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PROCEEDINGS
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APRIL 18, 1849.

The following communications were read :—

1. *Palichthyologic Notes*. No. 3.—*On the GANOIDEI HETEROCERCI*. By Sir PHILIP DE MALPAS GREY EGERTON, Bart., M.P., F.R.S.

THIS family has been considerably reduced, since the publication of the 'Poissons Fossiles,' by the new arrangement of the fishes of the old red sandstone and their allies contained in the 'Monographie des Poissons du Vieux Grès Rouge' of M. Agassiz. A further reduction became recently necessary in consequence of the discovery of the true affinities of the genus *Platysomus**. As at present constituted, the genus *Amblypterus* stands at the head of the family.

Genus AMBLYPTERUS, Ag.

Of this genus Agassiz has described nine species, but one of these he subsequently cancels, namely *Amblypterus Olfersi* from Brazil, which forms the type of his new genus *Rhacolepis*†. Since the publication of Agassiz' work, Professor Goldfuss has described in great detail the characters of the scales of *Amblypterus macropterus*‡, which rarely occur in a good state of preservation. He enumerates

* *Palichthyologic Notes*, No. 2. p. 329. † Poiss. Foss. vol. ii. part 2. p. 283.

‡ *Beiträge zur vorweltlichen Fauna des Steinkohlengebirges*, p. 20.

six variations in the sculpture of the enamel. In five of these the scale is divided by a diagonal line extending from the upper anterior to the lower posterior angle, of various degrees of curvature. The scale is traversed by from twenty to four-and-twenty striæ; those, on one half of the scale, sometimes the upper, sometimes the lower, run parallel to the diagonal line; those on the other impinge on it at various angles. The sixth variety has a raised ridge in place of the diagonal line to which the striæ converge on either side. The latter form of scale occurs behind the pectoral fins. He describes the head bones as ornamented with granules, closely arranged in radiating lines. The teeth he affirms to be strong and conical (*kegelförmig*), not *en brosse* as stated by Agassiz*.

(*New Species.*)

AMBLYPTERUS PORTLOCKI, Egerton.

Colonel Portlock, in his 'Report on the Geology of the County of Londonderry, and of parts of Tyrone and Fermanagh†,' mentions some scales as probably belonging to this genus, found in the coal shale of Ballycastle, in the clay and marl of Moyola in the parish of Maghera, and in Fermanagh. I have two specimens, one from Moyheeland near Draperstown, the other from Maghera, apparently belonging to the same species, which being new, I propose to designate by the name of the discoverer. The specimens are very imperfect, but the character of the scales is sufficient to distinguish the species from those hitherto known. The specimen from Moyheeland shows the insertion of the pectoral fin, and a portion of the humerus. The surface of the latter is covered with broad flattened plicæ running nearly parallel with the curvature of the bone. The rays of the fin are strong, and appear to have been less numerous than is generally the case in this genus. The scales are large for the size of the fish. They are very thick, and are ornamented on the entire surface with strong prominent ridges, fewer in number and coarser than in any other *Amblypterus*, so much so that a single scale is quite enough to indicate the species.

Genus EURYNOTUS, Ag.

This genus was arranged by Agassiz between the genera *Palæoniscus* and *Platysomus*, and was considered to have affinities to the latter genus and *Amblypterus*‡. In consequence of the discovery of the dentition of *Platysomus* and its removal to the family of the *Pycnodontida*, it was necessary to inquire into the propriety of retaining *Eurynotus* in the position originally assigned to it. This examination became more necessary in consequence of a letter received not long ago from Mr. Hugh Miller, communicating the discovery of a group of rounded palatal teeth in a specimen of *Eurynotus crenatus* found in the neighbourhood of Crail in Fifeshire. I have since received a very accurate cast of this specimen showing the teeth *in situ*. These at first sight would seem to indicate a *Pycnodont*, but a comparison

* Poiss. Foss. vol. ii. p. 30. † Page 462. ‡ Poiss. Foss. vol. ii. p. 153.

