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FERDINAND PRANTL a ALOIS PŘIBYL:

Roztřídění některých českých Cheiruridů. (Trilobitae.)

Classification of some Bohemian Cheiruridae. (Trilobitae.)

(Předloženo 4. března 1947.)

Tato práce je věnována novému systematickému roztřídění českých cheiruridních trilobitů z podčeledi *Cheirurinae* (HAWLE & CORDA), emend. RAYMOND, 1913 a *Cyrtometopinae* ÖPIK, 1937. J. BARRANDE (1846; 1850; 1852 a 1872) zahrnoval většinu sem náležejících druhů do jediného rodu — *Cheirurus* BEYRICH, 1845. Rody *Actinopeltis* HAWLE & CORDA, 1847 a *Eccoptochile* HAWLE & CORDA, 1847 pokládal při tom za totožné s rodem výše zmíněným. Později přeřadil O. NOVÁK (1890) některé české druhy k SALTEROVU podrodu *Crotalocephalus* SALTER, 1853. V novější době oddělil C. D. BARTON dva BARRANDOVY druhy *(Cheirurus comes* a *Ch. vinculum)* do zvláštních rodů *Ceraurinus* BARTON, 1913 a *Lehua* BARTON, 1915. R. RŮŽIČKA (1926; 1934) popsal z českého ordoviku dvě nové cyrtometopinní formy pod rodovým jménem *Cyrtometopus* ANGELIN, 1854, které však T. KOBAYASHI (1934; 1935) přeřadil do svého nového rodu *Parapilekia* KOBAYASHI, 1934. Jinak se však v poslední době nikdo, s výjimkou starších prací REEDOVÝCH (1896; 1898) a práce C. D. BARTONA (1915), otázkou systematické příslušnosti českých cheirurinních a cyrtometopinních trilobitů nezabýval.

Proto si všímáme i celkové klasifikace čeledi *Cheiruridae* (HAWLE & CORDA), emend. RAYMOND, 1913. Rozdělujeme ji do pěti podčeledí, a to: *Cheirurinae* RAYMOND, 1913; *Cyrtometopinae* ÖPIK, 1937; *Deiphoninae* RAYMOND, 1913; *Sphaeroxochinae* ÖPIK, 1937 a *Areiinae* nov. subfam. Rod *Staurocephalus* BARRANDE, 1846, který byl až dosud kladen rovněž do čeledi *Cheiruridae*, přeřazujeme současně do čeledi *Encrinuridae* ANGELIN, 1854 a tvoříme pro něj novou podčeleď *Staurocephalinae* nov. subfam.

Ve starším paleozoiku středočeském je podčeleď *Cheirurinae* RAYMOND, 1913, zastoupena rodem *Cheirurus (Cheirurus)* BEYRICH, 1845

a *Ch. (Crotalocephalus)* SALTER, 1853, k nimž připojujeme jako další náš nový podrod *Ch. (Pseudocheirurus)* nov. subgen. Mimo to navrhujeme utvoření nového rodu *Cerauroides* nov. gen. a podrodu *Ceraurinus (Osekaspis)* nov. subgen. Současně doplňujeme vymezení dříve utvořeného rodu *Lehua* BARTON, 1915.

Podčeleď *Cyrtometopinae* ÖPIK, 1937 je u nás zastoupena rody *Actinopeltis* HAWLE & CORDA, 1847; *Cyrtometopus* ANGELIN, 1854; *Eccoptochile* HAWLE & CORDA, 1847; *Parapilekia* KOBAYASHI, 1934 a *Pseudosphaeroxochus* SCHMIDT, 1882. U rodu *Eccoptochile* rozlišujeme však vedle typického podrodu *E. (Eccoptochile)* HAWLE & CORDA, 1847 i další podrod, *E. (Eccoptochiloides)* nov. subgen. Podobně rozdělujeme rod *Pseudosphaeroxochus* v typický podrod *P. (Pseudosphaeroxochus)* SCHMIDT, 1882 a *P. (Pateraspis)* nov. subgen. Mimo to navrhujeme utvoření dalšího nového rodu, *Stubblefieldia* nov. gen.

Systematickou příslušnost všech českých zástupců podčeledi *Cheirurinae* a *Cyrtometopinae* lze znázorniti tímto přehledem:

Cheiruridae HAWLE & CORDA, emend. RAYMOND, 1913.

Cheirurinae HAWLE & CORDA, emend. RAYMOND, 1913.

Cheirurus (Cheirurus) insignis BEYRICH, 1845.
Cheirurus (Cheirurus) quenstedti BARRANDE, 1846.
Cheirurus (Cheirurus) bifurcatus BARRANDE, 1852.
Cheirurus (Cheirurus) obtusatus HAWLE & CORDA, 1847.
Cheirurus (Cheirurus) bicuspidatus BOUČEK, 1933.
Cheirurus (Cheirurus) transiens BOUČEK, 1935.
Ch. (Crotalocephalus) gibbus (BEYRICH, 1845).
Ch. (Crotalocephalus) globifrons (HAWLE & CORDA, 1847).
Ch. (Crotalocephalus) cordai (BARRANDE, 1846).
Ch. (Crotalocephalus) pauper (BARRANDE, 1852).
Ch. (Crotalocephalus) sternbergi (BOECK, 1827).
Ch. (Pseudocheirurus) beyrichi (BARRANDE, 1846).
Cerauroides hawlei (BARRANDE, 1852).
Ceraurinus (Osekaspis) comes (BARRANDE, 1872).
Lehua vinculum (BARRANDE, 1872).

Neurčité postavení mezi cheirurinními trilobity z českého ordoviku zaujímá druh *Cheirurus? fortis* BARRANDE, 1872, který je až dosud znám velmi nedostatečně. Celková stavba glabely a tvar hypostomu poukazují jednoznačně na jeho příslušnost k této podčeledi. V jednotlivostech se však tento druh liší od známých rodů; pro utvoření nového rodu je materiál, který máme po ruce, zcela nedostatečný.

Cyrtometopinae ÖPIK, 1937.

Actinopeltis globosa (BARRANDE, 1864).
Actinopeltis completa (BARRANDE, 1872).
Actinopeltis gryphus (BARRANDE, 1872).
Actinopeltis insocialis (BARRANDE, 1852).
Eccoptochile (Eccoptochile) clavigera clavigera HAWLE & CORDA, 1847.
Eccoptochile (Eccoptochile) clavigera aspera HAWLE & CORDA, 1847.
E. (Eccoptochiloides) scuticauda (BARRANDE, 1846).
E. (Eccoptochiloides) tumescens (BARRANDE, 1852).
Cyrtometopus? neuter (BARRANDE, 1872).
Pseudosphaeroxochus (Pseudosphaeroxochus) pectinifer (BARRANDE, 1872).
P. (Pateraspis) pater (BARRANDE, 1872).
Parapilekia bohemica (RŮŽIČKA, 1934).
Parapilekia olešnaensis (RŮŽIČKA, 1926).
Stubblefieldia neglecta (BARRANDE, 1872).

Náš nový rod *Stubblefieldia* nov. gen., utvořený pro druh *Cheirurus neglectus* BARRANDE, 1872, zaujímá mezi všemi ostatními cyrtometopinními trilobity poněkud výminečné postavení. Určitými znaky vybočuje totiž z hranic této podčeledi a vlastně všech *Cheiruridů* vůbec, ačkoliv jinými znaky ukazuje na poměrně úzkou příbuznost s některými sem náležejícími rody. Proto jej označujeme jako *Cyrtometopinae incertae sedis.*

Závěrem pokládáme za svou milou povinnost poděkovati všem, kdož nám byli jakýmkoliv způsobem v naší práci nápomocni. Naše díky náležejí především p. Dr. R. S. BASSLEROVI z *US. National Museum ve Washingtoně* a p. Dr. C. J. STUBBLEFIELDOVI z *Geological Survey & Museum v Londýně* za ochotu, se kterou nám zpřístupnili některou velmi vzácnou a těžko dostupnou literaturu.

In J. BARRANDE'S classical work (1852, 1872) on the trilobites of Bohemia all species of our *Cheiruridae,* both those described by him for the first time and those already known were placed in one genus — *Cheirurus* BEYRICH, 1845 thoug in reality they belong to different genera of the subfamilies *Cheirurinae* HAWLE & CORDA, 1847, emend. RAYMOND, 1913 and *Cyrtometopinae* ÖPIK, 1937.

The reason why J. BARRANDE (1852) thus placed them all in one genus was that he did not accept the validity of the genera *Actinopeltis* and *Eccoptochile* established by I. HAWLE and A. C. CORDA (1847). In accordance with his general view on the systematics of trilobites he considered them identical with the genus *Cheirurus* BEYRICH, 1845, and therefore its synonyms. Thus the extension of the genus *Cheirurus* in the sense of BARRANDE became very wide and really assumed the significance of a higher systematic unit corresponding approximately to the extension of the present subfamilies *Cheirurinae* and *Cyrtometopinae*.

In the affinity of the genus *Cheirurus* BEYRICH, 1845, thus conceived, J. BARRANDE (1852) placed also the genera *Sphaerexochus* BEYRICH, 1845; *Staurocephalus* BARRANDE, 1846; *Placoparia* HAWLE & CORDA, 1847; and *Deiphon* BARRANDE, 1852; which he placed together with it in one common group or family of his system of trilobites, which he marked with the Nro. XIII. Later, however, J. BARRANDE (1872) changed the designation of this family to Nro. XV and still further added to it the genera *Crotalurus* VOLBORTH, 1858 and *Areia* BARRANDE, 1872. Thus this family or group assumed a much wider and more indeterminate extension than the family *Cheiruridae (Cheirurides)* originally proposed by I. HAWLE and A. J. CORDA (1847) had possessed and taxonomically it must thus be considered a regression.

On the other hand, J. BARRANDE (1852) was well aware of the great morphological diversity of the different species which he included in the genus *Cheirurus* taken in his sense. Therefore he attempted to classify them within the genus in this sense and divided it into several groups. But he did not attribute to his classification any systematic significance or importance. J. BARRANDE (1852) expressly denied all possibility of a sharp delimitation of these different groups, but at the same time he pointed out that between the different species included here by him there exist very many morphological transitions, mutually combined in the most manifold ways.

As a basis for his classification of the genus *Cheirurus* J. BARRANDE (1852) used especially differences in the shape of the thoracic pleurae, according to which he divided the whole genus into two main sections: In *Section I.* he placed all the forms whose pleural groove is parallel with the border and only slightly marked; ten to twelve segments to the thorax. In *Section II.* he placed the forms whose pleural groove is oblique and deep; eleven segments to the thorax. Further he distinguished within Section I. three subdivisions according to the different numbers of thoracic segments (10, 11, 12). In *Section II.* he distinguished only between two subdivisions according to the course of the glabellar side-furrows: *1.* the subdivision with glabellar side-furrows not united on the axis of the glabella, and *2.* the subdivision with glabellar side-furrows united on the axis of the glabella.

Notwithstanding the erroneous conception there was much truth in BARRANDE'S classification. Certain fundamental features of this classification can still be distinctly recognized in the more recent division of the genus *Cheirurus* into several related genera and subgenera, as proposed e. g. by J. W. SALTER (1853; 1864), F. SCHMIDT (1881), F. R.

C. REED (1891), C. D. BARTON (1915), as well as in the quite recent conception of the familly *Cheiruridae* HAWLE & CORDA, 1847, emend. RAYMOND, 1913. In the conception of P. E. RAYMOND (1913) of the familly *Cheiruridae* and similarly in the amendments and supplements of his followers (D. C. BARTON, 1915; E. WARBURG, 1925; T. KOBAYASHI, 1934; A. ÖPIK, 1937; etc.) we find, however, in the main BARRANDE'S original classification of the genus *Cheirurus* combined with BARRANDE'S conception of his whole group or family Nro. XIII or XV, though of course with due consideration given to the forms not represented in the Lower Palaeozoic of Central Bohemia and therefore not known to J. BARRANDE.

The authors mentioned above who dealt with the question of the classification and phyletic relations of the different reperesentatives of the family *Cheiruridae*, paid also attention of course to the *Cheiruridae* forms of B o h e m i a and at least some of them tried to classify these according to new systematic views. So far, however, nobody except F. R. C. REED (1896) and more latter, C. D. BARTON (1913) has attempted a complete classification of the Bohemian *Cheiruridae*. The last mentioned author established for the species *Cheirurus vinculum* BARRANDE, 1872 a new genus — *Lehua* BARTON, 1913.

In our opinion, however, some of the systematic placings of the Bohemian forms, undertaken so far, are not quite in keeping with the facts. In many cases they seem to have been founded entirely on the illustration and description of the different species as given in J. BARRANDE'S work (1852; 1872) and not on the direct study of the type-material, so that either too much or again too little importance is attributed to certain features which are important in modern systematics. In the course of our re-studying BARRANDE'S type-specimens and the other proof-material of the Bohemian *Cheiruridae* deposited in the collections of the *National Museum* in P r a g u e we found that with regard to the Bohemian species none of the classifications recommended so far was fully satisfactory. Therefore we have tried to propose our own classification. Thus the aim of this paper is a new systematic arrangement and classification of those Bohemian *Cheiruridae* which J. BARRANDE included under the generic name *Cheirurus* BEYRICH, 1845 and which in reality belong to different genera of the subfamilies *Cheirurinae* and *Cyrtometopinae*. It was even impossible to place some of briefly the other Bohemian *Cheiruridae* whose generic position and them in any of the existing genera or subgenera. We shall mention only briefly the other Bohemian *Cheiruridae* whose generic position and specific delimitation are upon the whole clear.

