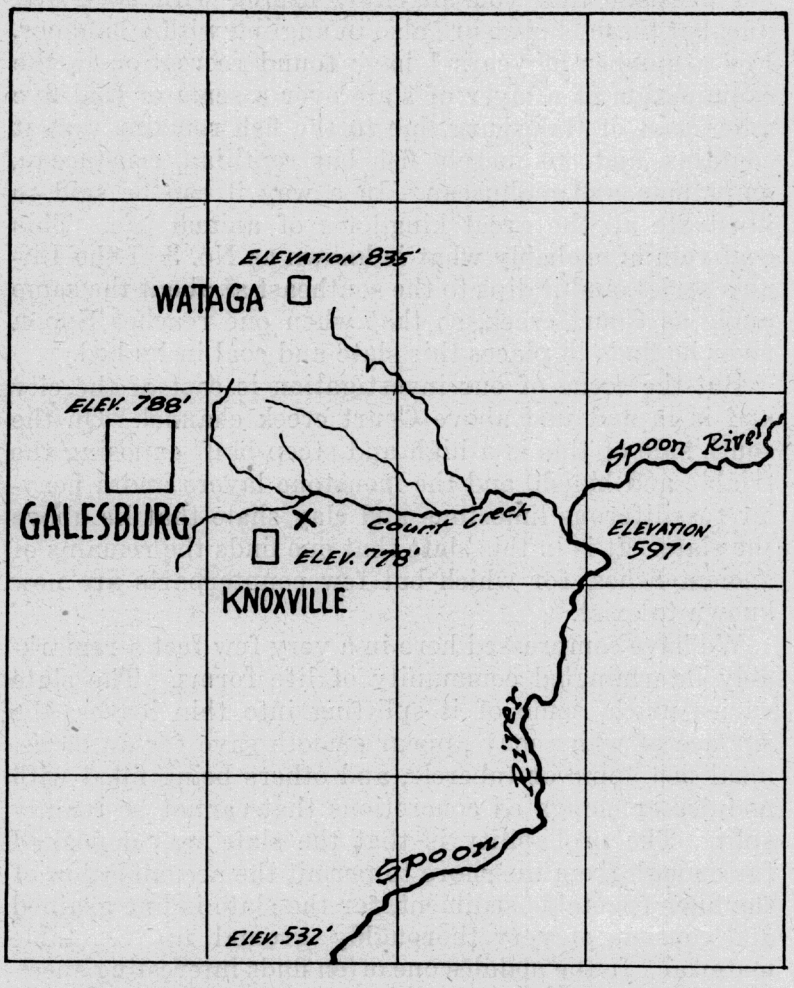
I presume that you all enjoy fishing with hook and line, but there is pleasure also in angling with a hammer. For a number of years I have found recreation in the examination of a layer of slate over a seam of coal five miles east of Galesburg due to the fish remains that it contains, and not merely fish but reptilian, crustacean, amphibian and molluscan. In a way it can be said to illustrate all the great kingdoms of animal life. This coal vein is probably what is known as No. 3 of the Illinois series, and it dips to the southeast at about the same angle as Court creek, so that when one reaches Spoon river he finds in places this slate and coal in its bed.

But the scene of our investigation is east of the city and is in and just above Court creek channel. On the south side of this is a high and steep bluff exposing the friable and bluish, and the ironstone layers and a heavier fossiliferous limestone and clay shale that lie above the slate. It is in this slate that one finds the remains of ancient fishes, for which but few counterparts are now known to exist.

We have compressed here in a very few feet a remarkably intermingled community of life forms. The slate varies much, some of it splitting into thin leaves, the surface of which may appear smooth save for an occasional fish spine or tubercle, and others being filled with nodules or elongated concretions that cannot be readily split. The probability is that the slate was deposited far enough from the shore to permit the accumulation of the finer vegetable sediment, for the slate is fine grained and consists of very thoroughly ground up vegetable material. In the nodules one often finds interesting specimens of the life of that ancient sea. These are composed of a much harder material than the slate, and constitute caskets around the remains of what were once organic beings. Usually by a careful application of the hammer on one end, the nodule will split open and disclose the specimen.

KNOX COUNTY, ILLINOIS.



X — Where fish remains were found.

Fig. 1. Fin or paddle like form, order and species undetermined. Bony structure indicated, with what seems impression of integument.