of the dentition of this family with other fishes having blunt rounded teeth, especially with *Lepidotus* and *Tetragonolepis*, shows that there is so great a difference in the arrangement of the teeth in the two families, that even without the test of microscopic examination, the true affinities of the fish can be determined. In the form and arrangement of the scales and in other important respects, *Eurynotus* differs entirely from the *Pycnodontidæ* and agrees with the *Lepidoidei*. It certainly resembles *Platysomus* in the depth of the body and extent of the dorsal fin, but the former character is also common to *Amblypterus*, and the structure of the dorsal fin is more in conformity with that of this organ in *Palæoniscus*. The discovery of the dentition of *Eurynotus* is not without interest, inasmuch as it tends to invalidate the dental characters assigned by Agassiz to the Lepidoid family, and to show that although these fishes may have had "Dents en brosse sur plusieurs rangées, ou une seule rangée de petites dents obtuses*," yet that some of these had (perhaps in addition to those described by Agassiz) teeth of a larger and more massive character. Thus in the genus *Amblypterus* the teeth are described in the 'Poissons Fossiles' as "dents en brosse extrêmement fines†," while Goldfuss says "dass die Zähne nicht bürstenförmig sondern stark und kegelförmig sind‡." Some of the *Palæonisci* also have teeth which cannot be considered as "dents en brosse," especially the American species, now arranged under the genus *Ischypterus*. It is therefore not unlikely, that as in some of the homocerque Lepidoids we find teeth of various forms and sizes associated in the same individual, so a similar condition may have obtained in their heterocerque predecessors. Of the three species of *Eurynotus* described by Agassiz, one, viz. *Eurynotus tenuiceps* from Massachusetts, is considered by Mr. W. C. Redfield to be an imperfect specimen of *Palæoniscus* (*Ischypterus*) *latus* §.

Genus PLECTROLEPIS, Ag.

Agassiz in his 'Tableau Général' mentions a genus under this designation from the coal-measures of Carlisle. I have not seen the specimens on which it was founded, but Lord Enniskillen has a fish from the same locality which represents so truly the character expressed in the title, that I feel little hesitation in referring it to this genus. In size and form it resembles a moderate-sized *Palæoniscus*, but it differs widely in other respects from that genus. The scales are very solid, and covered by a coat of dense, highly lustrous ganoine. The posterior margin is armed with four or five sharp and strong spines, whence the generic name. The bones of the head are covered with coarse wrinkles; the teeth are blunt, resembling those described above as having been found by Mr. Miller in *Eurynotus crenatus*. The dorsal fin is situated very far forward, nearer to the head than in any genus of this family. The upper lobe of the tail is covered by a

* Poiss. Foss. vol. ii. p. 1.

† Vol. ii. p. 30, line 23.

‡ Beiträge, p. 20.

§ Short notices of American Fossil Fishes; read before the Yale Nat. Hist. Soc. April 28, 1841.

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series of strong ridge-shaped scales. The specific name given by Agassiz is *rugosus*, probably in allusion to the rugged character of the cranial bones.

Genus PALÆONISCUS, Ag.

This genus embraces a greater number of species than any other of the Heterocerque Lepidoids. Not only in species but in individuals the *Palæonisci* appear to have been the most numerous of the vertebrate denizens of the waters in which they flourished, associating together in large shoals, and performing no doubt important functions in the then economy of nature, probably by reducing and assimilating the superabundant vegetable substances brought within their reach, and again in their turn forming the prey of the *Megalichthys*, *Holoptychius*, *Aerolepis*, *Pygopterus*, and other voracious sauroid fishes with which they co-existed. Agassiz has described twenty-one species in the 'Poissons Fossiles,' including *Palæoniscus fultus*, which forms the type of the genus *Ischypterus* and will be alluded to hereafter. In addition to these he mentions in his 'Tableau Général' five others as undescribed, besides the American species *P. Agassizii* and *P. macropterus*.

PALÆONISCUS CATOPTERUS, Ag.