We shall consider 29 species which were formerly described by J. BARRANDE (1846; 1850; 1852; 1872; 1882), E. BEYRICH (1845; 1846), I. HAWLE and A. J. CORDA (1847); and more recently by B. BOUČEK (1933; 1935) and R. RŮŽIČKA (1926; 1934). Nobody else has seriously dealt with the detailed study of our *Cheiruridae*, with the exception of O. NOVÁK (1890) who gave valuable supplements to some Devonian species of *Cheirurinae* from Bohemia and simultaneously introduced for the first time the subgenus *Crotalocephalus* SALTER, 1853 into

Czech paleontological literature. Quite recently F. PRANTL (1947) has studied in this subgenus the so-called *regressive mutations* in KARNY's sense and re-described the species *Ch. (Crotalocephalus) globifrons* HAWLE & CORDA, 1847, which J. BARRANDE (1852) had considered conspecific with the species *Ch. (Crotalocephalus) gibbus* (BEYRICH, 1845).

On the other hand we eliminate from the list of Bohemian *Cheiruridae* the species described under the names of *Cheirurus minutus* BARRANDE, 1872; *Cheirurus perneri* RŮŽIČKA, 1926; *Cheirurus hofmani* PERNER, 1900; and *Cheirurus vittatus* BARRANDE, 1882.

Under the name of *Cheirurus minutus* BARRANDE, 1872, J. BARRANDE described and illustrated a minute pygidium, on which O. NOVÁK (MS.) remarked that it corresponds to a young specimen of the species *Cheirurus (Crotalocephalus) sternbergi* BARR., 1852 (F. PRANTL, 1947). In our opinion this pygidium shows rather *Lichadian* features.

The species *Cheirurus perneri* RŮŽIČKA, 1926, was really excluded from the *Cheiruridae* already by C. KLOUČEK and J. KOLIHA (1926). T. KOBAYASHI (1935) drew attention to its resemblance to the genus *Damesella* WALCOTT, 1905, and placed it therefore with some doubt in his family of *Damesellidae*, KOBAYASHI 1935. To this A. ÖPIK (1937) remarks that the Cheiruridan nature of this species remains really still controversial. After re-studying RŮŽIČKA's type-specimens of this species and the other homeotypes determined by him we can say that „*Cheirurus*" *perneri* RŮŽIČKA, 1926, does not show any really decisive features which would give him a right to his original generic placing. On the other hand, however, all the material of this species at our disposal is so insufficient and incomplete that it does not allow us to place it in another genus.

The species *Cheirurus hofmani* PERNER, 1900 is really an opisthoparian trilobite which shows a close affinity with the genus *Petigurus* RAYMOND, 1913.

The species *Cheirurus vittatus*, supplementarilly quite briefly delimited by J. BARRANDE (1882) is according to the still unpublished notes of O. NOVÁK *(MS.)* conspecific with the species *Eccoptochile (Eccoptochiloides) scuticauda* (BARRANDE, 1852), described earlier; this view we consider correct.

Cheiruracea ÖPIK, 1937.

This superfamily founded by A. ÖPIK in 1937 includes the families *Cheiruridae* HAWLE & CORDA, 1847, emend. RAYMOND, 1913; *Eucrinuridae* ANGELIN, 1854 and *Pliomeridae* ÖPIK, 1937. It forms in the main a fairly natural unit of a higher order, characterised by some common features. A. ÖPIK (1937) stresses especially the existence of rostrale and palpebral ridges. According to him the *Cheiruracea* show certain relations to the superfamily *Phacopidea* RICHTER, which manifest themselves the most distinctly just in the family *Cheiruridae* HAWLE & CORDA, 1847, emend. RAYMOND, 1913.

Cheiruridae HAWLE & CORDA, 1847, emend. RAYMOND, 1913.

The modern taxonomic conception of this family derives in the main from P. E. RAYMOND, 1913, who supplemented and amended the original delimination of the family *Cheruridae* as proposed by I. HAWLE and A. J. CORDA. RAYMOND's conception was, however, soon subjected to criticism and modified in many respects, especially by C. D. BARTON (1915), A. ÖPIK (1937), etc. Thus this family has today again a somewhat different extension and significance than was given to it by P. E. RAYMOND (1913). For the present we follow on the whole the classification recommended for this family by A. ÖPIK (1937); but we are well aware that for various reasons even this latest conception of the family *Cheiruridae* cannot be considered final.

P. E. RAYMOND (1913) divided the family *Cheiruridae* in his sense into the three subfamilies: *Cheirurinae, Pliomerinae* and *Deiphoninae.*

This classification was founded by P. E. RAYMOND (1913) especially on differences in the number of segments in the thorax and in the pygidium and on the bulbosity of the glabella as cardinal distinguishing features. In many respects this classification represented a certain progress compared with some earlier attemps at a similar classification of the *Cheiruridae,* as e. g. those of F. SCHMIDT (1881), F. R. C. REED (1888) and up to a point also J. M. CLARKE (1897), etc.; nevertheless the system given by this classification remained still fairly artificial and unnatural.

A little later D. C. BARTON (1915) recommended a new, more detailed classification of the subfamily *Cheirurinae,* but using other distinguishing criteria. In the main D. C. BARTON (1915) used, while simultaneously raising BARRANDE's conception of the genus *Cheirurus* to the subfamily *Cheirurinae,* a division into two sections based on the shape of the thoracic pleurae and on the pleural furrows respectively, which had been used before him already by J. BARRANDE (1852) himself and after him by FR. SCHMIDT (1881). Only in the further classification D. C. BARTON (1913) took into consideration also other features, especially the number of segments and the configuration of the glabella.

But the use unequal emphasizing of different distinguishing features by P. E. RAYMOND (1913) and D. C. BARTON (1915) had as its consequence that the affinity of some genera to a certain subfamily became rather indeterminate and controversial. Thus some genera belong to the subfamily *Cheirurinae* in the sense of C. D. BARTON, which P. E. RAYMOND (1913) himself placed in the subfamilies *Pliomerinae* or *Deiphoninae.* Attention was drawn to this discrepancy especially by E. WARBURG (1925), A. ÖPIK (1937), etc.

A. ÖPIK (1937) recommended therefore a new classification of the whole family *Cheiruridae* HAWLE & CORDA, emend. RAYMOND, 1913, to which we, too, adhere in principle. A. ÖPIK (1937) excluded first from the family *Cheiruridae* the subfamily *Pliomerinae* formed by P. E. RAYMOND (1913) and simultaneously raised it to a separate family *(Pliomeridae,* ÖPIK 1937). In his opinion this family is of the same value

as the whole family *Cheiruridae* HAWLE & CORDA, emend. RAYMOND, 1913, and forms with it and with the family *Encrinuridae* ANGELIN, 1854 the special superfamily *Cheiruracea* ÖPIK, 1937. The exclusion of the subfamily *Pliomerinae* is in keeping with the view expressed by E. WARBURG (1925) who was the first to express a doubt about its belonging to the other *Cheiruridae*. On the other hand, A. ÖPIK (1937) divided the whole family *Cheiruridae* into four subfamilies: *Cheirurinae* RAYMOND, 1913; *Cyrtometopinae* ÖPIK, 1937; *Deiphoninae* RAYMOND, 1913; and *Sphareroxochinae* ÖPIK, 1937. To these we venture to add as a further subfamily *Areiinae* NOV. SUBFAM.

1. Subfamily *Cheirurinae* RAYMOND, 1913.

This subfamily, which in the sense of A. ÖPIK (1937) corresponds in the main to the second section of BARRANDE's division of the genus *Cheirurus* and thus to one part of BARTON's division of this subfamily in the original sense, includes the representatives of the family *Cheiruridae*, characterised by pleurae with a diagonal deep pleural furrow. The ocular ridges when developed run at a certain distance from the anterior branch of the facial suture and join the dorsal groove.

A. ÖPIK (1937) places here in addition to the typical genus *Cheirurus* BEYRICH, 1845 and his subgenus *Crotalocephalus* SALTER, 1853 (which he considers, however, erroneously as separate genus), the genera *Ceraurus* GREEN, 1832; *Ceraurinus* BARTON, 1913; and *Lehua* BARTON, 1915. With some doubt he places here further also the genera *Krattaspis* ÖPIK, 1937, and *Pompeckia* WARBURG, 1925.

To these we add as further one our new genus *Ceraurioides* nov. gen. In the genus *Cheirurus* BEYRICH, 1845 we distinguish further in addition to the typical subgenus *Ch. (Cheirurus)* BEYRICH, 1845 and *Ch. (Crotalocephalus)* SALTER, 1853 a further subgenus, *Ch. (Pseudocheirurus)* nov. subgen. Similarly we divide also the genus *Ceraurinus* BARTON, 1913 into the typical subgenus *C. (Ceraurinus)* BARTON, 1913, and *C. (Osekaspis)* nov. subgen.

To this subfamily belongs also in our opinion most probably the species *Cheirurus? fortis* BARRANDE, 1872; but so far our knowledge of it is so incomplete that it is not possible for us to ascertain its generic position with certainty.

2. Subfamily *Cyrtometopinae* ÖPIK, 1937.

With the formation of this subfamily A. ÖPIK (1937) starts from BARTON'S (1915) divison of the subfamily *Cheirurinae*, from the division corresponding roughly to Section I. of BARRANDE's conception of the genus *Cheirurus* as later taken over also by F. SCHMIDT (1881). The representatives of this subfamily are characterised especially by

a weakly marked horizontal pleural furrow, which sometimes appears only as a row of minute pores or pits. The false ocular ridge, if at all developed, runs close along the anterior branch of the facial suture and connects the palpebral lobe with the cephalic border.

According to A. ÖPIK (1937) there belong to this subfamily besides the typical genus *Cyrtometopus* ANGELIN, 1852 the genera *Actinopeltis* HAWLE & CORDA, 1847; (NON *Actinopeltis* POULSEN, 1946); *Anacheirurus* REED, 1898; *Eccoptochile* HAWLE & CORDA, 1847; *Youngia* LINDSTRÖM, 1885 (NON *Youngia* JONES & KIRBY, 1886); *Kawina* BARTON, 1920; *Niezskowskia* SCHMIDT, 1881; *Pilekia* BARTON, 1920; *Parapilekia* KOBAYASHI, 1935; *Reraspis* ÖPIK, 1937 and *Seisonia* KOBAYASHI, 1935. The genus *Hemisphaerocoryphe* REED, 1896, occupies an uncertain position and could be equally well placed among the *Deiphoninae*.

As a special group within his subfamily *Cyrtometopinae* A. ÖPIK (1937) delimits the morphological circle of the genus *Protopliomerops* KOBAYASHI, 1934, which distinguishes itself from all the other representatives by the entirely different shape of its pleurae.

To the genera listed by A. ÖPIK (1937) we still add the genus *Pseudosphaeroxochus* SCHMIDT, 1881, in which we distinguish in addition to the typical subgenus *P. (Pseudosphaeroxochus)* SCHMIDT, 1881, still another subgenus, *P. (Pateraspis)* nov. subg. Similarly we divide also the genus *Eccoptochile* into two subgenera, i. e. the typical *E. (Eccoptochile)* HAWLE & CORDA, 1847, and *E. (Eccoptochiloides)* nov. subgen.

Provisionally we place in this subfamily also our new genus *Stubblefieldia* nov. gen., which in the configuration of its cephalon corresponds entirely to the type of this subfamily, but differs from all the genera placed in it by the entirely different configuration of its pleurae. Its systematic position with regard to the subfamily *Cyrtometopinae* is thus analogous to that of the above mentioned genus *Protopliomerops* KOBAYASHI, 1934. We do not consider it impossible that in future it will be necessary to separate the two into separate subfamilies.

3. Subfamily *Deiphoninae* RAYMOND, 1913.

The delimitation of this subfamily, which is closely allied to the preceding family, is fairly uncertain. E. WARBURG (1925) even denied its validity and transferred some genera *(Deiphon* BARRANDE, 1850; *Sphaerocoryphe* ANGELIN, 1852) placed in it by P. E. RAYMOND (1913) to the subfamily *Cheirurinae* in the sense of D. C. BARTON (1915).

The subfamily *Deiphoninae* was formed by P. E. RAYMOND (1913) for those *Cheiruridae* whose glabella is at least in part heavily bulbous, though the pleurae are of characteristically Cyrtometopian type. But the subfamily is not unambigously characterised by this feature of the bulbous glabella. A. ÖPIK (1937), too, is well aware of its somewhat vague delimitation against the closely allied subfamily *Cyrtometopinae*,

and therefore he explains it as a younger evolutionary derivate of the latter subfamily. A. ÖPIK (1937) remarks at the same time that the genus *Hemisphaerocoryphe* REED, 1896 placed by him in the subfamily *Cyrtometopinae,* may equally well be counted among the *Deiphoninae,* and that conversely the genus *Sphaerocoryphe* ANGELIN, 1852 otherwise close to the genus *Deiphon* BARRANDE, 1850, shows at the same time also a close affinity to the genus *Cyrtometopus* ANGELIN, 1852. At the same time, however, he draws attention to W. F. WHITTARD's finding (1934) that the genera *Sphaerocoryphe* ANGELIN, 1852; *Onycopyge* WOODWARD, 1880 and *Deiphon* BARRANDE, 1850, are mutually very closely allied and form in his opinion one evolutionary series.

We accept for the present the validity of the subfamily, in agreement with P. E. RAYMOND (1913) and A. ÖPIK (1937). Yet at the same time we venture to point out that in our opinion the subfamily *Deiphoninae* as a systematic unit has not the same significance as the subfamily *Cyrtometopinae* and that it represents raelly only its evolutionarily younger subdivison.

Today only the genera *Deiphon* BARRANDE, 1850; *Onycopyge* WOODWARD, 1880 and *Sphaerocoryphe* ANGELIN, 1852, are counted among the *Deiphoninae.* Perhaps the genus *Hemisphaerocoryphe* REED, 1896, may also be placed in it.

