NO. XXII.—"CAMP SILURIA." By PETER MACNAIR, Joint Hon. Secretary, Keeper of the Natural History Collections in the Glasgow Museums. With two Photographs [Plate No. VI.], and a Section.

[Read 14th March, 1901.]

AMID the recesses of one of the streams that descend from the Nutberry Hill, on the confines of Lanarkshire and Ayrshire, there might have been seen in the summers of 1899, 1900, and 1901, a tent with a flag bearing the legend "Camp Siluria," and another close by. But being some six miles distant from the great highway which bears southward to Carlisle, they were too far removed from the beaten track to leave much chance of their discovery by the ordinary pedestrian or tourist, and it is a country almost unknown to the cyclist. Hidden deep down close beside the bank of the burn, the camp would never have been noticed from the rough mountain path, had not a small tributary burn here cut a deep gash into the wall-like banks of the main stream, revealing the tents nestling under an overhanging cliff upon a broad patch of alluvial haugh-land.

In the year 1882, a well-known member of the Society, Dr. J. R. S. Hunter, of Braidwood, camped out for three months on the upper reaches of the Logan Water, his tent being pitched at the place known as Shanks Castle, with the object of collecting the Upper Silurian fossils which occur in great numbers in the shales and mudstones exposed in the numerous sections laid bare by the action of the stream and its tributaries; and then for the first time in this lonely moorland region the flag "Siluria" was unfurled. A full account of the doctor's doings here was afterwards read by him before the Society, and afterwards printed in the *Transactions*.*

Within more recent years an important discovery of fish-remains has been made in the same beds, and it was that which induced Mr. David Nimmo and the writer to adopt Dr. Hunter's plan, and again unfurl the flag "Siluria" in the Lesmahagow uplands. Had it not been for the enthusiasm shown by Mr. Nimmo the

* "Three Months' Tent Life amongst the Silurian Hills of Logan Water, Lesmahagow." *Transactions*, vol. vii., part 2, 1885, page 272.

I. "At Work on the Fish-bed," Logan Water, Lanarkshire.

II. "Camp Siluria," Logan Water, Lanarkshire.

idea would neither have been begun nor carried out to its successful issue. Behind everything he was the motive power, and those who lived in the camp, whether for a single night or for the season, owe a debt of gratitude to him for his hospitality. Nor was this welcome confined to those immediately connected with the geological operations, for in the course of time when news of the camp began to spread abroad, and farmers and shepherds from far and near came to listen to the wonderful philosophy propounded by "the daft callants that broke the chuckie-stanes," they drank their host's health in cups of tea, or occasionally in something stronger.

The history of the original discovery of this inlier of Upper Silurian rocks in the neighbourhood of Lesmahagow is already so well known that I shall only give a brief sketch of it here, showing its connection with the later ones just mentioned. A distinguished late member of the Society, Dr. Slimon of Lesmahagow, had the honour of being the first to reveal the existence of Upper Silurian rocks north of the Tweed. At the Meeting of the British Association held in Glasgow in 1855 he exhibited a collection of remarkable fossils quite new to geologists, which had been gathered in the course of his professional visits through the district. These fossils having come under the notice of Sir Roderick Murchison, he lost no time in visiting the places where they had been found, under their discoverer's leadership, and in a letter to Professor Harkness he described the important results of his visit as follows:—

"I came last night direct from the Lesmahagow country, where I passed two entire days with the good Slimon, and took Ramsay with me. We had glorious weather. I am more satisfied with my general results than anything I have seen for many a day.

"The merit of this discovery is Slimon's, and I shall raise a statue to him for it. As I had a very fast horse to take me from point to point, and used my legs up every burn (including all the Carboniferous series to the east) and to the top of Nutberry, and considerably to the west of it, I have no doubt as to the completeness of the evidence. . . .