Although the discovery of this species in the new red sandstone of the county Tyrone was communicated to the Geological Society by Sir Roderick Murchison so long ago as 1835*, yet no description of the fish has yet been published. It was assigned to the genus *Palæoniscus* by Agassiz, who very happily noted its most distinctive character in the specific appellation *catopterus*. In size it is the smallest, in form the most slender species of the genus. The head is small and more pointed than in other *Palæonisci*; the eye is placed forward; the mouth appears small; the operculum is nearly semicircular. The dorso-ventral series of scales are very regular and distinct. The scales themselves are large, and of very uniform size over the whole body. The specimens hitherto found are not in a condition to show the superficial characters of the scales, the impressions of the under sides alone being preserved. The dorsal fin is placed much nearer the tail than in any other species; in this respect, but in no other, *Palæoniscus catopterus* resembles the genus *Catopterus* of Mr. Redfield. The tail is decidedly heterocerque. It is altogether so distinct from all the other *Palæonisci*, that it is recognizable at first sight.

PALÆONISCUS SPECIOSUS, Münt.

This is from the Kupferschiefer of Richelsdorf, and was named by Count Münster. Lord Enniskillen, who had an opportunity of seeing the specimen in the collection of M. Althaus, considers it a good species. It is as long as *Palæoniscus magnus*, but not so deep.

PALÆONISCUS ORNATUS, Münt.

This species is followed by a note of interrogation in the 'Tableau Général,' and Lord Enniskillen, who also saw this specimen, says he

* Proc. Geol. Soc. vol. ii. p. 206. Portlock, Geol. Mem. p. 468.

could not detect any specific character as differing from *P. speciosus*. It is possible some confusion may have arisen from the similar signification of the specific titles.

PALÆONISCUS EGERTONI, Ag. PL. I. fig. 2.

This species, although named by Agassiz during his second visit to England, has not yet been described. It was found by my brother the Rev. W. H. Egerton in the coal shale at Silverdale in North Staffordshire, and has since been discovered in Lancashire and Yorkshire, as also, I believe, in some of the Scotch and Irish coal-fields. It is a small and delicate species, somewhat less than *Palæoniscus Robisoni*. It is characterized by the scales, which are deeply furrowed and serrated at the posterior margins*. The dorsal fin is large and situated far back, its anterior insertion being very slightly in advance of the anal fin. The fin rays are strong, and dichotomise near their extremities; the transverse articulations are distant. The anal fin corresponds in size and character with the dorsal fin. The pectoral fins are small and delicate. The ventral and caudal fins are deficient. The head is smaller in proportion to the body than in any other species.

PALÆONISCUS MONENSIS, Egerton. PL. I. fig. 3.

Lord Enniskillen found the specimens from which this species is named in the shale brought out of a coal-pit in the Isle of Anglesea, near the Holyhead road, a few miles from the Menai Bridge. They are single scales which belonged to a larger fish than *P. Egertoni*, and differ in external character from those of that species. The surface is traversed by regular parallel grooves, the ridges between these terminating in cusps at the posterior margin. In addition to these a series of fine lines is distinctly seen, bordering two sides of the scale, apparently indicating the annual increment.

Since the completion of the 'Poissons Fossiles' the following species have been made known:—

PALÆONISCUS TCHEFKINI, Fisch.

This fish, from the Permian system of the Steppe of Kargala, is figured by Fischer de Waldheim in the Bull. Nat. de Moscou. Sir Roderick Murchison† mentions three other species as probably belonging to this genus, found in the same Steppe near Orenburg.

PALÆONISCUS GELBERTI, Goldf. PL. I. fig. 4.

Professor Goldfuss has given this name to a *Palæoniscus* discovered by Herr Gelbert in the coal formation at Heimkirchen‡. He describes it as being longer and narrower than *Palæoniscus Duvernoy*, and as differing from all other species of the genus in the ornament of the scales. It is a handsome and well-marked-species.

* At p. 93, vol. ii. Poiss. Foss., Agassiz cancels the observation made at p. 41 as to the general smoothness of the scales of the *Palæonisci* found in the coal-measures.

† 'Russia,' page 227, note.

‡ Beiträge zur vorweltlichen Fauna des Steinkohlengebirges, p. 17.

PALÆONISCUS MACROPHthalmus.

M. Althaus has a specimen from the Kupferschiefer of Richelsdorf thus named. I am unable to ascertain whether it is considered identical with the species so named by Agassiz, from the magnesian limestone of this country, or whether the name has been given in ignorance of its previous application.

PALÆONISCUS MEGACEPHALUS, Germar.