P. E. RAYMOND (1913) placed in the subfamily *Deiphoninae* also the genus *Staurocephalus* BARRANDE, 1846, (NON *Staurocephalus* GRUBE, 1885), which, however, really occupies quite a special position. E. WARBURG (1925) and A. ÖPIK (1937) emphasize that the genus *Staurocephalus* has no close affinity either to the genus *Deiphon* or to *Sphaerocoryphe.* A. ÖPIK (1937) even doubts its belonging at all to the *Cheiruridae.*

Similarly F. R. C. REED (1898 a) already drew attention to the fact that the genus *Staurocephalus* BARRANDE, 1846, belongs in his opinion rather to the family *Encrinuridae* ANGELIN, 1854, than to the family *Cheiruridae* HAWLE & CORDA, emend. RAYMOND, 1913. He emphasizes that in this genus only the frontal lobe of the glabella is bulbous, separated from the other portions of the glabella by a connected first pair of lateral glabellar furrows, which form one deep and broad transverse furrow. In the *Cheiruridae* with a distinctly bulbous glabella this bulbosity invariably also includes more or less of the posterior parts of the glabella.

Among the other distinctive features F. R. C. REED (1898 a) emphasizes especially the granulated surface of the glabella, the stalked eyes, the large subtrigonal free cheeks, and the different course of the facial suture.

Recently J. L. BEGG (1940) has drawn attention to a certain inconsistency between the illustration and verbal description of the course of the facial suture in this genus, as given by J. BARRANDE (1852).

Basing ourselves on our study of the Bohemian material we venture to remark to this that the verbal description of J. BARRANDE is

entirely correct and to the point. J. L. BEGG's remark (1940) appears to be well founded only in that respect that in BARRANDE's illustration of the species *S. murchisoni* (1852, pl. 43, figs. 28—29) the posterior branch of the facial suture is drawn somewhat more strongly curved downward than is actually the case.

According to F. R. C. REED (1898 a) the pleurae of this genus are very reminiscent of certain forms of the family *Encrinuridae* ANGELIN, 1854, especially so by their very marked *fulcrum.* Similarly the groove developed in the anterior part of the pleurae in *Staurocephalus* is according to him not homologous with the pleural groove of the *Cheiruridae.* Furthermore, the pygidium of the genus *Staurocephalus* is according to F. R. C. REED (1898 a) reminiscent in its general shape and in the small number of pleurae of the genus *Encrinurus* EMMRICH, 1844 or *Cybele* LÓVEN, 1845 (NON *Cybele* REICHENBACH, 1852, NEC *Cybele* PECKHAM, 1894). J. BARRANDE's remark (1852) about the analogy existing between the pygidium of *S. murchisoni* and the species *Eccoptochile (Eccoptochiloides) tumescens* (BARR.) does not do justice to reality in our opinion. On the contrary and as already pointed out by F. R. C. REED (1898 a) one might rather speak of an analogy between the pygidium of *Staurocephalus* BARRANDE, 1846, and that of *Pliomera* ANGELIN, 1854 or of *Cybele* LÖVEN, 1845.

Similarly the hypostoma of the genus *Staurocephalus* BARR. differs very strikingly from the hypostomae of all the representatives of the whole family *Cheiruridae.* As W. B. R. KING (1920) more recently emphasized after a re-studying of the type specimen of the only hypostoma of this genus formerly depicted by J. W. SALTER (1864), it is necessary to separate the genus *Staurocephalus* BARRANDE, 1846 from the other *Cheiruridae* on account of the entirely different shape of the hypostoma. W. B. R. KING (1920) places this genus simultaneously, though with some hesitation, in the family *Encrinuridae* ANGELIN, 1854 thus approaching the point of view of F. R. C. REED (1898 a).

On the other hand the analogy in the configuration of the hypostomae of the genera *Staurocephalus* and *Encrinurus* is in our opinion not too great, though certain morphological analogies can be followed. The genus *Cybele* LÓVEN, 1845 has a hypostoma of entirely different shape.

Thus we agree with the opinion of F. R. C. REED (1898 a), W. B. R. KING (1920) etc. in so far as to consider it fully proved that the genus *Staurocephalus* BARRANDE, 1846 is in reality not of *Cheiruridan type* and that it is much more likely to belong to the morphological affinity of the family *Encrinuridae* ANGELIN, 1854. As however this genus distinguished itself from the other representatives of the family *Encrinuridae* by a number of important morphological features, we consider it to be its separate lateral evolutionary derivate. The separation of the genus *Staurocephalus* BARRANDE from the original stock of the *Encrinuridae* appears to have taken place very early, though we do not yet know when it happened. Therefore we recommend to

establish for this genus a *separate subfamily*, *Staurocephalinae**) nov. subfam., within the family *Encrinuridae*.

4. Subfamily *Sphaeroxochinae* ÖPIK, 1937.

According to A. ÖPIK (1937) this whole subfamily corresponds to the delimitation of the genus *Sphaeroxochus* BEYRICH, 1845. A. ÖPIK (1937) emphasizes especially the characteristic configuration of the glabella, which according to him has a distinctly *Cyrtometopian shape*, and the configuration of the pleurae.

A. ÖPIK (1937) derives also this subfamily from the subfamily *Cyrtometopinae* as its younger derivate. In our opinion, however, the genus *Sphaeroxochus* BEYRICH, 1845, does not have nearly so close relations with the subfamily *Cyrtometopinae* as A. ÖPIK (1937) believes. The structure of the pleurae is in this genus quite different and the analogy in the general configuration of the cephalon might perhaps be explained by heterochronous homeomorphy. In any case the subfamily *Sphaeroxochinae* BEYRICH, 1845, forms undoubtedly a separate

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*) *Encrinuridae* Angelin, 1854.

Staurocephalinae, nov. subfam.

Type: *Staurocephalus* BARRANDE, 1846. Silurian of Central Bohemia. The diagnosis of this new subfamily corresponds to the diagnosis of the genus *Staurocephalus* BARRANDE, 1846. Its relations to the other representatives of the family *Encrinuridae* are discussed above and we refer the reader therefore to that discussion.

The monotypic subfamily *Staurocephalinae* nov. sub., i. e. the genus *Staurocephalus* BARRANDE, 1846, is represented in the Silurian of Bohemia by one species only (*S. murchisoni* BARRANDE, 1846). This species occurs here in the uppermost strata of the Wenlockian (Motol Shales — $e\alpha_2$) and continues into the Lower Ludlovian (Budňany Limestones — $e\beta$). This vertical distribution corresponds to its distribution in the Silurian of England (North Wales; Woolhope Limestones and Shades, Wenlock Limestones of Dudley and Malvern). The occurrence of this species mentioned by J. W. SALTER, 1864, in the "*Caradocian*" is according to the investigations of J. L. BERG (1940) very doubtful. The species *Staurocephalus clavifrons* is mentioned also from the Upper Ordovician of Scandinavia and *S. globiceps* from Ordovician of Scotland, etc.

P. THORSLUND (1940, p. 161) drew attention to the fact that his new genus *Jemtella* THORSLUND from the Scandinavian Ordovician shows likewise certain morphological affinities with the genus *Staurocephalus* BARRANDE. It is reminiscent of it especially by the configuration of the glabella, chiefly by its distinctly bulbous frontal lobe and the narrow, relatively little convex remaining portion of the glabella, fairly sharply delimited against the frontal lobe. The course of the facial suture and the shape and size of the free cheeks are, however, quite different.

P. THORSUND (1940) placed his new genus in the family *Cheiruridae* without attempting to determine its position more accurately. On the other hand he was forced to admit that this systematic position of the genus *Jemtella* cannot be considered as quite unequivocal and certain. He also drew attention to the fact that this genus shows certain affinities also to the families *Phacopidae* and *Encrinuridae*, of which it is reminiscent especially by the ornamentation of the glabellar surface.

lateral evolutionary branch, of which it cannot yet be determined with any degree of accuracy when it separated from the common stock of the *Cheiruridae*.

5. Subfamily *Areiinae* nov. subfam.

Cheiruridae of broadly oval body, with pleurae of the *Cyrtometopian type* and small pygidium of only four lobes, lacking visual organs and facial sutures. The anterior cephalic border is in front of the glabella shifted forward in steps, in front of the other portions of the cephalon.

This subfamily includes only the genus *Areia* Barrande, 1872 and its delimitation corresponds with the diagnosis of this genus. The genus *Aireia* BARR. has to be considered typically *Cheiruridan* as emphasized more recently by E. WARBURG (1925) and A. ÖPIK (1937) in contradistinction to C. E. BEECHER (1897) who placed it in the *Encrinuridae* ANGELIN, 1854. Hitherto the position of this genus within the family *Cheiruridae* HAWLE & CORDA, emend. RAYMOND, 1913, had been uncertain.

The genus *Areia* BARRANDE, 1872, distinguishes itself, however, from the other *Cheiruridae* in some characteristic features of the cephalon, especially by the fact that no facial suture is developed and that it lacks the visual organs. Also the course of the lateral glabellar furrows is slightly different. On the other hand the *Cyrtometopian* character of this genus is emphasized not only by the characteristically shaped pleurae but also by the shape of the hypostoma. As already pointed out by J. KOLIHA (1922)the species *A. fritschi* BARR., in all other respects closely related to the other two species of this genus in the Bohemian Ordovician *(A. bohemica* BARR., *A. barrandii* NOVÁK), has a hypostoma reminiscent of the species *Cheirurus* (RECTE *Actinopeltis) completus* (BARR.).

F. R. C. REED (1898 a) voiced the opinion that *Areia* BARR. was a very primitive *Cheiruridae* in which it came to a partial cessation of the ontogenetic development, so that it retained some primitive larval characters, which of course were modified secondarily. We do not venture here to decide in detail how far REED's opinion is justified. According to the present state of our knowledge of the evolution of the whole family *Cheiruridae* HAWLE & CORDA, emend. RAYMOND, 1913, we consider it for exclused that *Areia* BARRANDE, 1872, was some neotenic form. It is far more likely that this genus originated as a secondary separate evolutionary branch, which was up to a certain degree parallel to the subfamily *Cyrtometopinae* and in which it came to the reduction of the visual organs and facial sutures perhaps only secondarily, during the phyletic evolution. On the upper surface of the cephalon of the genus *Areia Barr.* there are no traces whatsoever of free cheeks. The supposition expressed by E. WARBURG (1925) that nevertheless this genus had perhaps some very narrow free cheeks not yet ascertained up till now, lacks in our opinion all foundation.

Subfamily *Cheirurinae* (HAWLE & CORDA), RAYMOND, 1913.

Genus *Cheirurus* BEYRICH, 1845.

Genotype: *Cheirurus insignis* BEYRICH, 1845. Silurian. Bohemia.

In our opinion the genus *Cheirurus* BEYRICH, 1845 is divided into three separate, different subgenera, which differ from each other in a number of characteristic features. They are the typical subgenus *Cheirurus (Cheirurus)* BEYRICH, 1845, with the characteristic subgenotype *Cheirurus (Cheirurus) insignis* BEYR.; furter *Cheirurus (Crotalocephalus)* SALTER, 1853, with the subgenotype *Cheirurus gibbus* BEYRICH, 1845.

For the species *Cheirurus beyrichi* BARR. we establish a further new subgenus founded on the different shape of the pygidium, the course of the glabellar furrows, etc., and propose for it the name of *Cheirurus (Pseudocheirurus)* nov. subgen.

The typical Subgenus *Cheirurus (Cheirurus)* BEYRICH, 1845.

Subgenotype: *Cheirurus insignis* BEYRICH, 1845. Silurian. Bohemia.

The typical subgenus is formed by *Cheirurinae* trilobites comprising only the groups of the species *Cheirurus insignis* and *Ch. quenstedti*. There is no need for a more detailed description, as it is a generally distributed and sufficiently known subgenus whose delimination we do not modify at all. More subtile differences between the two groups or species *(Cheirurus insignis* and *Ch. quenstedti)* were given already by J. BARRANDE (1852, pp. 785 and 791), to whom we therefore refer the reader. The same author also pointed out (1852, p. 785) that in the species *Cheirurus quenstedti* BARR. we have to see the morphological transition to the species *Cheirurus gibbus* BEYRICH, which was later selected by J. W. SALTER (1853) as subgenotype of his subgenus *Crotalocephalus* SALT.

In our opinion it is more probable that the morphological transition and perhaps also the phyletic affinity between the typical subgenus *Cheirurus (Cheirurus)* BEYRICH and the subgenus *Cheirurus (Crotalocephalus)* SALT. can be expressed correctly by the series *Cheirurus quenstedti — Crotalocephalus sternbergi.*

Occurrence: The typical subgenus *Cheirurus (Cheirurus)* BEYR. occurs almost exclusively only in the Silurian, though with its first representatives it reaches down into the Upper Ordovician.

Geographical Distribution: This characteristic subgenus is of cosmopolitic distribution, as it is known from almost all Silurian regions.

Species: In the Bohemian Silurian the following forms belong to this subgenus: *Cheirurus (Cheirurus) insignis* BEYRICH; *Ch. (Ch.) quenstedti* BARR.; *Ch. (Ch.) obtusatus* HAWLE & CORDA; *Ch. (Ch.) bifurcatus* BARR.; *Ch. (Ch.) bicuspidatus* BOUČ.; and *Ch. (Ch.) transiens* BOUČ.

Subgenus *Cheirurus (Crotalocephalus)* SALTER, 1853.

Subgenotype: *Cheirurus gibbus* BEYRICH, 1845. Devonian. Bohemia.

We retain the original delimitation of this subgenus as given by J. W. SALTER (1853 and 1864). Thus we do not accept the opinion maintained by A. ÖPIK (1937) and others who consider SALTER's subgenus a separate genus, equivalent to the other members of the subfamily *Cheirurinae* (HAWLE & CORDA), em. RAYMOND, 1913.