"The Old Red is a poor affair there, one member of it, *i.e.*, the Lower, is undoubted, and great dislocations separate it from the Lower Carboniferous formation. But the graduation into Upper

Silurian on the Logan Water, and the alternation of red and grey until all becomes grey, is the best exemplification of transition that can be. In short, it is equal to any passages of the same rocks in Hereford, Salop, and Cumberland. When Salter has examined the fossils I will tell you more. In the meantime I have left Slimon the happiest man possible, and I intend, *d.v.*, to give a little introduction to the description of the wonderful geological parish of Lesmahagow, and the merits of the poor, but meritorious Dr. Slimon, who, if he had been rich enough to visit his patients on a horse, and had not travelled up the braes on foot, would never have made this excellent hit."

In the third edition of his "Siluria," 1859, Sir Roderick Murchison gave an account of the structure of the ground, accompanied by a horizontal section, and in the Memoir to accompany sheet 23 of the Geological Survey Map there is a somewhat detailed account of the Upper Silurian inliers found in Lanarkshire and Ayrshire. One of the most interesting points in the geological structure of this area is the apparently conformable sequence from Upper Silurian into Lower Old Red rocks. This conformability has been recognised by Murchison, Ramsay, and Geikie, and subsequently by Dr. Peach.

In the Memoir and the Map of the Survey the line of demarcation between the Old Red Sandstone and the Upper Silurian rocks was drawn considerably below the horizon which the more recent palæontological discoveries would warrant, and thus the red and yellow sandstones and conglomerates, and certain green and red mudstones with bands of grey shale and greywacke, were included in the Lower Old Red Sandstone, the occurrence in these beds of organisms identical with those found in the underlying Ludlow rocks being accounted for on the supposition of the occurrence of marine or brackish-water conditions during the accumulation of the lower members of the Old Red Sandstone.

In the course of the recent revision of the above-mentioned Survey sheet (23), special attention was given to the fossiliferous bands found in the so-called passage beds, and as a result of this, in the year 1897 Messrs. Macconochie and Tait discovered a remarkable fish-fauna in a bed intercalated in the green and red mudstones which immediately underlie the thick bed of conglomerate. The consequence was that they were led to

transfer many of the beds formerly included in the Old Red Sandstone into the Upper Silurian, and they are now considered to be the equivalents of the tilestones, Downtonian sandstones, and Ledbury shales, which in Herefordshire overlie the Upper Ludlow rocks.

There cannot, however, be the least doubt that the merit of renewed attention having been given to the fauna of these beds is due to Mr. James Young of Lesmahagow, who, in the year 1896, discovered an entire fish of the genus *Thelodus* in the upper reaches of Logan Water, above Logan House, and in the same bed as that in which Dr. Hunter got the remains of a Scorpion (*Palæophonus*), undoubtedly of Ludlow age. Dr. Hunter also discovered in the same district, in 1882, scales of *Thelodus*, which he described as "small scales something like those of Acanthodian fishes." Specimens of these presented to the late Dr. John Young, F.G.S., of the Hunterian Museum, were sectioned by him, and are now in "The Young Collection" in the Kelvingrove Museum, Glasgow.

During the recent visit of the British Association to Glasgow in 1901, an excursion was made to the Downtonian beds exposed in the Birkenhead Burn, and through the kindness of Miss Slimon the collection made by her father was laid out for the inspection of the members. It was then discovered by the writer that Dr. Slimon had actually collected specimens of those Upper Silurian fishes, including one of *Thelodus* from the Ludlow rocks, and one of *Birkenia*, probably from the same bed; and he has since found in the Hunterian Museum several nodules containing remains of *Thelodus* more or less perfect, which had been presented to the museum by Mr. James Young previous to his discovery of the complete fish, as already mentioned, though their character and importance had evidently been overlooked.