A species of *Palæoniscus* from the Kupferschiefer of Mansfeld with this name, is figured and described by Kùrtze in his 'Commentatio de petrifactis quæ in schisto bituminoso Mansfeldensi reperiuntur.' I am inclined to think it is founded on imperfect specimens of *Palæoniscus Freieslebeni* crushed vertically, thus giving an incorrect idea of the size of the head.

PALÆONISCUS PYGMÆUS.

M. Hermann von Meyer has given this designation to a small *Palæoniscus* of the Kupferschiefer which will be described in an early number of the 'Palæographica.'

(*New Species.*)

PALÆONISCUS BEAUMONTI, Ag. Pl. I. figs. 5, 6.

This is the largest and finest species of the genus. The most perfect example I have seen was presented to Lord Enniskillen by the Baron de Ponsort, and was found in the coal shale at Autun. It measures thirteen inches in length by four in depth. In shape and appearance, if we except the heterocerque tail, it is not unlike some species of *Lepidotus*. The head is unfortunately so much dislocated that its form and proportions are not recognizable. Some of the detached bones are elaborately ornamented with a labyrinthine pattern. The scales vary much in size and form in different regions of the body. Those on the flanks immediately below the lateral line are the largest, whence they decrease in size above and below. In the vicinity of the dorsal, ventral and anal fins they are narrow oblongs; on the tail they are lozenge-shaped, elongating gradually as they approach its termination. They differ from those of every other species in the character of the exterior surface. Those immediately succeeding the thorax have from fifteen to twenty oblique parallel striæ on the middle of the scale, terminating in sharp points at the distal margin, but the upper and lower angles of the scales have no serrations. The latter character encroaches more and more upon the central portion, in the scales on the back and tail, until the striæ and serrations altogether disappear, and the scale becomes smooth on the surface and entire at the margin. The same change of character obtains more slowly on the ventral region, so that a few serrations are observable as far back as the anal fin. The fins are of moderate size with the exception of the caudal, which is very long and strong. Its upper margin is roofed with a series of large, solid, arrow-headed scales, and the lobe

itself is covered with scales to its extremity. Lord Enniskillen has also a specimen of a young individual of this species seven inches in length. It differs from the mature fish in being less deep in proportion to its length.

PALÆONISCUS DECORUS, Egerton. PL. II.

Whether we consider the elegant form and proportions of this fish, or the graceful tracery on the head, or the varied form and arrangement of its delicate scales, it must rank as one of the most beautiful species of this beautiful genus. It is rare to find among fossil fishes a highly sculptured character of the cranial bones, without the least trace of ornament on the scales of the nape and those immediately in contact with the thoracic girdle. Such however is the case in this species. All the head bones are covered with an elegant tracery of distinct lines running in tortuous courses, sometimes bifurcating, sometimes inosculating and forming intricate patterns of extreme beauty. The scales are thin and perfectly smooth, with entire margins. Those on the back are scallop-shaped, and arranged like the plates of scale-armour. In advance of the dorsal fin are four large saddle-shaped scales decreasing in size from the front. Round the base of the fin the scales are small and of various shapes, arranged in an elegant tessellated pattern. The ventral scales are oblong, and with the exception of the large plate in advance of the anal orifice, considerably smaller than those on the flanks. The latter are oblong on the anterior part of the body, rather higher than wide, but they gradually assume a rhomboidal outline as they approach the central region. The anterior margin of the dorsal fin is ornamented with a delicate fringe of fine scales; the rays composing it gradually elongate up to the eleventh or twelfth, which is the longest. This character resembles the arrangement of the dorsal fin of *Eurynotus*. The tail is of very elegant proportions; the upper lobe attenuates very gradually and is invested with scales to its minutest extremity. This species is from the coal shale of Commenterie in Auvergne. Lord Enniskillen has a specimen of *Palæoniscus*, stated to have been found near Ilfeld in the Hartz, which has considerable resemblance to this species.

PALÆONISCUS ARCUATUS, Egerton. PL. I. fig. 1.