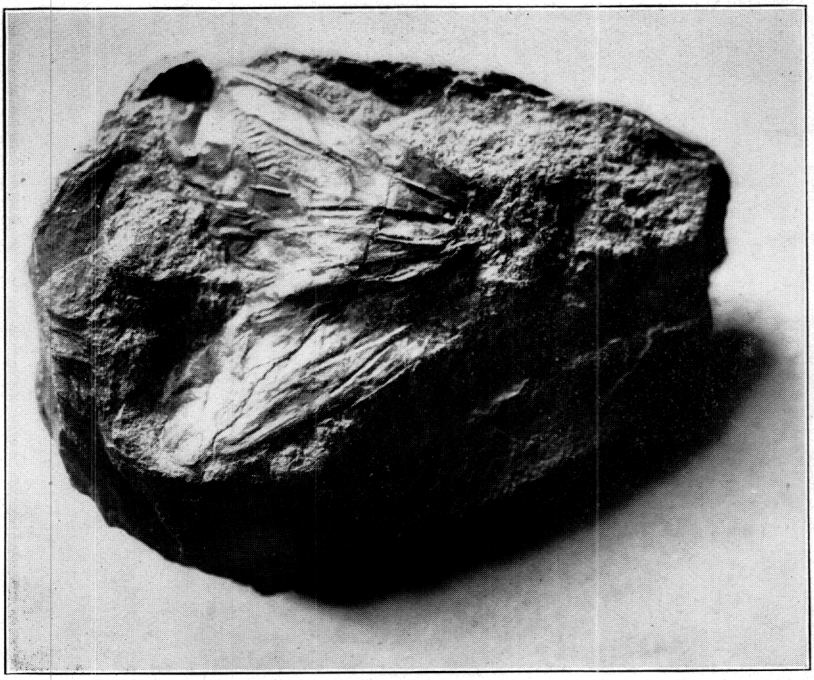


Fig. 2. May be caudal fin of crustacean. Other specimens have extending from this what appear jointed structures.

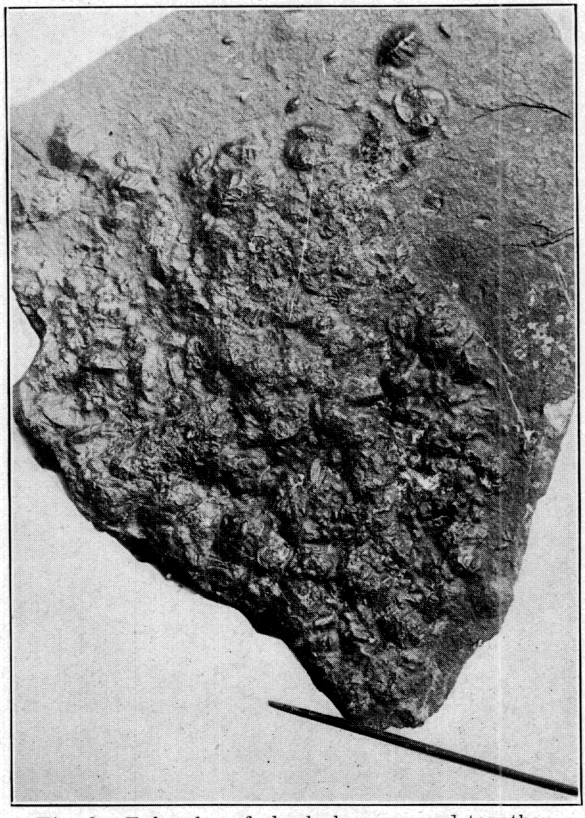


Fig. 3 Tubercles of shark, here massed together, often found singly.

In speaking of the preserving characteristics of this slate, Professor E. D. Cope, the noted paleontologist, wrote. "It will be worth while to make further examination in the slates, which are the best I have seen for the preservation of paleozoic fishes."

Among the animals thus found encased are large types of what for lack of a better English name I will call water fleas, a simple type of crustacean, some with carapaces or body casements plain, and some with carapaces covered with many lines of minute scales. Extending back from the sinus, or incurved beak portion, were several segments that terminated in two spines. This is true at least of some of the species. Creatures allied to this crustacean type are now quite small and are found in ponds, but in the slate one can find the carapaces alone from three to six or more inches long. From the abundance of the remains, one is forced to believe that these creatures constituted one of the leading features of the life of that sea or estuary, that they were of many varieties, and that they attained not merely great size but had their own beauty of form and motion.