The first discovery of these beds is due therefore to Dr. Slimon, and the recognition of their geological importance to Sir Roderick Murchison, but as to the fish-remains, the honour cannot be so easily settled. Dr. Slimon really found them first, but did not know what they were, while those afterwards collected by Dr. Hunter were pronounced by Dr. John Young to be remains of fishes, but not identified. Mr. James Young of Lesmahagow, though thus only the third to get *Thelodus*, was the first to find an entire fish, but it was his discovery which undoubtedly put

A SECTION IS HERE GIVEN SHOWING THE STRUCTURE OF THE UPPER SILURIAN INLIER OF LESMAHAGOW
FROM SEGGHOLM TO YONDEBTOWN.

*Section across the Lesmahagow Upper Silurian Inlier from Seggholm to Yondertown, (Distance about nine miles.)
After the Geological Survey.*

Downtonian.	{	d2. Lower Carboniferous formations.	
		c1. Lower Old Red Sandstone.	
		6e. Chocolate-coloured Sandstones.	
		6d. Quartzite conglomerate.	
		6c. Fish-beds.	
Ludlow.	{	6b. Red and Yellow Sandstones.	The Glenbuck conglomerate band (6a) is not here present.
		5f. Greywackes and Mudstones.	
		5e. <i>Trochus</i> -beds.	
		5d. <i>Pterygotus</i> -beds.	
		5c. <i>Ceratiocaris</i> -beds.	
		5b. Shales and Greywackes.	
		5a Wenlock (?). B. Dolerite Dykes (Tertiary). f Faults.	

the Survey Officers upon the scent, resulting in the wonderful additions to the Silurian fish-fauna of Scotland by Messrs. Macconochie and Tait. We are indebted to Dr. Traquair for their determination and description.

In 1899 the first "Camp Siluria" was pitched in a bend of the Logan Water, above Logan House, under the direction of Mr. James Young, for the purpose of working the beds in which he had found the *Thelodus* some three years previous, and in which Dr. Hunter had also found the *Palæophonus* earlier.

During that summer a number of fine specimens of *Thelodus*, *Ceratiocaris*, and *Pterygotus* were found by Messrs. Young, Nimmo, and Clarkson, many of them being presented to the Kelvingrove Museum. Amongst the more important finds of the year may be mentioned the typical Upper Silurian brachiopod, *Lingula Lewisii*, which had not been previously recorded from the Lesmahagow inlier, though found by Mr. John Henderson in the ravines of the North Esk in the Upper Silurians of the Pentland Hills. *L. Lewisii* is present in the Woolhope beds, the Wenlock limestone and its shale, the Lower Ludlow, and the Aymestry limestone of England. The discovery of this typical Upper Silurian form in the Logan Water bed helps to further confirm its exact geological position. Another interesting specimen found during this year's excavations shows the abdominal segments of a crustacean, which possessed several distinct pairs of swimming feet, and resembled *Ceratiocaris*.

In the summer of 1900 it was determined to shift the camp to the Birkenhead Burn, for the purpose of working the Downtonian beds exposed in the deep ravines cut by the stream, and so it was pitched below a protecting cliff of the Great Conglomerate. Looking from the heights down the stream we could espy the cairn-capped summit of Tinto, and when the rays of the sinking sun struck upon the western side of the great corrie, the pink felsite, of which the mountain is composed, glowed as if it were on fire.

The routine of everyday life in the camp may here be briefly described. Morning has scarcely begun to dawn when signs of life within the tent become evident; the doorway is unloosened, revealing a head protruded to inspect the weather, for that is the all-important point. Some one climbs the

neighbouring height to scrutinize the summit of the great hill, for we, like the "auld wives" of Symington, have considerable faith in its powers as a weather prophet. As the old saying runs:—

"When Tinto tap puts on her cap, and Coulter on her coul,
The auld wives of Symington say it will be foul."