Within this subgenus one of us (F. PRANTL, 1947) has recently distinguished two groups, i. e. the group of the species *Cheirurus (Crotalocephalus) gibbus* and that of *Ch. (Crotalocephalus) sternbergi.* The first is characterized by a narrowly oval, elongated, distinctly convex body, the seven-lobate pygidium is characterized by short bent pleural spines and well developed unpaired (central) spine which forms the continuation of the rhachis.

The second group is characterized by a far less convex, but broader body, and by a six -lobate pygidium with long spines.

Occurrence: Lower and Middle Devonian. BARRANDE's note of the occurrence of this subgenus in the Silurian of Bohemia cannot be considered well proved according to O. NOVÁK (1890), and the same applies to its occurrence in the Srbsko Beds — h. (Mesodevonian).

Geographical Distribution: Europe, Asia Minor.

Species: For the present we give for this subgenus only the species occurring in the Devonian of Central Bohemia: *Cheirurus (Crotalocephalus) gibbus* (BEYRICH); *Ch. (Crotalocephalus) globifrons* (HAWLE & CORDA); *Ch. (Crotalocephalus) pauper* (BARR.); *Ch. (Crotalocephalus) sternbergi* (BOECK); and *Ch. (Crotalocephalus) cordai* (BARR.).

Subgenus *Cheirurus (Pseudocheirurus)* nov. subgen.

Derivatio nominis: *Pseudo* — sham; *Cheirurus.*

Locus typicus et stratum typicum: Dlouhá hora near Beroun, Bohemia. Budňany Beds — $e\beta_1$. Middle layers of the Lower Ludlovian.

Subgenotype: *Cheirurus beyrichi* BARRANDE, 1846.

Synonimum: *Cheirurus* auctorum.

Diagnosis: Subgenus of the genus *Cheirurus* BEYRICH, characterized by the strongly oblique course of the first two pairs of glabellar furrows and by its seven-lobate pygidium, whose pleurae end in flat, bluntly lobate lobes lying close to each other. The seventh (unpaired) lobe is smaller and of a subtetragonal shape.

Description: Cephalon semicircular, markedly convex. Glabella subtetragonal, strongly convex, delimited by deep circumglabellar furrows which converge slightly in a downward direction. Glabella with three pairs of lateral glabellar furrows; the first two pairs which reach almost to two thirds of the width of the glabella, are markedly oblique and slightly arcuate. The furrows of the third (posterior) pair cross. Basal lobes subtriangular, perfectly delimited. Fixed cheeks large, convex, obliquely inclined in the direction towards the lateral border. Free cheeks small, subtriangular. Visual organs of medium size, placed near the glabella at about the level of the first pair of glabellar lobes. Facial sutures of *Cheiruriniae type*, but with the difference that the posterior branch of the facial suture after reaching the rim of the lateral border suddenly bends sharply obliquely downward. Lateral and posterior border of the cephalon wide, convexly elevated. Genal angle running out in an entirely stunted short genal spine. Occipital furrow deep; occipital ring in the centre broad, convex, subtriangular.

Thorax of 11 segments. Axis semicircularly convex, comprising a little more than one fifth of the total width of the thorax. Pleurae of the *Cheirurinae type*.

Pygidium semicircular, seven-lobate, with raised axis occupying about one third of its total width; composed of three segments. The first two pairs of the pygidial pleurae have in their inner part a characteristic diagonal furrow. The pygidial pleurae end in flat, bluntly lobate-enlarged lobes which touch each other closely. The central (unpaired) lobe is shorter than the others, of subtetragonal shape.

Relations and Remarks: The figure of the species *Cheirurus (Pseudocheirurus) beyrichi* (BARR.) given by J. BARRANDE (1852, pl. 42, fig. 5) does not show the course of the glabellar furrows correctly. In reality they are more oblique than is shown in the figure. Similarly, the strong convexity of the cephalon is not clearly visible in the drawing. Neither do the lobate ends of the pygidium show in BARRANDE's drawing a blunt termination.

Cheirurus (Pseudocheirurus) nov. subgen. is very close to the typical subgenus *Cheirurus (Cheirurus)* BEYRICH, 1845. The latter differs from it mainly by the different shape of its pygidium. On the other hand, our new subgenus is reminiscent of the genus *Ceraurinus* BARTON, 1913, in the course of the posterior branch of the facial suture, but the latter is characterised by a quite different configuration of glabella and pygidium.

By the shape of its pygidium *Cheirurus (Pseudocheirurus)* n. subg. distinguishes itself from all other representatives of the subfamily *Cheirurinae* HAWLE & CORDA, 1847, em. RAYMOND, 1913; on the other hand this pygidium is slightly reminiscent of the *Cyrtometopinae* genus *Eccoptochile* HAWLE & CORDA, 1847, to which *Cheirurus (Pseudocheirurus)* n. subg. has no closer affinity whatsoever.

Occurrence: Middle layers of the Lower Ludlovian. Budňany Beds — $e\beta_1$.

Geographical Distribution: Central Europe: Bohemia.

Species: To the subgenus *Cheirurus (Pseudocheirurus)* nov. subgen. belongs only one representative, the subgenotype and species *Ch. (Pseudocheirurus) beyrichi* (BARRANDE. 1846).

Genus *Ceraurioides* nov. gen.

Derivatio nominis: The name of *Ceraurioides* was derived from the generic name *Ceraurus*, as the pygidium of this new genus is reminiscent of the genus *Ceraurus* GREEN, 1832.

Locus typicus et stratum typicum: Lochkov, Bohemia. Budňany Beds — $e\beta_1$ (Lower Ludlovian).

Genotypus: *Cheirurus Hawlei* BARRANDE, 1852.

Synonymum: *Cheirurus* auctorum.

Diagnosis: Trilobite of *Cheirurinae type*, characterised by the following features: Glabellar side-furrows of *Ceraurinus type;* free cheeks very small, shifted forward. Fixed cheeks large. Facial sutures have a different course, are situated in front. Visual organs small. Anterior portion of the thoracis pleurae strikingly short. Pygidium of *Ceraurus type*, with strikingly raised axis.

Description: Cephalon semicircular, slightly convex. Glabella subtetragonal, rounded in front, narrowing distinctly to the back. The threepairs of glabellar furrows are arranged regularly,distinctly obliquely arcuate, reaching to about one third of the width of the glabella. The posterior pair of glabellar side-furrows is a little less oblique than the preceding furrows, does not reach the occipital furrow, but it connected with it by a shallow connective; thus the basal lobes are only imperfectly separated. Frontal lobe relatively long, transversally arched. Circumglabellar furrow straight, very deep. Fixed cheeks very large, comprising the larger portion of the cephalon. Free cheeks small, subtriangular, markedly shifted forward. Surface of cheeks closely pitted. The frontal branch of the facial suture runs from the frontal margin of the cephalon close to the frontal lobe, obliquely to the visual organ. The posterior branch runs from the visual organ parallel to the furrow of the posterior margin of the cephalon to its lateral margin, at the level of the first pair of glabellar furrows, where also the visual organ is situated. Visual organs very small, shifted forward. Lateral margin of the cephalon convexly elevated, running out at the genal angle in a short spine extending obliquely from the cephalon. Posterior border of the cephalon broader, straight. Occipital furrow fairly deep. Occipital ring wide, in the middle convex and enlarged.

Thorax of unknown number of segments, probably eleven. Axis very raised, corresponding to about one fourth of the total width of the thorax. Pleurae of characteristic *Cheirurinae type*, with thin outer portion shorter by about one half than their inner portion.

Pygidium trapezoid, with raised axis, composed of four segments. The first pair of pleurae runs out into long ensiform spines; the other two pairs are stunted.

Concerning the hypostoma we refer the reader to the description given by J. BARRANDE (1852, p. 787, pl. 42, figs. 9—10).

Relations and Remarks: The genus *Cerauroides* nov. gen. is somewhat reminiscent in the shape of the cephalon of the genus *Ceraurinus* BARTON, 1913, to which it is analogous especially in the configuration of the glabella. The striking prolongation of the pygidial spines in the first pair of pygidial pleurae is reminiscent, however, of the genus *Ceraurus* GREEN, 1832. The axial portion of the pygidium is, however, in our genus distinctly separated from the lateral pleurae.

On the other hand *Cerauroides* n. g. shows a certain analogy to the genus *Cheirurus* BEYRICH, 1845, which manifests itself especially in the shape of the hypostoma and the general aspect of the cephalon but for the features mentioned above.

In our opinion *Cerauroides* nov. gen. is probably a representative of a separate, blindly ending evolutionary branch, which arose from the same morphological stock of Ordovician *Cheirurinae* as the genus *Cheirurus* BEYRICH, 1845 itself.

Occurrence: Silurian, Lower Ludlovian. Budňany Beds — $e\beta_1$.

Geographical Distribution: Europe; Bohemia, Germany (Oberfranken) and Karnian Alps.

Species: Up till now there belongs to this new genus only the genotype and the species *Cerauroides propinquus* (MÜNSTER, 1840). As already mentioned by J. BARRANDE (1852; p. 788) the two species appear to be closely related.

Genus *Lehua* BARTON, 1915, nov. emend.

Genotype, by original designation, *Cheirurus vinculum* BARRANDE, 1872. Ordovician; Bohemia.

Synonyms: *Cheirurus* auctorum; *Krejčia* NOVÁK, MS.

Diagnosis: Trilobite of the subfamily *Cheirurinae* of medium size, with 11 thoracic segments and six-lobate pygidium. Free cheeks small, shiften forward. Facial suture forming a small arc; at first it runs close along the margin of the glabela and at the level of the first lateral glabelar lobe it turns back in an arc to the lateral margin of the cephalon. Neither visual organs nor palpebral lobe are developed. Pygidium with raised subtrigonal axis composed of four rings, the fourth being completely stunted. Three pairs of sword-like curved, free, flat pleurae of unequal length. The lower margin of the pygidium is sharply cut off in a straigth line perpendicular to the axis.

Description: Cephalon transversely semielliptic, short. Glabela sligthly convex rounded in front, sligthly narrowing downwards; frontal margin of the glabella shifted sligthly forward. Three pairs of glabellar furrows which reach to about one third of the total width of the glabella; they are narrow, and sligthly bent back in an arc under an angle of 45. Frontal glabellar lobe very short. Axial part of the glabela sligthly raised above the glabellar lobes. Circumglabellar furrow narrow and deep. Fixed cheeks slightly convex, subtetragonal, rather big comprising the larger part of the cephalon. Free cheeks small, shifted well forward, subtriangular. Surface of the cheeks densely pitted. Visual organs and palpebral lobes completely lacking. Facial suture running along the glabellar margin and turning back in an arc to the lateral margin of the cephalon at the level of the first glabellar lobe.

Lateral border clearly discernible, convex, running out in the genal angle in a strong, oblique spine. Posterior border equally raised and equally vide. Occipital ring rather wide and sligthly bent forward at its rim on both sides. Occipital furrow straigth, broad, and deep.

Thorax of 11 segments, with sligthly raised axis narrowing fairly quickly in a backward direction. The axis occupies approximately one fourth of the total width of the thorax. Each axial ring is separated by deep axial furrow. The centre of the axial ring is decorated with a pair of ornamental tubercles. Pleurae distinctly two-partite; the inner portion of the pleurae is very short and corresponds approximately to one third of the outer portion. It is divided by an oblique transverse furrow into two equal, sligthly raised triangles. The constriction between the inner and outher portions of the pleurae is sligthly marked and the nodular elevation at the beginning of the outer portion is likewise slightly raised. The outer portion of the pleurae is bent back in a sword-like way.

Pygidium with raised, subtriangular axis composed of four rings, of which the fourth is completely aborted. Three pairs of ensiform, free, flat pleurae of unequal length. The lower margin of the pygidium is harply cut off in a straigth line perpendicular to its axis.

The surface of the whole body is granulated with tubercles of different size. Hypostoma not known.

Relations and Remarks: The genotype of this genus, *Cheirurus vinculum* BARRANDE, 1872 was recognised by O. NOVÁK already as the representive of a new genus of the *Cheiruridae*, for which it was proposed by him the generic name *Krejčia* NOVÁK, MS. With this name it is labeled the drawing of the species mentiond above in the unpublished plates of his unfinished manuscript on the Bohemian Trilobites.

The true systematic position of the genus *Lehua* BARTON, 1915, which has seemigly the priority over the *MS.* designation of O. NOVÁK, is not yet quite clear; the inaccessibility of some of the earlier papers on the subject prevents us comparing the genus *Lehua* BARTON, 1915 with all genera coming into consideration, e. g. the genus *Typhloniscus* SALTER, 1856 (non *Typhlonicus* SCHOEBL, 1860).

C. D. BARTON (1915) compares the genus *Lehua* with the genera *Eccoptochile* HAWLE & CORDA, 1847 and *Anacheirurus* REED, 1898. Both of them belong to the subfamily *Cyrtometopinae* ÖPIK, 1937 and therefore the Cheirurinian genus *Lehua* does not have close relations to the genera mentioned above.

In the configuration of the cephalon *Lehua* BARTON, 1915 which is a typical representative of the subfamily *Cheirurinae* (HAWLE & CORDA, 1847), emend. RAYMOND, 1913, it reminiscent especially on the genus *Ceraurinus* BARTON, 1913 and chiefly on the genotype of the genus, *C. marginatus* BARTON, 1913 by the shape of the glabella with characteristic short frontal lobe, which in front projects a little beyond the margin of the cephalon. But the course of the glabellar furrows and facial sutures is essentially different. We consider a more detailed comparison useless, as the delimination of the genus *Ceraurinus* BARTON, 1913 is in our opinion very broad and undetermined as it includes forms with quite different configuration of the glabellae and pygidia. In our opinion the generic name of *Ceraurinus* BARTON, 1913 is a cumulative designation including several more or less different forms without close phylletic affinity to each other. On the other hand, the pygidium of the genus *Lehua* BARTON, 1913 is reminiscent of the species *Ceraurinus? icarus* (BILLINGS), which, dowever, is characterised by a quite different configuration of the cephalon, especially of the glabellae. Besides, all the forms placed by C. D. BARTON (1913) in the genus *Ceraurinus* have well developed, relatively large visual organs. On the contrary, *Lehua* BARTON is a completely blind form.