This species has some resemblance to the preceding, but is a shorter and deeper fish. The line of the back from the head to the dorsal fin is gracefully arched, and the dorso-ventral series of scales are more curved both above and below the lateral line in the anterior part of the body than is usual in this genus. The scales are smaller than those of *Palæoniscus decorus* and thicker. The fine striæ denoting the lines of growth are clearly defined. The bones of the head are covered with flattened plicæ. The teeth in the lower jaw are numerous and very regular. The fins resemble those of *Palæoniscus decorus*, but the dorsal fin is inserted nearer to the head than in that species. The tail is wanting. This species is from the coal shale of Goldlauter.

I have a specimen presented to me by the Baron de Ponsort from the coal-measures of Liège, which differs from the genus *Palæoniscus* in the small size and pointed form of the scales, and in the greater thickness of the body immediately in advance of the caudal fin. The form of this fish is also in other respects very distinct from *Palæoniscus*. The specimen is too imperfect to describe, but perhaps this notice may produce more satisfactory materials for the determination of the generic and specific characters.

Genus *ISCHYPTERUS*, Egerton.

Mr. W. C. Redfield, in alluding to the description of *Palæoniscus fultus* given by Agassiz*, says, "the stout character of the fins and their insertions (which suggested to Agassiz the specific name) is also found to pertain in a greater or less degree to all the known American species of the genus, and would perhaps warrant their separation from the *Palæonisci*†." Fully concurring in this view, I suggested to Sir Charles Lyell‡ the propriety of eliminating these fishes from the Agassizian *Palæonisci* and grouping them together under the generic name of *Ischypterus*, a term expressive of the common character noticed by Mr. Redfield. Of the five species described by Mr. Redfield, Agassiz considers *I. fultus* and *I. macropterus* to be identical§. I am not cognizant of any species of this genus found at Antrim, as stated by Sir C. Lyell||.

Genus *CATOPTERUS*, J. H. Redf.

This genus has been well characterized by Mr. J. H. Redfield¶, with the exception of an error regarding the form of the tail, which has since been corrected by Mr. W. C. Redfield in the memoir quoted above**. In addition to the original species, named *C. gracilis*, Mr. W. C. Redfield has described three species; of these, *C. macrurus* must be canceled as being the type of a new homocerque genus—*Dictyopyge*††, Egerton.

CATOPTERUS REDFIELDI, Egerton.

On looking over a large collection of fossil fishes from Durham, Connecticut, forwarded to me by Sir C. Lyell for that purpose (and to whom I communicated the results), I found evidence of another species of *Catopterus*, to which I gave the above specific name in compliment to the original discoverer of the genus.

Genus *GYROLEPIS*, Ag.

The scattered and fragmentary condition in which the remains of this genus have always been found, has proved hitherto an insur-

* Poiss. Foss. vol. ii. p. 43.

† Short notices of American Fossil Fishes, by W. C. Redfield, read before the Yale Nat. Hist. Soc. April 23, 1841.

‡ Journal of Geol. Soc. vol. iii. p. 277.

§ *Ibid.* vol. iii. p. 277.

|| *Ibid.* vol. iii. p. 278.

¶ Annals of New York Lyceum of Nat. Hist. vol. iv. p. 39.

** American Journal of Science, vol. xli. p. 26.

†† Journal of Geol. Soc. vol. iii. p. 275.

mountable obstacle not only to a definition of its generic characters, but to a determination of the family in which it ought to be placed. It is not even known whether the tail was homocerque or heterocerque, a point of some importance as bearing upon the value of this character as a criterion of the age of strata, since some of the species are confined to the Triassic period. Agassiz has described three* species from the Muschelkalk and Keuper of Germany, two of which occur also in the bone-beds of Old Passage and Axmouth, and at Newtown Limavady in Ireland†. He mentions another species as having been found in the coal shale near Leeds. Count Münster has described a fifth species from the Trias at St. Cassian which he names *G. bipli-catus*.

Genus COCCOLEPIS, Ag.

This genus is liable to be overlooked by those having occasion to consult the work of Agassiz, as it is described in a supplemental chapter at the end of the Observations on the Heterocerque Lepidoids; it is however worthy of especial notice as being the only one of this family hitherto found in any stratum more recent than the Trias. *C. Bucklandi* is an unique specimen in the collection of Dr. Buckland from the Oolite of Solenhofen.

Summary of Genera and Species.