As it seems, no fears need be entertained for this day, at least; the sky is clear, and the distant outline of Tinto is already becoming well defined. By this time all inhabitants are astir, and half a dozen geologists, all told, are busy. One man is pumping at a "primus" stove, as if it were a case of life and death. Another is rushing about with a rasher of bacon in one hand and a couple of eggs in the other, while a third is busily washing the dishes. Even at this early time of the morning, for it cannot be later than five o'clock, the remaining three are already deep in some profound geological problem, having innumerable geological maps and sections spread out before them, and are busy discussing the throw of faults, the outcrop of conglomerates, and the position of the fish-beds. When the dishes have been put away, and the blankets put out to air, a move is made by some of the party upstream to a large pool where a morning dip is indulged in, followed by a run through the heather—

"Oh the wild joys of living! the leaping from rock up to rock,
The strong rending of boughs from the fir tree, the cool silver shock
Of the plunge in the pool's living water . . .
How good is man's life, the mere living! how fit to employ
All the heart and the soul and the senses for ever in joy!"*

A start is now made about a hundred yards up the burn to a cliff, where the work of the day is to take place. The first man in the procession has a "pinch" on his shoulder, the second a pick, and the third a shovel; while the remainder are armed with hammers of various shapes and sizes—some for breaking up hard blocks, and others for splitting the finely laminated rock in which the fossils we are in search of are to be found. A considerable amount of rock has to be removed before the fossiliferous bed can be reached. Eventually, when the underlying bed is laid bare, pieces of the rock are passed over to those who wield the

* "Saul," by Robert Browning.

splitting hammers, and the excitement begins. After some time expended in fruitless work, a cry at length rends the air, "*A Lanarkia, a Lanarkia,*" and immediately a rush is made to inspect the find. Drawing closer, we see that the worker is busy with a fine chisel and hammer removing a layer, beneath which something like a dark brown stain is showing itself. Whenever this has been finished, something uncommonly like the tail of a fish is laid bare, and after about a quarter of an hour's work the entire form of the fossil lies revealed.

There can now no longer be any doubt—*Lanarkia* is a fish. Clearly outlined upon the stone is the figure of a fish, and a quaint one it must have been. The head and anterior part of the body are of a flattened trapezoidal shape, broader behind than in front; the sides swelling out into flat-like projections, sharply marked off from the tail, behind which comes a deeply bifurcate and strongly heterocercal caudal fin, and one of the most characteristic features of this fish, the dermal armature, consisting of little conical hollow spines without a basal plate. In the specimen just found, and in fact in all the specimens which have as yet been found, there is no evidence of the existence of mouth or eyes, only the outline of the head, the body, and the tail being shown.

Another long period elapses, during which great masses of rock are detached from the hillside. It seems as if our luck has deserted us, but that does not cause despair, as we have sometimes hammered here for a whole day without obtaining a single fossil worth taking home. We have even worked for a week without finding a really good specimen, till perhaps on the last morning, on despairingly taking a last parting shot just before leaving for town, a very fine fish might be turned out. So on this day, when things are looking dull, and backs and arms are becoming sore, a shout again makes the welkin ring—"A *Birkenia*, lads; a *Birkenia*"—and a ring of eager faces is formed round the discoverer. This time the whole fossil has been laid bare at a stroke, and it is again a fish, but wholly unlike the *Lanarkia* previously spoken of. In fact, it is so unlike any other fishes hitherto known, that Dr. Traquair has felt the necessity of forming a new order for its reception. He describes it as follows:—"The genus *Birkenia* is fusiform;

body covered with several longitudinal rows of narrow scutes, arranged in lines running obliquely from above downwards and forwards; head bluntly rounded, also covered with narrow scutes; an oblique row of small round openings on the side just at the posterior boundary of the head, no orbit seen, and no evidence of cranial bones, jaws, or shoulder girdle, no paired fins, caudal palæoniscoid in shape, completely heterocercal, deeply bilobed and rayed; a small rounded dorsal, situated far back near the caudal."

But the sun is now high in the heavens, and a halt must be called for dinner. So, somewhat exhausted with the hard work of the morning, we retrace our steps to the tent and begin preparations for the mid-day meal. After dinner, tobacco is produced, and, lying around on the grass, we enter into discussions more or less profoundly palæontological and stratigraphical. One favourite and ever-recurrent subject is the physical conditions which obtained during the deposition of the rocks on which we have been at work. Some of the party maintain that they must have been laid down in freshwater lakes, others that they were estuarine, while a third group contend they were of marine origin; the estuarine and marine theories, however, carry the day.