In the slate are found also species of nautilus and parts of large shells of this order, some enclosed in nodules and some not. In fact, on top of one slab I found a large nautilus, six inches in diameter. In addition, in some of the lower layers one often discovers numerous scallop shells, types of which are contained both in the slate and the overlying layers, showing that they had a long lease of life; these are not unlike some of the forms that still exist.

Also quite frequently seen are the elegantly preserved parts of what some of our authorities call the wings of insects, but which from the numerous specimens examined seem to me the caudal or tail fin of a crustacean. In addition there have been noticed what appeared to be distorted fragments of a larger species of crab. On one leaf there was part of the skeleton perhaps of an amphibian, but not sufficiently defined to determine with exactness. Thus you see that there was quite a varied fauna of this minor life.

But it is the fish life that most concerns one, and it presupposes many other forms of life on which the fish subsisted, but whose remains may have been too soft to have been preserved. Still there are numerous marks and tracings on the slate which seem to reflect a multiplicity of forms, and not the least of these are what are presumed to be the teeth of mollusks.

One Thanksgiving day a number of years ago I split open a slab of this slate about two feet square and was about to strike it again when my attention was attracted by a row of sharp teeth along extended jaws or mandibles. At the same time there appeared over the surface of the slab a series of bones still showing the bony structure, and from them ran what seemed a short segment of the backbone. Stout spines, two or three in number, were back of the jaws some distance. The teeth were keen pointed and less than half an inch in length, with denticles each side extending up from the base of the tooth. Some of these teeth showed a curvature backward.

I sent the specimen to Professor Cope, then a recognized authority on fishes, and he became greatly interested in it, as it threw some light on controverted points regarding ancient fishes. He made the specimen, which he described as that of a paleozoic shark, the subject of a scientific description in a work that he was then getting out. Judging from the size of the jaws and the connecting bones of the skull, it was a shark of considerable size, and considering the teeth and their extreme sharpness, was capable of doing much execution on the other denizens of the water. Such backward curved teeth surely gave it ability to hold what it once gripped.

At the same time I sent Professor Cope another type of fish from the same formation, but evidently of different habits and adapted to other forms of food. It appeared to be somewhat reptilian in shape , with its long narrow head and the extension backward of the jaws. But its mouth was filled with crushing or pavement teeth, that is, teeth rounded on top with a raised center and somewhat corrugated. The dentition was thus in sharp contrast to that of the shark previously described. From the general appearance one would judge that this crea-

Fig. 4. Carapace of Ceratiocaris, water flea, abounding in slate, and of several varieties.

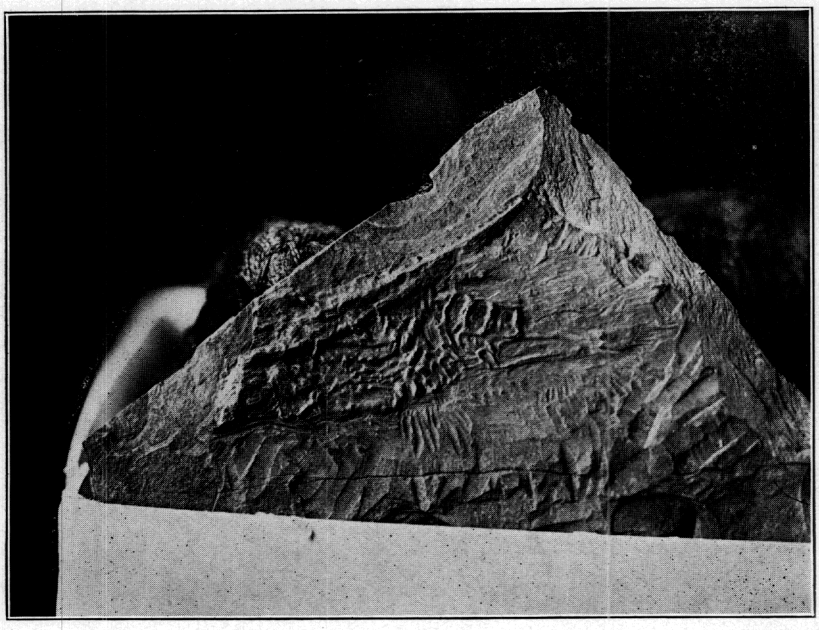


Fig. 5. Fish spine, with outward edge dentate, and what appears fin attached to other edge.