AMBLYPTERUS, Ag.			
Agassini, Münster	P. F. vol. ii. p. 105	Muschelkalk	Esperstädt, Thuringia.
eupterygius, Ag.	P. F. vol. ii. p. 36	Coal formation	Saarbrück and Lebach.
lateralis, Ag.	P. F. vol. ii. p. 39	Coal formation	Saarbrück and Lebach.
latus, Ag.	P. F. vol. ii. p. 37	Coal formation	Saarbrück and Lebach.
macropterus, Ag.	P. F. vol. ii. p. 31	Coal formation	Lebach and Bürschweiler.
nemopterus, Ag.	P. F. vol. ii. p. 107	Coal formation	Newhaven.
Portlocki, Egert.	Geol. Journ. vol. vi. p. 2.	Coal formation	Mayola, Moyheeland and Maghera.
punctatus, Ag.	P. F. vol. ii. p. 109	Coal formation	Newhaven.
striatus, Ag.	P. F. vol. ii. p. 111	Coal formation	Newhaven.
EURYNOTUS, Ag.			
crenatus, Ag.	P. F. vol. ii. p. 154	Coal limestone	Burdie House.
fimbriatus, Ag.	P. F. vol. ii. p. 157	Coal formation	Newhaven.
PALEONISCUS, Ag.			
angustus, Ag.	P. F. vol. ii. p. 57	Coal shale	Autun.
arcuatus, Egert.	Geol. Journ. vol. vi. p. 7.	Coal shale	Goldlauter.
Beaumonti, Ag.	Geol. Journ. vol. vi. p. 6.	Coal shale	Autun.
Blainvillei, Ag.	P. F. vol. ii. p. 48	Coal shale	Autun.
carinatus, Ag.	P. F. vol. ii. p. 104	Coal-measures	Newhaven.
catopterus, Ag.	Geol. Journ. vol. vi. p. 4.	Permian	Rhone Hill.
comatus, Ag.	P. F. vol. ii. p. 97	Magnesian limestone	East Thickley, &c.
decorus, Egert.	Geol. Journ. vol. vi. p. 7.	Coal shale	Auvergne.
Duvernoy, Ag.	P. F. vol. ii. p. 45	Coal shale	Munster-Appel.
Egertoni, Ag.	Geol. Journ. vol. vi. p. 5.	Coal shale	North Stafford.
elegans, Sedgw.	P. F. vol. ii. p. 95	Magnesian limestone	East Thickley, &c.
Freislebeni, Ag.	P. F. vol. ii. p. 66	Kupferschiefer	Mansfeld, Richelsdorf.
Gelberti, Goldf.	Beiträge	Coal formation	Heimkirchen.
glaphyrus, Ag.	P. F. vol. ii. p. 98	Magnesian limestone	East Thickley, &c.
lepidurus, Ag.	P. F. vol. ii. p. 64	Permian	Scharfenack, Ottendorf.
longissimus, Ag.	P. F. vol. ii. p. 100	Magnesian limestone	Ferry Hill, Whitley.
macropomus, Ag.	P. F. vol. ii. p. 81	Zechstein	Ilmenau.
macrophthalmus, Ag.	P. F. vol. ii. p. 99	Magnesian limestone	East Thickley, &c.
magnus, Ag.	P. F. vol. ii. p. 78	Kupferschiefer	Mansfeld.
megacephalus, Germ.	Kürze	Kupferschiefer	Mansfeld.
minutus, Ag.	P. F. vol. ii. p. 47	Coal shale	Munster-Appel.
Monensis, Egert.	Geol. Journ. vol. vi. p. 5.	Coal shale	Anglesea.

* *Gyrolepis giganteus* is an *Holoptychius*, Poiss. Foss. vol. ii. part 2. p. 285.

† Portlock, Geol. Mem. p. 469.

Summary of Genera and Species (continued).