The genus *Lehua* distinguishes itself from all other known representatives of the subfamily *Cheirurinae* by the shape of its cephalon, especially by the course of the facial sutures and glabellar furrow, and by the shape of the pygidium.

Occurrence: Ordovician; Dobrotivá Beds — $d\gamma_2$. (Llanvirnian-Llandeilian).

Geographical Distribution: Central Europe: Bohemia; South Africa; ? India.

Species: To this genus belongs only most probably the genotype *Lehua vinculum* (BARRANDE, 1872). C. D. BARTON (1915) places here also the species *Lehua princeps* (REED, 1908) and *Lehua? inexpectatum* (REED, 1906).

Genus *Ceraurinus* BARTON, 1913.

Genoholotype: after the original designation: *Ceraurinus marginatus* BARTON, 1913. Richmond, Ontario, Canada.

In the original description of this genus C. D. BARTON (1913) divided all the species placed here by him into several groups, and in one of them he placed also the Bohemian species *Cheirurus comes* BARRANDE, 1872. He considered the differences in the general shape of the glabella and in the shape of the lateral glabellar furrows to be the characteristic distinguishing features.

A closer investigation showed, however, that the species *Ch. comes*, BARRANDE 1872, does not fit in certain features, especially in the different course of the facial suture, into the frame of the genus *Ceraurinus* BARTON, 1913. For this reason we separate it — against BARTON's original conception — and form for it a new subgenus, *Ceraurinus (Osekaspis)* nov. subgen. Thus we divide the genus *Ceraurinus* into two subgenera, i. e. the typical subgenus *Ceraurinus (Ceraurinus)* BARTON, 1913, and the new subgenus *Ceraurinus (Osekaspis)* nov. subgen. Simultaneously we venture to mention that in our opinion the genus *Ceraurinus* BARTON, 1913, was established too large and indefinite, and that in future it may thus prove necessary to subdivide the typical subgenus *Ceraurinus (Ceraurinus)* BARTON too.

Occurence and Distribution: Upper Ordovician of North America and Canada (Trenton, Black River) and Ordovician of Central Bohemia. According to D. C. BARTON (1913) this genus is probably represented also in the Ordovician of the East Baltic region (Echinospharites Limestones) and perhaps also in India.

Subgenus *Ceraurinus (Osekaspis)* nov. subgen.

Genoholotype: after the original designation, *Cheirurus comes*, BARR., 1872.

Derivatio nominis: after the village Osek near Rokycany (West Bohemia), the classical locality for fossils in the Osek-Kváň Beds —$d\gamma$.

Locus typicus: Osek near Rokycany, West Bohemia.

Stratum typicum: Šárka Beds — $d\gamma_1$ (Llandvirnian).

Diagnosis: Subgenus of the genus *Ceraurinus* BARTON, 1913, characterised by the following features: Glabella subrectangular, slightly narrowed in front. Third (posterior) pair of glabellar furrows turned back in an arc and not reaching the occipital furrow. Lateral basal glabellar lobes continuing without constriction into the central portion of the glabella. Posterior branch of the facial suture at approximately right angle to the lateral margin of the cephalon.

Description: Cephalon subsemicircular, slightly convex, with characteristic marginal, flatly raised margin which is separated from the other portions of the cephalon by a deep furrow and runs out in short, pointed, cheek-spines. Glabella subrectangular and slightly narrowing in a forward direction. Circumglabellar furrows almost parallel to the axis of the glabella and fairly deep. The first two pairs of the lateral glabellar furrows are short, but deep and slightly arcuate; they reach only to about one third of the total width of the glabella. The basal pair of glabellar furrows is more strongly arcuate and a little longer than the furrows of the preceding pleurae, but do not reach the occipital furrow. The basal glabellar lobes are therefore not limited by any constriction or narrowing and pass gradually into the other portions of the glabella.

The frontal glabellar lobe is surrounded by a narow preglabellar field somewhat shifted forward and transversely cut off; it is delimited on both sides by the upper branch of the facial suture, the ocular ridges delimiting the cheeks. The posterior margin is of approximately the same width as the lateral margin of the cephalon, and is likewise delimited by a deep furrow. The occipital ring is slightly raised and broader than the lateral and posterior margin.

Free cheeks relatively small, of subtrigonal shape. Visual organs of medium size, situated in the middle of the cheeks at about the level of the second lateral glabellar lobe. The upper branch of the facial suture runs from the frontal border of the cephalon slightly obliquely towards the visual organ and after encircling the palpebral lobe turns with its posterior branch under an almost right angle to the lateral border of the cephalon, which it reaches at about the level of the anterior glabellar furrow.

Surface of the glabella smooth; surface of the cheeks, with the exception of the lateral margin, minutely pitted.

Remarks and Relations: *Ceraurinus (Osekaspis)* nov. subgen. distinguishes itself from the subgenotype of the typical subgenus *Ceraurinus (Ceraurinus)* BARTON, 1913, especially by its glabella somewhat narrowing towards the front and by the arcuate course of the posterior pair of glabellar furrows. The basal glabellar lobes are not separated by any, however slight, constriction from the central portion of the glabella, into which they pass gradually. The posterior branch of the facial suture shows likewise a different course; in the typical subgenus *Ceraurinus (Ceraurinus)* BARTON, 1913, the posterior branch of the facial suture turns, in about the middle of its course, very sharply obliquely downward and forms with the lateral margin of the cephalon an acute angle, whereas in *Ceraurinus (Osekaspis)* nov. subgen. the posterior branch of the facial suture is quite gently undulatingly bent and forms with the margin of the cephalon an almost right angle. The occipital ring shows in the latter subgenus no central enlargement, so characteristic of the typical subgenus *Ceraurinus (Ceraurinus)*.

For the present a further comparison of the differences or analogies between the two subgenera with regard to the shape of the thorax, pygidium and hypostoma is not possible, as the subgenoholotype of our new subgenus is so far known only from its cephalon.

The subgenus *Ceraurinus (Osekaspis)* nov. subg. was established for BARRANDE's species *Cheirurus comes* BARR., 1872, placed later by F. R. COWPER REED (1896) in the affinity of the genus *Eccoptochile* HAWLE & CORDA. More recently A. ÖPIK (1937) designated it *Ceraurus? comes* (BARR.), though already C. D. BARTON (1913) had placed it in his genus *Ceraurinus*. In his division of this genus already D. C. BARTON (1913) separated this our Bohemian species into a separate group and at the same time remarked that it different in some features from

the orther representatives of the genus. Thus our separation of it into a separate subgenus, *Ceraurus (Osekaspis)* n. subg., is really in keeping with BARTON's original conception.

Occurrence and Distribution: Bohemia, Šárka Beds — $d\gamma_1$ (Llandvirnian). So far this subgenus has not been determined in other Ordovician areas.

Cheirurinae incerti generis.

Cheirurus? fortis BARRANDE, 1872.

To the subfamily *Cheirurinae* HAWLE & CORDA, 1847, belongs very probably also the species described by BARRANDE (1872) under the name of *Cheirurus? fortis* BARR., which we cannot place with certainty in any known genus. This species, which is founded on one incomplete glabella with the hypostoma preserved *„in situ"*, is however too insufficient a material to found on it a new genus or subgenus.

The whole configuration of the glabella is in general of *Cheirurus type*. It differs, however, from the typical representatives of the genus *Cheirurus* BEYRICH, 1845, by the striking lengthening of the whole glabella, of which especially the frontal lobe is very long. The third (basal) pair of glabellar furrows is in about half its length abruptly bent downward and slightly enlarged in comparison with the marginal portion. For the rest these furrows do not reach the occipital furrow, so that the basal lobes are but incompletely separated from the other parts of the glabella.

The length of the glabella is very considerable (56 mm.), so that it must have belonged indubitably to a species of considerable size, much larger than the usual representatives of the subfamily *Cheirurinae*.

Hypostoma preserved *„in situ"*, corresponding in general to the typical shape of the hypostomae in the other *Cheirurinae*, especially in the subgenus *Cheirurus (Cheirurus)* BEYRICH, 1845, itself.

Considering the incomplete material the features mentioned of the species *Cheirurus? fortis* BARR. are not sufficiently conclusive either for placing it directly in the genus *Cheirurus* BEYR. or for its separation into another genus. Apart from certain differences in the shape of the frontal glabellar lobe and basal lateral lobes the shape of the glabella and hypostoma mentioned corresponds after all to the typical subgenus. Thus we attach it to it until further, though with some hesitation.

Occurrence and Distribution: *Cheirurus? fortis* BARR. was found in the Králův Dvůr Beds — $d\xi_1$ (Ashgillian) in the Ordovician of Central Bohemia. If its generic position is correct, it belongs thus to the group of Ordovician *Cheirurinae* so far not re-studied more in detail. Such Ordovician *Cheirurinae* are known *e. g.* from the Upper Ordovician of England and Scotland, *e. g.: Cheirurus bimucronatus* MURCH.; *Ch. keisleyersis* REED, etc.

Subfamily *Cyrtometopinae* ÖPIK, 1937.

Genus *Cyrtometopus* ANGELIN, 1854.

Genotype: *Calymene ? clavifrons* DALMAN, 1826. Ordovician, Scandinavia.

In this genus, which so far has been erroneously mentioned from the Ordovician of Central Bohemia only by R. RŮŽIČKA (1926, 1934) — see *Cyrtometopus,* recte *Parapilekia bohemica* and *P. olešnaensis* — we place with some hesitation the species *Cheirurus neuter* BARRANDE, which was reffered with some doubts by C. D. BARTON (1915) to the genus *Eccoptochile.* 1872 (pl. 12, figs. 5—6). This species is known so far for certain only in one specimen (holotype) with incomplete cephalon, and is reminiscent in its general configuration most strikingly of the species *Cyrtometopus clavifrons* (DALMAN, 1826) and especially of the specimen figured by F. SCHMIDT (1881, pl. 16, fig. 7) from the East Baltic Ordovician (Iswos — B_2b).

Occurrence and Distribution: The representatives of the genus *Cyrtometopus* ANGELIN, 1854, occur mainly in the Lower and Middle Ordovician of Scandinavia and the Baltic region. However, the species *Cyrtometopus neuter* (BARR.), should its generic position prove correct, derives from the Upper Ordovician (Králův Dvůr Beds — $d\xi_1$ — Ashgillian).

Genus *Parapilekia* KOBAYASHI, 1934.

Genotype: *Calymene ? speciosa* DALMAN, 1826. Tremadocian, Scandinavia.

We place in this genus the two oldest Bohemian representatives of thee subfamily *Cyrtometopinae* ÖPIK, 1937, originally described by R. RŮŽIČKA under the name of *Cyrtometopus bohemicus* RŮŽIČKA, 1926, and *Cyrtometopus olešnaensis* RŮŽIČKA, 1935, both of which occur in the Olešna Beds and Milina Beds — $d\alpha_{2-3}$ (Tremadocian). The species *„Cyrtometopus" bohemicus* RŮŽ. was placed already by T. KOBAYASHI (1934) in the genus *Parapilekia* when he formed this genus. A further species was placed here by P. RAYMOND (1937) who at the same time confirmed the correctness of the generic position of the first species.

Occurrence and Distribution: Tremadocian of Bohemia and Sweden.

Central Europe: Bohemia; Scandinavia: Sweden.

Bohemian species: *Parapilekia bohemica* (RŮŽ.) and *P. olešnaensis* (RŮŽ.).

Genus *Eccoptochile* HAWLE & CORDA, 1847.

Genotype: *Cheirurus clavigera* BEYRICH, 1845. Ordovician. Bohemia.

This genus established by I. HAWLE and A. J. C. CORDA (1847) for the species *Cheirurus claviger* BEYRICH, 1845 was later not recognised by J. BARRANDE (1852) and placed by him in the synonymics of the

genus *Cheirurus* BEYRICH, 1845. The validity of this genus was, however, recognised again by different authors (J. W. SALTER, 1864, F. R. C. REED, 1896, A. ÖPIK, 1937, etc.). Today there can be no doubt as to the independence of this genus. C. D. BARTON (1915) divided this genus into two groups which are characterised by the different number of the thoracic segments.

In our conception the genus *Eccoptochile* HAWLE & CORDA, 1847, is divided into two subgenera which correspond to the BARTON's division. The typical subgenus is *Eccoptochile (Eccoptochile)* HAWLE & CORDA with the subgenotype *Eccoptochile clavigera* (BEYRICH). In the synonymics of this subgenus belongs in our opinion the recently established genus *Placoparina* WHITTARD, 1940, which is founded on a completely blind form. This feature is in itself insufficient, in our opinion, to establish a new genus, as various degrees of reduction of the visual organs are known also among other groups of trilobites. It is not possible to find other distinguishing features between the two genera.

For the species *Cheirurus tumescens* BARR. and *Cheirurus scuticauda* BARR. we are establishing a separate subgenus, for which we propose the new name of *Eccoptochiloides* nov. subgen. This subgenus differs from the type chiefly by a different number of thoracic segments and by the shape of the pygidium. As its subgenotype we give the species *Cheirurus tumescens* BARRANDE, 1852.

Typical Subgenus *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847.

Subgenotype: *Cheirurus clavigera* BEYRICH, 1845. Ordovician. Bohemia.

Diagnosis: *Cyrtometopinae* with 12 thoracic segments and six-lobate pygidium, whose pleurae are throughout the whole of their course broad, nowhere constricted, and ending obtusely lobate.