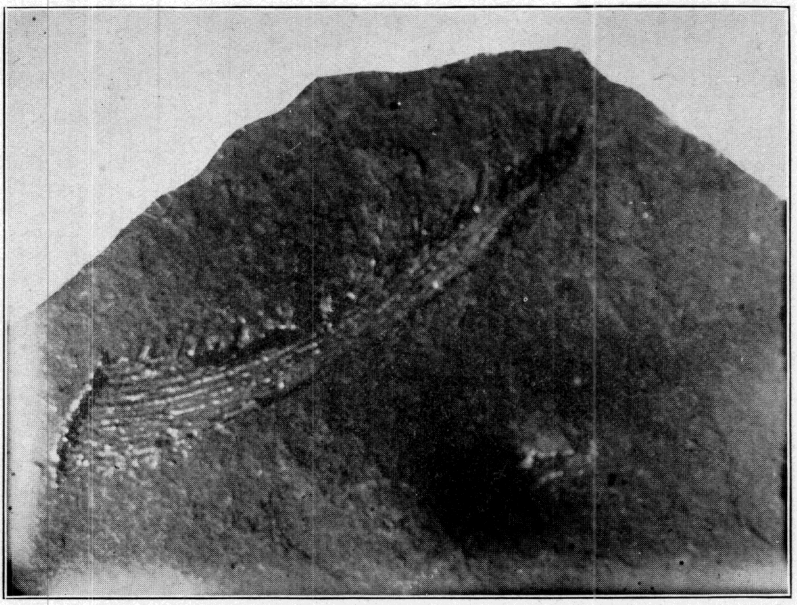


Fig. 6. Single fish spine, Listracanthus. A large slab shows number of these in connection with spicules, that appear to pass upward into these spine forms.

ture was capable of great speed, for back of the head there are the rays of powerful fins. You might ask what use this fish had of crushing teeth, and the answer would be that perhaps it fed on the water fleas and other shelly creatures that would require this form of dentition. Such teeth assumed a decided variety of shapes, and it would be easy for one if he met them separately to ascribe them to different species.

There were still other shark forms and there are indications that these also were of large size. Their remains are, however, so scattered that it is hard to frame a definite idea of their outlines. I found, for instance, a finely ornamented spine eight inches long that must have extended a considerable distance above the back. It has ridges running its full length and along these there are strings of little black knobs. As one looks at this specimen he can almost imagine a hungry shark with its dorsal or top fin attached to this ornamental spine cleaving the water, in zealous pursuit of its prey.

The tubercles that abound in the integument of certain sharks are frequent and are found at times in considerable number, clusters or masses. These are star-shaped with a raised center and with a base about a quarter of an inch in diameter.

Then there are other sharks that had numerous spines in the integument. Formerly I thought that these spines must be solitary, placed for instance on the backbone, but more recently I have found a large specimen that would indicate that they might have been scattered over the shark and in all stages of development, ranging from those shaped like a small v to those with three ribs and those of more up to a dozen, all apparently secured in the integument and so forming quite a defense. These or similar spines have occasionally a length of three to four inches, while still others, evidently of a different genus, are of a tapering spindle-like shape.

Some have tried to connect up these spine finned fishes with the Port Jackson shark, and they may be right but there is still need of light. They must have ranged from those small to those of large size, if the spines are any criterion. There is nothing to show what the dentition

was, and the shark has been named from the spines, but I am sure that it will take much study yet to settle definitely its rightful affinities.

If you wish the scientific names of these three types of sharks you will find that they are Symmorium reniforme, Orodus basilis, and Listracanthus, the first two derived from the form of the teeth and the third from the spine.

Still another shark that Professor Cope passed on had small, very sharp teeth scattered over the palate, which he named stylobasis. Needle like as the teeth were, yet judging from the massiveness of the head it was of considerable size.

Aside from these more formidable types, which must have been the terrors of that ancient sea, there were several species of ganoids, an order of fishes that exist in our own day and have their chief representatives in the gar pike and the sturgeon. One of the most beautiful fossil fishes that I ever found was a ganoid, encased in a glistening, white armor of scales, lapping up one against the other, and all prettily decorated. It was five inches long and an inch or so in height, and evidently was as perfect as when the shale was sifted over it. This also was sent to Professor Cope for determination.

Another almost perfect ganoid shows scales and characteristic tail with peculiar scale markings. One often finds a single enameled scale, and even clustered scales, and this is sufficient to show that such a fish existed. These little ganoids were elegantly shaped, and when in schools must have made a brilliant spectacle. They connect the remote past with the present.