PALÆONISCUS, Ag.			
<i>ornatissimus, Ag.</i>	P. F. vol. ii. p. 92	Coal limestone	Burdie House.
<i>ornatus, Münster</i>		Kupferschiefer	Richelsdorf.
<i>pygmaeus, H. von Meyer</i>		Kupferschiefer	Richelsdorf.
<i>Robisoni, Hibbert</i>	P. F. vol. ii. p. 88	Coal limestone	Burdie House.
<i>speciosus, Münster</i>		Kupferschiefer	Richelsdorf.
<i>striolatus, Ag.</i>	P. F. vol. ii. p. 91	Coal limestone	Burdie House.
<i>Tchekini, Fisch.</i>	Bull. Nat. de Moscou.	Permian	Bielebei.
<i>Voltzii, Ag.</i>	P. F. vol. ii. p. 55	Coal shale	Autun.
<i>Vratislaviensis, Ag.</i>	P. F. vol. ii. p. 60	Permian	Neudorf, Ruppertsdorf.
_____		Permian	Steppe of Kargala.
_____		Permian	Steppe of Kargala.
_____		Permian	Steppe of Kargala.
ISCHYPTERUS, Egerton.			
<i>Agassizi, Redf.</i>	Am. Journ. of Sci. xli. 26	Sunderland, Mass.; Boonton, N. J.; Middletown, Durham, Con.	
<i>fultus, Ag.</i>	P. F. vol. ii. p. 43	Sunderland, Mass.; Boonton, N. J.; Middletown, Durham, Con.	
<i>macropterus, Redf.</i>	Am. Journ. of Sci. xli. 26	Boonton, N. J.; Middletown, Durham, Con.	
<i>latus, J. H. Redf.</i>	Ann. N. Y. Lyceum, iv. 38.	Boonton, N. J.; Middletown, Durham, Con.	
<i>Eurynotus tenuiceps, Ag.</i>	P. F. vol. ii. p. 159	Boonton, N. J.; Middletown, Con.; Sunderland, Mass.	
<i>ovatus, Redf.</i>	Am. Journ. of Sci. xli. 26		
CATOPTERUS, J. H. Redfield.			
<i>anguilliformis, W. C. Redf.</i>	Am. Journ. of Sci. xli. 27	Middletown, Con.; Boonton, N. J.; Southburg, Con.	
<i>gracilis, J. H. Redf.</i>	Ann. N. Y. Lyceum, iv. 39.	Middletown, Durham.	
<i>parvulus, W. C. Redf.</i>	Am. Journ. of Sci. xli. 28	Middletown, Con.; Boonton, N. J.	
<i>Redfieldi, Egert.</i>	Geol. Journ. vol. iii. p. 278.	Durham, Con.	
GYROLEPIS, Ag.			
<i>Alberti, Ag.</i>	P. F. vol. ii. p. 173	Trias	Germany, Bristol, Axmouth, and Newtown Linavady.
<i>biplicatus, Münster</i>	Beiträge, vol. iv. p. 140	Trias	St. Cassian.
<i>maximus, Ag.</i>	P. F. vol. ii. p. 173	Trias	Germany.
<i>Rankinei, Ag.</i>	P. F. vol. ii. p. 303	Coal shale	Leeds.
<i>tenuistriatus, Ag.</i>	P. F. vol. ii. p. 174	Trias	Germany, Bristol, Axmouth, and Newtown Linavady.
PLECTROLEPIS, Ag.			
<i>rugosus, Ag.</i>	P. F. vol. ii. pt. 2. p. 281.	Coal shale	Carlruke.
COCCOLEPIS, Ag.			
<i>Bucklandi, Ag.</i>	P. F. vol. ii. p. 300	Oolite	Solenhofen.

2. *On the Tertiary Deposits of the MORAY FIRTH and the GREAT CALEDONIAN VALLEY, with a brief notice of the Older Formations.* By the Rev. J. G. Cumming, M.A., F.G.S., Vice-Principal of King William's College, Isle of Man.

[Abstract.]

THE district which is the subject of the present memoir has been rendered familiar to geologists by the labours of Professor Sedgwick and Sir R. I. Murchison*, whose descriptions have reference to the older rocks, and to their connection with equivalents in the English system.

Very valuable additions have since been made to these records by Mr. George Anderson of Inverness, and Mr. Hugh Miller, whose

* Transactions of the Geological Society of London, vol. ii. 2nd series, pp. 293 and 353, &c., and vol. iii. 2nd series, p. 125, &c.

PALÆONISCUS ARCUATUS.

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