Description: Cephalon parabolic, with broad, convex glabella which narrows slightly to the back. Three pairs of deep glabellar furrows reach to about one third of the total width of the glabella; they are inclined obliquely downward. The frontal lobe of the glabella is surrounded with a narrow raised border, which at the sides passes into a false ocular ridge. Fixed cheeks subtriangular, less convex than the glabella, obliquely inclined to the border of the cephalon and running out in short strong genal spines. Free cheeks small, likewise subtriangular. Surface of the cheeks coarsely pitted. Visual organs protruding, facetted, situated approximately at the level of the middle glabellar furrow unfar from the lateral border of the glabella. Circumglabellar furrow deep. Lateral border of the cephalon broad, flatly convex, delimited by a marked furrow. Posterior border as broad as lateral border. Occipital ring fairly broad. Occipital furrov in the middle shallow and enlarged. Facial sutures of Proparian type; posterior branch of the facial suture running out at the lateral border of the cephalon at about the level of the second glabellar lobe.

Thorax of 12 segments. Axis relatively broad, flatly convex, narrowing in the direction of the back. Dorsal furrows marked. Pleurae slightly convex, of *Cyrtometopinae type*, ending bluntly ensiform.

Pygidium flat, semicircular to semi-elliptic. Its axis occupies about one third of its total width. The axis shows four rings, of which the last is usually stunted. Three pairs of pygidial pleurae, running out in six broad, bluntly ending lobes. Surface of the body densely granulated.

Relations and Remarks: *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847, differs from the related subgenus *Eccoptochile (Eccoptochiloides)* nov. subg. especially by the number of thoracic segments (12) and the six-lobate pygidium. From the other representatives of the subfamily *Cyrtometopinae* our typical subgenus *Eccoptochile (Eccoptochile)* is distinguished by the differentiating features mentioned above.

Occurrence: Middle Ordovician (Chrustenice Beds — $d\delta_3$ to Chlustina Beds — $d\varepsilon_1$).

Distribution: Bohemia, England, and France.

Species: To this typical subgenus belong *Eccoptochile (Eccoptochile) clavigera clavigera* (BEYRICH), 1845, *Ecc. (Ecc.) clavigera aspera* HAWLE & CORDA, 1847, *Ecc. (Ecc.) sedgwicki* (MCCOY), 1851 and *Ecc. (Ecc.) guilleri* (TROMELLIN), 1875.

Subgenus *Eccoptochile (Eccoptochiloides)* nov. subgen.

Subgenotype: *Cheirurus tumescens* BARRANDE, 1852.

Derivatio nominis: The name has been derived from the generic name *Eccoptochile — oides.*

Locus typicus et stratum typicum: Trubín, Bohemia. Lodenice Beds — $d\varepsilon_2$. Caradocian.

Diagnosis: Trilobite of *Cyrtometopinae type*, of small size, with a thorax composed of 10 thoracic segments and with an eight-lobate pygidium, closely related to the typical subgenus *Eccoptochile (Eccoptochile)* HAWLE & CORDA.

Description: Cephalon semicircular, moderately convex, with strongly raised pear-shaped glabella, which distinctly narrows backwards. Three pairs of very distinct glabellar furrows reaching to about one fourth of the total width of the glabella and running more or less obliquely arcuate backward. Circumglabellar furrow narrow and deep. Fixed cheeks relatively small, subtriangular, inclined to the lateral margin of the cephalon. Free cheeks very narrow; whole surface of the cheeks characteristically pitted. Visual organs slightly developed, small and semicircular, situated between the first and second pair of glabellar furrows. Palpebral lobes slightly marked and running out in a narrow false ocular ridge running obliquely towards the frontal margin of the cephalon. Anterior branch of the facial suture running from the frontal

margin of the cephalon, close along the false ocular ridge, and, after encircling the palpebral lobe, turning under an almost right angle towards the lateral margin of the cephalon. In the last fourth of its course it turns, however, sharply obliquely downward. Margin of the cephalon surrounded with a characteristic border, which distinctly widens towards the genal angles and runs out in a strongly flattened genal spine, which in the subgenotype reaches to the third thoracic segment. Occipital furrow straight, broad and deep. Occipital ring likewise broad, strongly convex, with an ornamental granula in the centre.

Thorax of 10 segments, with broad, slightly convex axis. The separate axial segments are separated from each other by broad furrows. Pleurae of *Cyrtometopinae type*, whose pointed outer parts are separated by slight constrictions from the inner parts.

Pygidium semicircular, eight-lobate, with a convex axis composed of four rings. Pygidial pleurae running out in bluntly-lobate enlarged lobes.

Relations and Remarks: The differences between this new subgenus, whose representatives F. R. C. REED (1896) tried to interpret as neotenic forms, and the typical *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847, have already been enumerated in the description of this latter subgenus, to which we refer the reader. In our opinion the subgenus *Eccoptochile (Eccoptochiloides)* nov. subgen. forms a transition between *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847, and the genus *Actinopeltis* HAWLE & CORDA, 1847, as indicated also by the stratigraphical occurrence of this subgenus. For the rest our new subgenus can be recognised at once by the different and small number of thoracic segments.

Occurrence: In the Ordovician of Central Bohemia the subgenus *Eccoptochiloides* n. subg. occurs in the Chrustenice Beds — $d\delta_3$ and Chlustina Beds — $d\varepsilon_1\beta$. So far it has not been found in other zones. From the Ordovician outside Bohemia no further representatives are known so far. Thus it seems that the subgenus *Eccoptochiloides* n. subg. is a *Cyrtometopinae type* restricted exclusively to the Ordovician of Central Bohemia.

Distribution: Central Europe: Bohemia.

Species: *Eccoptochile (Eccoptochiloides) tumescens* (BARRANDE) and *Ecc. (Eccoptochiloides) scuticauda* (BARRANDE).

Genus *Actinopeltis* HAWLE & CORDA, 1847.

Genotype: *Cheirurus globosus* BARRANDE, 1846 = *Actinopeltis caroli alexandri* HAWLE ET CORDA, 1847. Ordovician. Bohemia.

Diagnosis: Cephalon semicircular, strikingly convex, with glabella projecting in front. Glabella with three pairs of short glabellar furrows, of which the third (basal) pair is markedly stronger. Cheeks

relatively small, slightly convex. Facial Proparian sutures. Visual organs small, shifted forward. Thorax of 11 segments. On the inner part of the pleurae is a row of minute pores parallel to the margin of the pleurae. The outer part of the pleurae is free, pointed. Pygidium semicircular, with an axis of four rings. Pleurae in the lateral lobes running out in four pairs of pointed spines.

Description: Cephalon semicircular. Glabella strikingly convex, in front projecting beyond the frontal margin of the cephalon. First two pairs of glabellar furrows straight or slightly arcuate, extending only to about one fourth of the total width of the glabella. The third (basal) pair of glabellar furrows is deeply incised, bent backward in an arc, so that it reaches almost to the occipital furrow. Basal glabellar lobes small, subtriangular, almost completely separated from the other parts of the glabella. Circumglabellar furrows deep, at the lower margin of the cephalon parallel to the axis. Fixed cheeks very small, situated in front. Visual organs small, protruding, situated in the upper portion of the cephalon, close to the glabella. Anterior branch of the facial suture straight, starting from the frontal margin of the cephalon. Posterior branch of the facial suture turning at the visual organ almost under a right angle, describing a slightly sigmoidal curve and forming an acute angle with the lateral margin of the cephalon. Occipital furrow deep, straight, uniting with the furrow of the posterior margin of the cephalon. Occipital ring as wide as the posterior margin of the cephalon. Central and lateral rim of the cephalon narrower than the rim of the posterior margin. Surface of the cheeks pitted.

Thorax of 11 segments. Dorsal furrows deep. Axis convex, comprising about one third to two fifths of the total width of the thorax. Inner part of the pleurae straight, convex, and sharply separated from the outer part, which is much slighter. On the surface of the outer part of the pleurae is a row of minute pores, parallel to the margin of the pleura. Outer part of the pleurae pointed, free, slightly bent obliquely downward.

Pygidium semicircular. Axis of the pygidium with four rings. Lateral lobes with four pairs of pleurae running out in free pointed spines.

The hypostoma was described and illustrated by J. BARRANDE (1852, pl. 35, figs. 6—7).

Relations and Remarks: The genus *Actinopeltis* was established by HAWLE & CORDA (1847, pp. 131—132 (NON *Actinopeltis* POULSEN, 1946) as a transition type between the genus *Eccoptochile* HAWLE & CORDA, 1847, and *Cheirurus* BEYRICH, 1845, HAWLE & CORDA, 1847, remark, however, erroneously that the genotype of the genus *Actinopeltis caroli alexandri* (recte *Act. globosa* BARR.) has a thorax composed of 10 segments. Against this already BARRANDE (1852) pointed out that this species has really 11 segments.

J. BARRANDE (1852, p. 767) took the genus *Actinopeltis* HAWLE & CORDA to be identical with the genus *Cheirurus* BEYRICH, established earlier, as was in keeping with his wide conception of the latter genus.

In reality the genus *Actinopeltis* HAWLE & CORDA, 1847, belongs to the subfamily *Cyrtometopinae* ÖPIK, 1937, whose other representatives differ from it in the following features: *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847, has a thorax of 12 segments, a six-lobate pygidium, and a not projecting glabella. Similarly also the subgenus *Eccoptochiloides* n. subg., with a thorax of 10 segments and an eight-lobate pygidium. *Cyrtometopus* ANGELIN, 1854, corresponds to *Actinopeltis* HAWLE & CORDA, 1847, in the number of thoracic segments, but differs from it in its six-lobate pygidium and the completely different configuration of the glabella. The typical subgenus *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT, 1882, is reminiscent of *Actinopeltis* by its slightly convex glabella, which is also projecting, but it differs from this by the shape of its cephalon and by the greater number of thoracic segments (12). Another subgenus similar by the shape of its cephalon is *Pseudosphaeroxochus (Pateraspis)* nov. subg., but it has again a greater number of thoracic segments (12) and a six-lobate pygidium.

From the other representatives of this subfamily and of that of the *Cheirurinae* the genus *Actinopeltis* is distinguished by the features mentioned above and especially by its large and markedly projecting glabella.

Occurrence: The genus *Actinopeltis* is known only from the Upper Ordovician of Central Bohemia (Lodenice Beds — $d\varepsilon_1$ to Králův Dvůr Beds — $d\xi_1$). It is not known at all from the Ordovician outside Bohemia.

Distribution: Central Europe: Bohemia.

Genus *Pseudosphaeroxochus* SCHMIDT, 1882.

Genolectotype: *Sphaeroxochus hemicranium* KUTORGA, 1854. Echinosphaerites Beds (C_1). Ordovician. Balticum.

Basing ourselves on the material from Bohemia take the liberty to distinguish in this genus between two subgenera: the typical subgenus *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT, 1882, and *Pseudosphaeroxochus (Pateraspis)* nov. subgen. In our opinion both these subgenera are represented in the Ordovician of Bohemia. A. ÖPIK (1937) in his monograph of the Esthonian Ordovician trilobites strangely enough does not mention this genus at all.

Typical subgenus *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT, 1882.

Subgenolectotype: *Sphaeroxochus hemicranium* KUTORGA, 1854. Ordovician. Balticum.

To this typical subgenus belongs in the Ordovician of Bohemia the species *„Cheirurus" pectinifer* BARRANDE, 1872, reffered with some doubts by C. D. BARTON (1913) to the genus *Eccoptochile*. It corres-

ponds to this by the typical configuration of its cephalon as well as by the course of its facial sutures. On the other hand, the shape of its pleurae is somewhat different; the inner, stronger part of the pleurae is strikingly short in comparison with the outer arcuate part. The axis of the thorax is narrow as in the subgenotype. The axis of the pygidium is composed of two distinctly marked rings in whose continuation are two deep circular depressions which indicate perhaps a third ring. The end of the pygidium is eight-lobate as in the type. It differs from the type by its individual pygidial spines being of unequal length; the lateral spines are longer than the others; the ends of these spines lie in a line perpendicular to the axis of the pygidium. Thus the pygidium is of trapezoid shape.

Remarks: The differences between *Pseudosphaeroxochus (Pseudosphaeroxochus)* and *Pseudosphaeroxochus (Pateraspis)* nov. subgen. are given below and we refer the reader to them.

Occurrence and distribution: The typical subgenus *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT is known so far from the Ordovician of the Balticum, Great Britain and Sweden. Some doubtful species placed in this subgenus are mentioned also from the Ordovician of North America.

Subgenus *Pseudosphaeroxochus (Pateraspis)* nov. subgen.

Subgenotype: *Cheirurus pater* BARRANDE, 1872.

Derivatio nominis: The name of this subgenus is derived from the specific name "*pater*".

Locus et stratum typicum: Osek, Bohemia. Šárka Beds — $d\gamma_1$. Ordovician. Llandvirnian.

Diagnosis: Subgenus closely related to the subgenus *Pseudosphaeroxochus* SCHMIDT, 1882. Pygidium of three segments, running out in six free, equally long, flat spines. Thorax of 12 segments.

Description: Cephalon semicircular, with strikingly convex, oval glabella. Frontal glabellar lobe not projecting over the margin of the cephalon. Circumglabellar furrows deep, sharply marked just like the occipital furrow. First and second pair of glabellar furrows (reaching to about one third of the total width of the glabella) running in an arc slightly inclined backwards. The third (basal) pair of glabellar furrows is much more marked and much deeper than preceding furrows, and forms a characteristic arc which does not reach the occipital furrow. Its continuation is indicated on the glabella only as a slight constriction running in an arc towards the posterior margin of the fixed cheek and reaching the occipital furrow. Thus the basal lobes are completely separated from the glabella. The glabella is bordered in front by a narrow preglabellar field; at the point where the anterior branch of the facial suture begins, this preglabellar field is separated in steps from the lateral border. This raised field ends suddenly without any

border or rim. The shape of the cheeks and the course of the facial sutures are (except for a lesser differentiation) analogous to those of the typical subgenus *Pseudosphaeroxochus (Pseudosph.)* SCHMIDT, 1882.