There are some remains that have not yet been figured out. These are paddle-like remnants with rays attached to parts like those of a wrist, evidently belonging to some creature that was neither fish nor reptile. Moreover one specimen shows the delicate backbone and impression of some animal allied to the reptiles.

We have then in this deposit a decided multiplicity of life forms, some of which have relationship with the present. I remember that on one occasion while at Spoon river, thirteen miles east of this city, I was made aware that a friend had caught a large bass, for his yell of ex-

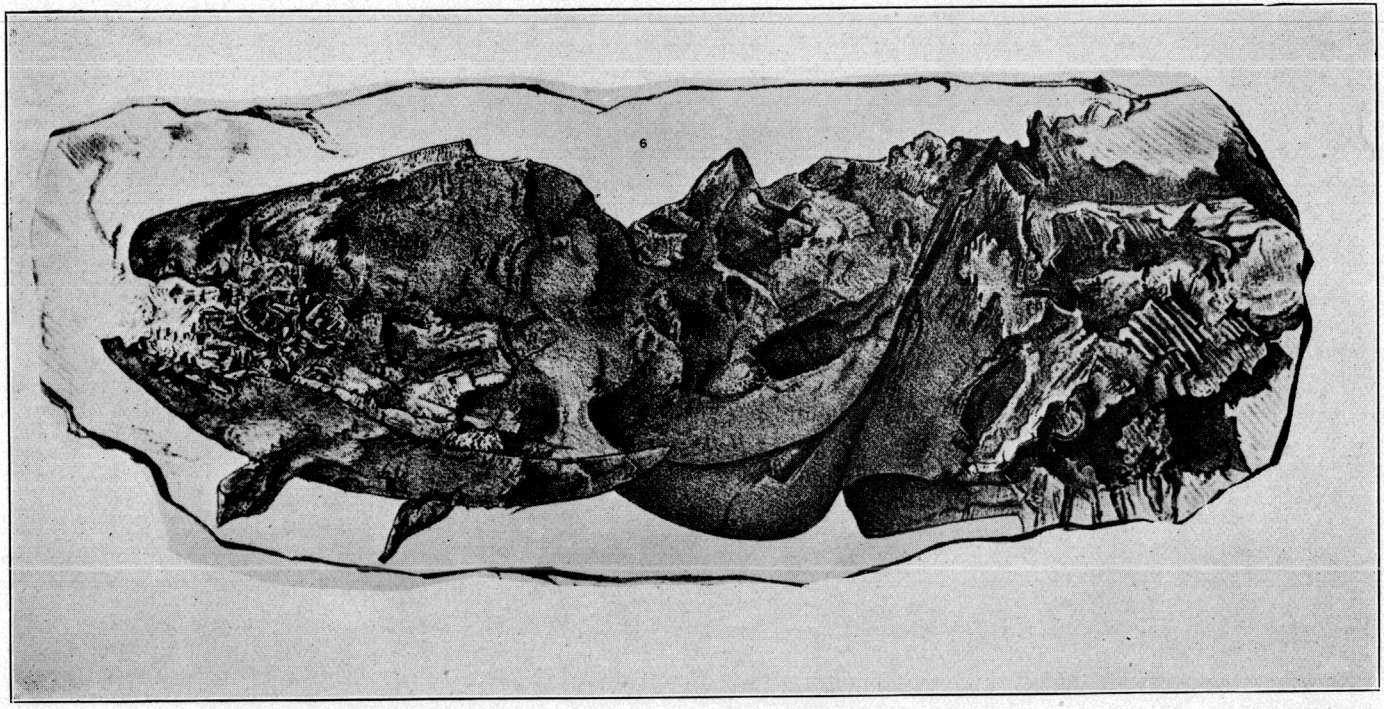


Fig. 7. Orodus basilis, shark form, anterior part, showing jaws and rounded, flattened teeth. These teeth are displayed in figures 7, 7a and 7b, plate 8.