About six o'clock in the afternoon, digging being stopped for the day, we again assemble at the tent for tea. Then comes more talk round a roaring camp fire, when all sorts of subjects in literature, science, and philosophy, including the use of the pathetic fallacy by Tennyson, the philosophy of the unconditioned, and the zoological affinities of the organisms disinterred during the day's operations, the last mentioned being the favourite. Upon one point there is general consent—that in the hands of the distinguished President of our Society, Dr. Traquair, the fishes from the Downtonian and Ludlow beds have thrown a flood of light upon the origin and descent of the Ostracodermi. Also that as no record of his investigations into these most interesting fish-remains has yet been placed in our *Transactions*, it is desirable that a short summary of them should now be given.

It is somewhat interesting to remember that a fish generically identical with the *Thelodus* of the Downtonian and Ludlow beds of the Lesmahagow Silurians was long ago found by Dr.

Powrie* in the Lower Old Red Sandstone of Turm Hill, near Forfar. This specimen was acquired in the year 1892 for the Edinburgh Museum of Science and Art, along with the rest of the Powrie collection. In the course of time Dr. Traquair was enabled to announce the identity of Powrie's *Cephalopteris* with the *Thelodus* of Agassiz, the latter genus having been founded on certain minute scales, which Agassiz had looked upon as teeth, and which had been found in the Ludlow bone-bed of the Upper Silurian rocks of Shropshire.

The discovery of a complete *Thelodus* in the Upper Silurian rocks of Lanarkshire showed that, though the fish had a shark-like appearance, it could scarcely be considered a true selachian. Dr. Traquair thus describes its appearance:—“*Thelodus Scoticus*, Traq.—It has a broad, flattened, anterior part corresponding to the forepart of the body, very bluntly rounded in front, and passing behind into right and left angular flap-like projections, which are sharply marked off from the narrow tail, which is furnished with a deeply-cleft heterocercal caudal fin. Unless the flap-like lateral projections are representatives of pectorals, no other fins are present; neither do we find any teeth or jaws, nor any trace of internal skeleton.” And he further says:—“Only a few days ago Mr. Tait, collector to the Geological Survey, pointed out to me in a recently-acquired specimen a right and left dark spot at the outer margin of the head near the front, which might indicate the position of the eyes.”

It ought, however, to be added that since the above was written Mr. James Young of Lesmahagow has found a specimen of *Thelodus* with a well-defined dorsal fin.

In general contour the genus *Lanarkia* presents much the same features as *Thelodus*, but instead of being covered by the well-known minute scales, its dermal armature consists of relatively large conical spines without a basal plate. *Lanarkia* is considered by Dr. Traquair to represent the least specialised member of the Ostracodermi, and I think he has shown most conclusively the line of descent of such highly specialised types as *Pteraspis* from such a comparatively simple form as *Lanarkia*.

But the night is getting somewhat chill, so we retire to our

* Powrie named the fish *Cephalopteris Pagei*, his original specimen being described and figured in the *Transactions* of the Edinburgh Geological Society, vol. i., 1870, p. 298.

tents, and lace up the doorways. The Chinese lanterns are lit, and by universal consent the philosopher and poet of the camp is requested to read extracts from the works of some of the masters. Tennyson, being his favourite poet, is naturally chosen, and nothing interrupts the sounds of his voice except the occasional rippling of the burn over its stony bed. Shall we be ashamed to confess that perhaps the last sound of which we were conscious was when our reader quoted that exquisite gem in which the great poet has crystallized the principles of modern geological science—

"The moanings of the homeless sea,
The sound of streams, that, swift or slow,
Draw down Æonian hills, and sow
The dust of continents to be?"