Thorax of twelve segments. The axis comprises almost one third of the total width of the thorax and narrows slightly towards the back. The inner portion of the pleurae is straight, convex, and carries a horizontal furrow of minute punctae or pitts. The outer portion of the pleurae is not longer than the inner portion and is slightly bent backward in a gentle arc. The ends of the pleurae run out in pointed, somwhat flattened, mutually diverging spines.

Pygidium semicircular, with slightly raised axis, composed of three rings, not counting the fourth (rudimentary) end ring. The lateral lobes of the pygidium run out in six large, somewhat flattened, slightly curved spines of equal length.

Surface of the thorax and pygidium, as far as preserved, decorated with dense, fine granulae. The surface of the cheeks finely, relatively scantily pitted. Hypostoma of subpentagonal shape, in its general configuration rather reminiscent of the hypostoma of the typical subgenus.

Relations and Remarks: *Pseudosphaeroxochus (Pateraspis)* nov. subgen., founded on the species *Cheirurus pater* BARRANDE, 1872, as subgenotype, differs from the typical subgenus *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT, 1882, especially by the different shape of the pygidium, which in the typical subgenus is eight-lobate. From among the other features we have to mention the much greater relative width of the axis compared to the total width of the thorax. The outer portion of the pleurae is in *Pateraspis* n. subg. slightly arcuate, whereas in *Pseudosphaeroxochus* the pleurae have a sharply broken fulcrum. Similarly the course of the facial sutures is somewhat different. For the rest the general structure of the two subgenera is the same.

In the fundamental structure of the cephalon *Pateraspis* n. subg. is reminiscent of another new genus, *Stubblefieldia* nov. gen. But this genus distinguishes itself at first glance not only by its characteristically developed false ocular ridge, but also by the general configuration of the pleurae and the shape of the pygidium. Our new subgenus *Pateraspis* is also reminiscent of some forms of the genus *Pompeckia* WARBURG, 1925, but differs from them (among other features) especially by the different shape of the glabella.

We wish to mention still that F. R. C. REED (1898, p. 11) and C. D. BARTON (1915, p. 106), erroneously placed the species *Cheirurus pater* BARR. in the genus *Eccoptochile* HAWLE & CORDA, 1847, which in our opinion is characterized by quite different features.

Occurrence and distribution: Osek—Kváň Beds — $d\gamma$ (Llandvirnian and Lower Llandeilian). *Pateraspis pater* (BARR.) has so far been found in the Šárka Beds — $d\gamma_1$ and the Skalka Quartzites — $d\gamma_{2a}$. A special, younger mutation seems to be represented in the Sv.

Dobrotivá Beds — $d\gamma_{2b}$. (See: C. KLOUČEK, 1919). So far it has not become known from the Ordovician outside Bohemia.

Species: So far only the subgenotype *Pateraspis pater* (BARRANDE 1872) belongs to this subgenus.

Cyrtometopinae incertae sedis.

Genus *Stubblefieldia* nov. gen.

Genotype: *Cheirurus neglectus* BARRANDE, 1852.

Derivatio nominis: This new genus was named in honour of the eminent expert on British trilobites, DR. C. W. STUBBLEFIELD, of the Geological Survey, London.

Locus typicus et stratum typicum: Králův Dvůr near Beroun. Králův Dvůr Beds — $d\zeta_1$ (Ashgillian).

Diagnosis: *Cyrtometopinae* of 11 thoracic segments, with a cephalon reminiscent of the genus *Cyrtometopus* ANGELIN, 1854, whereas the shape of the (seven-lobate) pygidium is reminiscent of the genus *Eccoptochile* HAWLE & CORDA, 1847. By the shape of its pleurae it differs from all the representatives of the family *Cheiruridae* HAWLE & CORDA.

Description: Cephalon semicircular, with large, semi-elliptic, rather convex glabella. Frontal glabellar lobe projecting over the frontal margin of the cephalon. Circumglabellar furrows narrow and deep, connected below with the occipital furrow. The glabellar furrows of the first and second pair are somewhat short and reach only to about one fourth of the total width of the glabella, they are gently bent obliquely backward. The third (basal) pair of glabellar furrows is deeply incised and broad, describing a closed arc which connects with the occipital furrow. The posterior glabellar lobes are completely delimited against the glabella. Fixed and free cheeks obliquelly inclined in the direction away from the glabella. Fixed cheeks relatively large, with a strikingly deep posterior furrow. Posterior border relatively broad, connecting in the genal angle in an arc with the lateral border. Free cheeks small, subtrigonal. Visual organs small, situated in the upper portion of the cheeks. Palpebral lobe slightly marked and running out in a narrow false ocular ridge, which surrounds in an arc the frontal part of the glabella. The lateral border keeps close to this false ocular ridge in front. Facial sutures of Proparian type; their anterior branch runs parallel to the ocular ridge, whereas the posterior branch runs from the visual organ obliquely to the lateral margin of the cephalon, where it runs out at about the level of the third glabellar furrow. Occipital ring narrow, of the same width as the posterior margin. Hypostoma not known.

Thorax of 11 segments; axis relatively broad, convex, delimited by deep dorsal furrows. Inner portion of the pleurae strikingly longer than outer portion. The outer portion of the pleurae forms a short, flat,

bluntly terminating spine directed obliquely downward. The inner portion of the pleurae carries a narrow, horizontal, distinct, elevated pleural ridge which gradually widens in the direction towards the outer margin and ends in a blunt, nodular expansion. Not the slightest trace of a pleural furrow can be seen on the surface of the pleurae. The pleural ridge is surrounded with an articulating half-pleura only in front and at the back.

Morphologically these pleurae correspond to BARRANDE's *type of pleures à bourrelet.*

Pygidium relatively small, semicircular, with three axial segments, seven-lobate. Lateral lobes flat, ending bluntly, composed of three pairs of pleurae. In the lateral lobes the pleurae run out in free, bluntly ending, broad and flat spines. The seventh, unpaired, spine of the pygidium forms probably the continuation of the axis.

Relations and Remarks: The genus *Stubblefieldia* nov. gen. was established for one species, *Cheirurus neglectus* BARRANDE, 1852. This genus combines on the one hand certain features of the genera *Cyrtometopus* ANGELIN, 1854, and *Eccoptochile* HAWLE & CORDA, 1847, and on the other hand falls entirely outside the limits of the subfamily *Cyrtometopinae* ÖPIK, 1937. The shape of the pleurae in *Stubblefieldia* nov. gen. is quite different from that of the pleurae of the typical representatives of the subfamilies *Cyrtometopinae, Cheirurinae* and *Deiphoninae;* it belongs to BARRANDE's *type of pleures à bourrelet,* in which the pleural groove is neither developed nor even indicated. The only subfamily of the *Cheiruridae,* where no pleural grooves are developed either, is the *Sphaeroxochinae* ÖPIK, 1937, where, however, the pleurae have an entirely different configuration. On the other hand the shape of the pleurae of the genus *Stubblefieldia* n. gen. is slightly reminiscent of the representatives of the family *Pliomeridae* ÖPIK, 1937, where, however, the distal ends of the inner portions of the pleurae are never nodularly expanded as they are in the genus just mentioned.

The systematic position of the genus *Stubblefieldia* nov. gen. in thus rather uncertain. As however in certain other features, especially in the shape of the cephalon, this genus is rather reminiscent of the genera *Cyrtometopus* and *Eccoptochile,* we leave it until further among the *Cyrtometopinae incertae sedis.*

It is not impossible that *Stubblefieldia* nov. gen. is a kind of connecting link between the *Cyrtometopinae* on one side and the *Pliomeridae* on the other. For the cephalon corresponds entirely to the *Cyrtometopinae type,* as already pointed out by J. BARRANDE himself (1852, p. 920), who emphasized that his species *Cheirurus neglectus* corresponds in the shape of the cephalon strikingly to the species *Ch. clavifrons* SALTER (*non* DALMAN) = *Ch. (Actinopeltis) juvenis* SALTER, 1864, from which it differs mainly in the shape of the pygidium. F. R. C. REED (1896) places with some hesitation the genotype of our new genus in the genus *Cyrtometopus* ANGELIN, 1854, and C. D. BARTON (1915) to the genus *Eccoptochile.* On the other hand the bluntly lobate

pygidium is really very reminiscent of the genus *Eccoptochile* HAWLE & CORDA, 1847. A characteristic feature of the genus *Stubblefieldia* n. g. is especially the shape of the pleurae, for which we find no analogy among the other *Cheiruridae*. Only the relative length of the inner and outer portions of the pleurae is the same in *Stubblefieldia* and in *Eccoptochile*. The number of thoracic segments in *Stubblefieldia* n. g. is the same as in the genus *Cyrtometopus* ANGELIN, 1854, (11). *Eccoptochile (Eccoptochile)* HAWLE & CORDA, 1847, has 12 and *Eccoptochile (Eccoptochiloides)* n. subg. only 10.

Occurrence and distribution: Ordovician (Ashgillian). Králův Dvůr Beds, $d\xi_1$, Bohemia (Central Europe).

Species: To this characteristic genus belongs only one species, the genotype *Stubblefieldia neglecta* (BARR.). We do not know this genus from the Ordovician outside Bohemia.

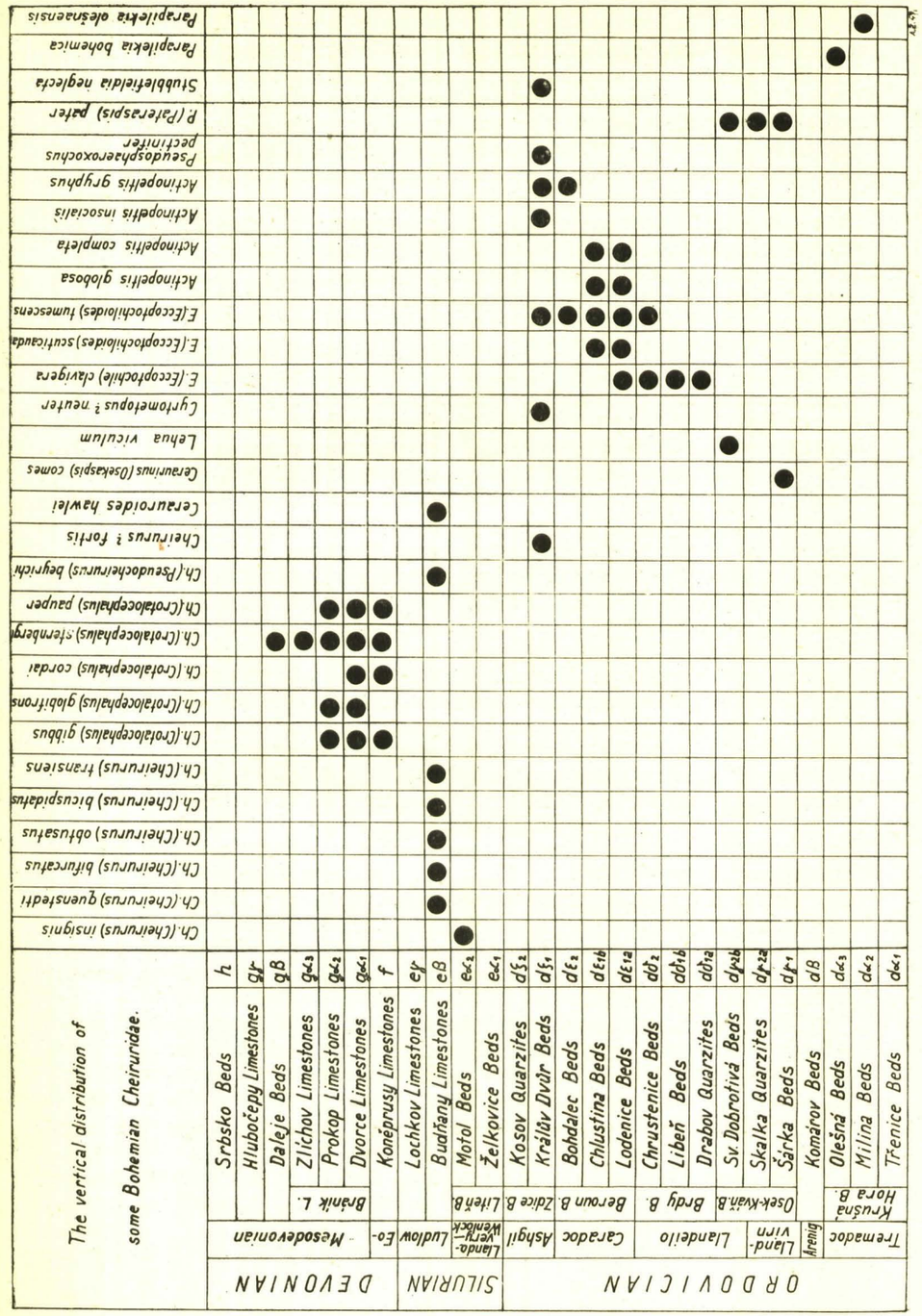
The vertical Distribution of the Bohemian Representatives of the Subfamilies *Cheirurinae* and *Cyrtometopinae*.

Cheiruridae HAWLE & CORDA, emend. RAYMOND, 1913, occur in great numbers in the Lower Palaeozoic area of Central Bohemia in the strata of both the Ordovician and Siluro-Devonian sedimentation cycle.

The oldest representative known so far of the subfamily *Cyrtometopinae* is the genus *Parapilekia* KOBAYASHI 1934, which occurs in the Middle and Upper Tremadocian (Mílina and Třenice Beds) accompanied by some other Cambro-Ordovician forms. But so far no *Cheiruridian* remains have been found in the Komárov Beds, which correspond to the Arenigian. The species *Cheirurus hofmani* described by J. PERNER (1900) from these beds belongs probably to the genus *Petigurus* RAYMOND, 1913.