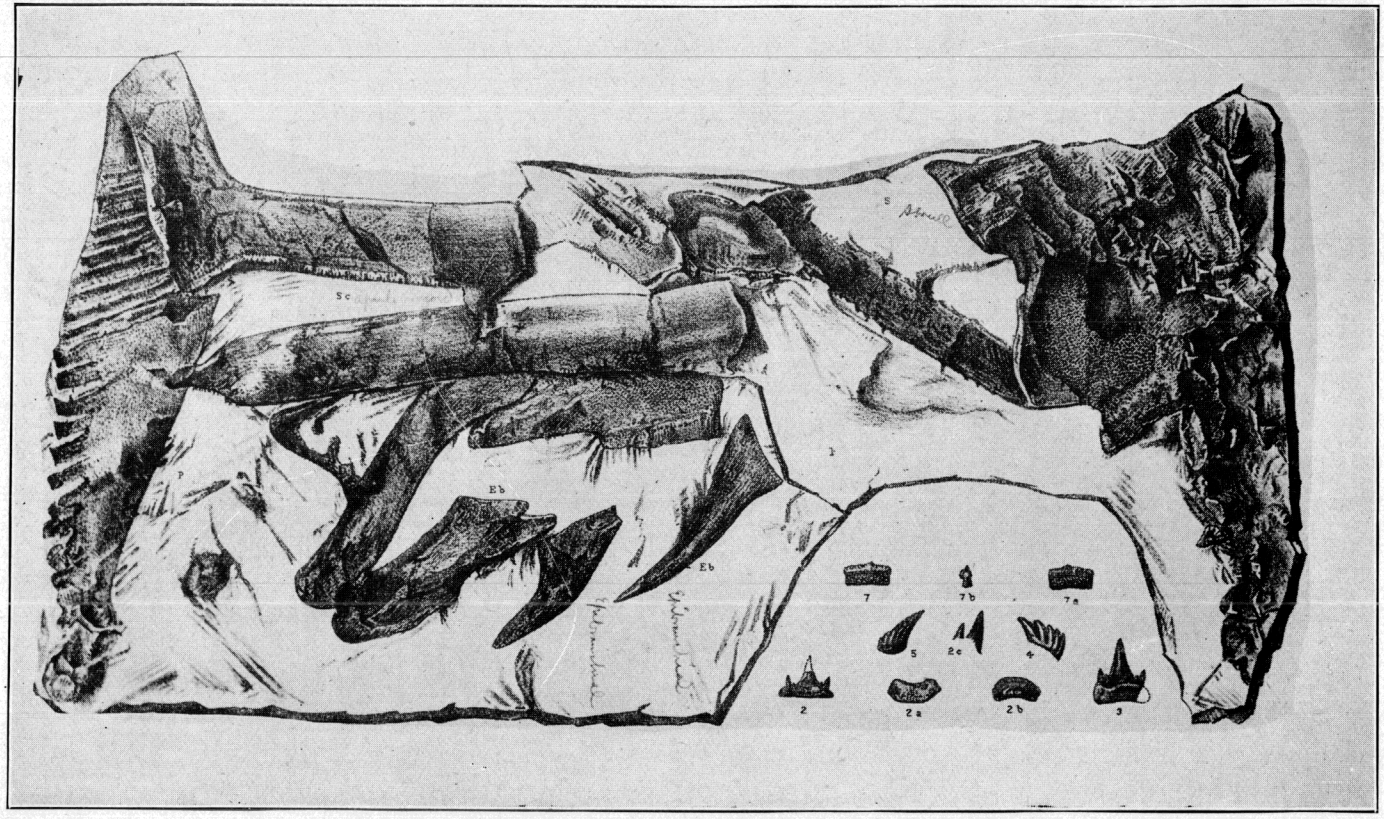


Fig. 8. Symmorium reniformis. Teeth shown not merely in engraving but in figures 2, 2a, 2b, 2c, 3, 4 and 5. Figures 7, 7b and 7c are of teeth of Orodus basils.

ultation echoed and re-echoed along the bluffs. I have read that the Director of the Geological Survey while on one of the mountains of Canada split open a rock and discovered therein a large perfect specimen of trilobite, that precursor of our modern crab, and he, too, yelled in triumph. I can assure you that when you go fishing with a hammer and split open a slab of slate and behold there the whole series of the teeth of a shark or the graceful outline of a large nautilus, or the glistening armor of a ganoid, you, also, will be tempted to make your pleasure audible.

But it all seems very strange that life should have existed so long ago on the earth and that there should be such a multiplicity of forms. Our own county furnishes a unique illustration. You may sit on a slab of slate in Spoon river bank and perhaps haul out bass, catfish, perch or sunfish, and then with your hammer find in the slate remnants of fish unlike anything that you have caught and that existed probably millions of years ago.