In the Šárka Beds, which may be approximately correlated with the Llandvirnian, there occurs together with the Cyrtometopian form *Pseudosphaeroxochus (Pateraspis) pater* (BARR.) also the first Bohemian representative of the subfamily *Cheirurinae*, i. e. the species *Ceraurinus (Osekaspis) comes* (BARR.). The species *P. (Pateraspis) pater* (BARR.) propagates through the Skalka Quartzites to the Sv. Dobrotivá Beds (Lower and Middle Llandeilian), in which it is represented chiefly by a mutation not described so far. As was pointed out by CELDA KLOUČEK (1916) and more recently by G. MĚSKA and F. PRANTL (1946) there are many Bohemian trilobites which occur in heterochronous groups with prevailing argillaceous sedimentation, separated from each other by a period of prevailing sandy sedimentation, in the upper layers always morphologically somewhat modified and forming distinct mutations or varieties.

From the point of view of the phyletic evolution of the Bohemian *Cyrtometopian trilobites* we have finally to remark that the subgenus *Pseudosphaeroxochus (Pateraspis)* nov. subgen. in Bohemia appears



much earlier than the typical subgenus *P. (Pseudosphaeroxochus)* SCHMIDT, 1881, represented only in the Ashgillian (Králův Dvůr Beds), whereas elsewhere (e. g. in the Ordovician of the Balticum and Scandinavia) it is known already from the Llandeillian. Restricted to the Sv. Dobrotivá Beds is also the genus *Lehua* BARTON, which is the oldest but one *Cheirurinian* form of Bohemia. In the Drabov Quartzites (Upper Llandeillian — Lower Caradocian approximately) there appears for the first time the genus *Eccoptochile* HAWLE & CORDA, 1847, which has the greatest vertical distribution of all the Bohemian *Cyrtometopian* trilobites. For the characteristic species *E. (Eccoptochile) clavigera* HAWLE & CORDA propagates from the Drabov Quartzites through the Chrustenice and Lodenice Beds to the Chlustina Beds (Middle Caradocian). In these last two divisions of the Ordovician this species is, however, represented by a special mutation, *E. clavigera aspera* HAWLE & CORDA, 1847, originally described as *E. aspera* HAWLE & CORDA, which J. BARRANDE (1852) erroneously considered to be entirely conspecific with the typical *E. clavigera* HAWLE & CORDA from the Drabov Quartzites and Chrustenice Beds.

The closely rolated subgenus *Eccoptochile (Eccoptochiloides)* nov. subgen. has a much smaller distribution. The species *E. (Eccoptochiloides)* scuticauda (BARR.) is limited exclusively to the Chrustenice and Lodenice Beds, whereas the species *E. (Eccoptochiloides) tumescens* (BARRANDE) continues as far as into the Chlustina Beds.

As for the genus *Actinopeltis* HAWLE & CORDA, its first representative appears already in the Lower Caradocian (Lodenice Beds), whence it propagates into the Ashgillian (Králův Dvůr Beds). In these beds it is joined by the typical *Pseudosphaeroxochus (Pseudosphaeroxochus)* SCHMIDT and doubtlessly also by the genus *Cyrtometopus* ANGELIN [*C.? neuter* (BARR.)]. The occurrence of the monotypical genus *Stubblefieldia* nov. gen. is also restricted to these beds; this genus occupies a somewhat uncertain position among the *Cyrtometopian trilobites*. The same applies to the species *Cheirurus? fortis* BARR., also from these beds, whose exact position among the Cheirurinian stock is likewise uncertain. The uppermost strata of the Ordovician of Central Bohemia, i. e. the Kosov Quartzites, have not yielded so far any *Cheiruridae*, nor any other well preserved fossils.

Whereas in the Ordovician of Central Bohemia the subfamily *Cyrtometopinae* prevails by number of species and genera by far over the representatives of the subfamily *Cheirurinae*, only the last mentioned subfamily is represented in the Silurian strata of Bohemia.

The Želkovice Beds — $e\alpha_1$, which form the lowest division of the Silurian of Bohemia and may be correlated with the Llandoverian and Gala-Tarannonian, have not so far yielded any remains of trilobites at all. The oldest species of Bohemian Silurian trilobites occur only in the overlying Motoly Beds, — $e\alpha_2$, i. e. in the Wenlockian, where there occurs among them also *Cheirurus*

(Cheirurus) BEYRICH, 1845. The main development of this typical subgenus occurs, however, only in the next following Budňany Beds — $e\beta$, *i. e.* in the Lower and Middle Ludlovian, where it is accompanied also by the monotypical subgenus *Ch. (Pseudocheirurus)* nov. subgen., in which we see a lateral evolutionary branch of the typical subgenus. Further, also our new genus *Cerauroides* nov. gen. joins them.

In the Devonian formation only the subgenus *Ch. (Crotalocephalus)* SALTER, the only representative of the family *Cheiruridae*, is represented by more numerous species. The earlier remarks of J. BARRANDE, 1852, on the occurrence of this subgenus also in the Budňany Limestones, i. e. Lower and Middle Ludlovian, do not correspond to reality according to the findings of O. NOVÁK (1890). This applies however also to O. NOVÁK's statement (1886) on the occurrence of this subgenus in BARRANDE's étage *Ff*, which according to the latest stratigraphical division is divided into two sections, i. e. the Lochkov Limestones — $e\gamma$ (Upper Ludlovian) and the Kosoř Limestones — f (Eodevonian). Only in the Kosoř Limestones and in their stratigraphical equivalent, the well known Koněprusy Limestones, were remains of this subgenus found.

The two uppermost divisions of the Middle Devonian of Bohemia contain no remains at all of the *Cheiruridae*. J. BARRANDE's remark (1852) on the occurrence of the species *Ch. (Crotalocephalus) sternbergi* (BOECK) in the Srbsko Beds — h is again founded on an arror and according to O. NOVÁK (1890) was made at a time when J. BARRANDE himself did not yet distinguish sharply between his étages Gg_3 (Hlubočepy Limestones) and *H* (Srbsko Beds).

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EXPLANATION OF THE PLATES:

I.

Cheirurus (Cheirurus) quenstedti BARRANDE

1. — Complete specimen, holotype. Nat. size. After J. Barrande, 1852.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Beroun.

4—5. — Hypostome; face and side view. Nat. size. After J. Barrande, 1852.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Beroun.

Cheirurus (Crotalocephalus) gibbus (BEYRICH)

3—2. — Complete specimen. Face and side view. Nat. size. After J. Barrande, 1852.
horizont: Bráník Limestones — gα.
locality: Dvorce, near Prague.

Cerauroides hawlei (BARRANDE)

5—6. — Cephalon, withouth the free cheeks. Face and side view. Nat. size. After J. Barrande, 1852.

10. — Thoracic segment. Nat. size. After J. Barrande, 1852.

11. — Nearly complete pygidium. Nat. size. After J. Barrande, 1852.
horizont: Budňany Limestones — eβ.
locality: Lochkow, W. of Prague.

Ceraurinus (Osekaspis) comes (BARRANDE)

8—9. — Cephalon; face and side view. Nat. size. Acording J. Barrande, 1852.
horizont: Šárka Beds — dγ_1.
locality: Osek, near Rokycany.

Actinopeltis completa (BARRANDE)

12. — Cephalon and thorax with pygidium. Nat. size. After J. Barrande, 1872.

13. — The same cephalon, side view. Nat. size.

14. — Hypostome, face view. Nat. size.
horizont: Drabov Quarzites — dδ.
locality: Mt. Drabov, near Beroun.

Cheirurus (Pseudocheirurus) beyrichi (BARRANDE)

15. — Complete specimen; holotype. Nat. size. After J. Barrande, 18.

16—17. — Hypostome, face and side view. Nat. size.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Beroun.

II.

Cheirurus ?fortis BARRANDE

1—2. — Cranidium and hypostome; holotype. Nat. size. Side view. After O. Novák, MS.
horizont: Šárka Beds — dζ_1.
locality: Králův Dvůr.

Cheirurus insignis BEYRICH

3—4. — Hypostome, face and side view. 2 ×. After O. Novák, MS.
horizont: Budňany Limestones — eβ.
locality: Sv. Jan pod Skalou.

Cheirurus (Crotalocephalus) gibbus (BEYRICH)

5—6. — Hypostome, face and side view. 2 ×. After O. Novák, MS.
horizont: Bráník Limestones — gα.
locality: Dvorce, near Prague.

Cerauroides hawlei (BARRANDE)

7. — Hypostome, face view. 2 ×. After O. Novák, MS.
horizont: Budňany Limestones — eβ.
locality: Lochkov.

Cheirurus (Cheirurus) quenstedti (BARRANDE)

8—9. — Hypostome, face and side view. 2 ×. After O. Novák, MS.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Beroun.

Cheirurus (Crotalocephalus) sternbergi (BARRANDE)

10—11. — Hypostome, face and side view. Nat. size. After O. Novák, MS.
horizont: Bráník Limestones — gα.
locality: Damil, near Beroun.

Eccoptochile (Eccoptochile) clavigera clavigera HAWLE & CORDA

12. — Hypostome, joung specimen. Nat. size. After O. Novák, MS.
horizont: Drabov Quarzites — dδ.
locality: Mt. Drabov, near Beroun.

Pseudosphaeroxochus (Pateraspis) pater (BARRANDE)

13—14. — Hypostome, face and side view. 2 ×. After O. Novák, MS.

15. — Hypostome "in situ". 2 ×. After O. Novák, MS.
horizont: Šárka Beds — dγ_1.
locality: Osek, near Rokycany.

III.

Lehna vinculum (BARANDE)

1. — Nearly complete, slightly deformed specimen. Nat. size. After O. Novák, MS.

2. — Pygidium; preserving the test. Nat. size. After O. Novák, MS.
horizont: Sv. Dobrotivá Beds — dγ
locality: Svatá Dobrotivá.

Pseudosphaeroxochus (Pseudosphaeroxochus) pectinifer (BARRANDE)

3—4. — Cranadium, face and side view. Nat. size. After J. Barrande, 1872.
horizont: Králův Dvůr Beds — dζ_1.
locality: Lejškov.

5. — Two thoracic segments. Nat. size. After J. Barrande, 1872.

6. — Pygidium. Nat. size. After J. Barrande, 1872.

Eccoptochile (Eccoptochile) clavigera aspera HAWLE & CORDA

7. — Nearly complete specimen. Nat. size. After J. Barrande, 1872.
horizont: Chlustenice Beds — dε_{1b},
locality: Zahořany, near Beroun.

Actinopeltis (Actinopeltis) globosa (BARRANDE)

8—9. — Cephalon, face and side view. Nat. size. After J. Barrande, 1872.

10. — Nearly complete specimen, showing the hypostome "in situ". Nat. size. After J. Barrande.
horizont: Králův Dvůr Beds — dζ_1.
locality: Králův Dvůr, near Beroun.

Pseudosphaeroxochus (Pateraspis) pater (BARRANDE)

11—12. — Cephalon, face and side view. Nat. size. After J. Barrande, 1872.
horizont: Šárka Beds — dγ_1.
locality: Osek, near Rokycany.

Actinopeltis gryphus (BARRANDE)

13. — Cephalon, nat. size. After J. Barrande, 1872.
horizont: Králův Dvůr Beds — dζ_1.
locality: Lejškov.

Stubblefieldia neglecta (BARRANDE)

14. — Nearly complete specimen; holotype. Nat. size. After J. Barrande, 1872.

15. — Cephalon, side view. Nat. size. After J. Barrande, 1872.
horizont: Králův Dvůr Beds — dζ_1.
locality: Králův Dvůr, near Beroun.

IV.

Cheirurus (Crotalocephalus) sternbergi (BARRANDE)

1. — Nearly complete specimen. Nat. size. After Novák, MS.
horizont: Bráník Limestones — gα.
locality: Lochkov.

V.

Cheirurus (Pseudocheirurus) beyrichi (BARRANDE)

1. — Cephalon, 2 x.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Králův Dvůr.

2. — Pygidium, 2 x.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Králův Dvůr.

Cerauroides hawlei (BARRANDE)

3. — Cephalon, 2 x.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Králův Dvůr.

4. — Cephalon, 2 x.
horizont: Budňany Limestones — eβ.
locality: Dlouhá hora, near Beroun.

Cheirurus (Cheirurus) insignis BEYRICH.

5. — Nearly complete, joung specimen, 2·5 x.
horizont: Motoly Beds — eα_2.
locality: Lodenice.

6. — Pygidium, 1·5 x.
horizont: Motoly Beds — eα_2.
locality: Sv. Jan pod Skalou.

Lehua viculum (BARRANDE)

7. — Cephalon, 2 x.
horizont: Sv. Dobrotivá Beds — dγ_{2b}.
locality: Sv. Dobrotivá.

Ceraurinus (Osekaspis) comes (BARRANDE)

8. — Cephalon, 2 x. Holotype; Barrande, 1872.
horizont: Šárka Beds — dγ_1.
locality: Osek, near Rokycany.

Eccoptochile (Eccoptochile) clavigera clavigera HAWLE & CORDA.

1. — Cranidium, 0·5 nat. size.
horizont: Drabov Quarzites — $d\delta$.
locality: Mt. Drobov, near Beroun.

2. — Pygidium. Nat. size.
horizont: Drabov Quarzites — $d\delta$.
locality: Mr. Drabov, near Beroun.

Eccoptochile (Eccoptochiloides) tumescens (BARRANDE)

3. — Nearly complete specimen, 1·5 x.
horizont: Lodenice Beds — $d\varepsilon 1a$.
locality: Trubín, near Zdice.

Eccoptochile (Eccoptochiloides) scuticauda (BARRANDE)

4. — Cephalon, 2·5 x.
horizont: Lodenice Beds — $d\varepsilon 1a$.
locality: Vinice, near Beroun.

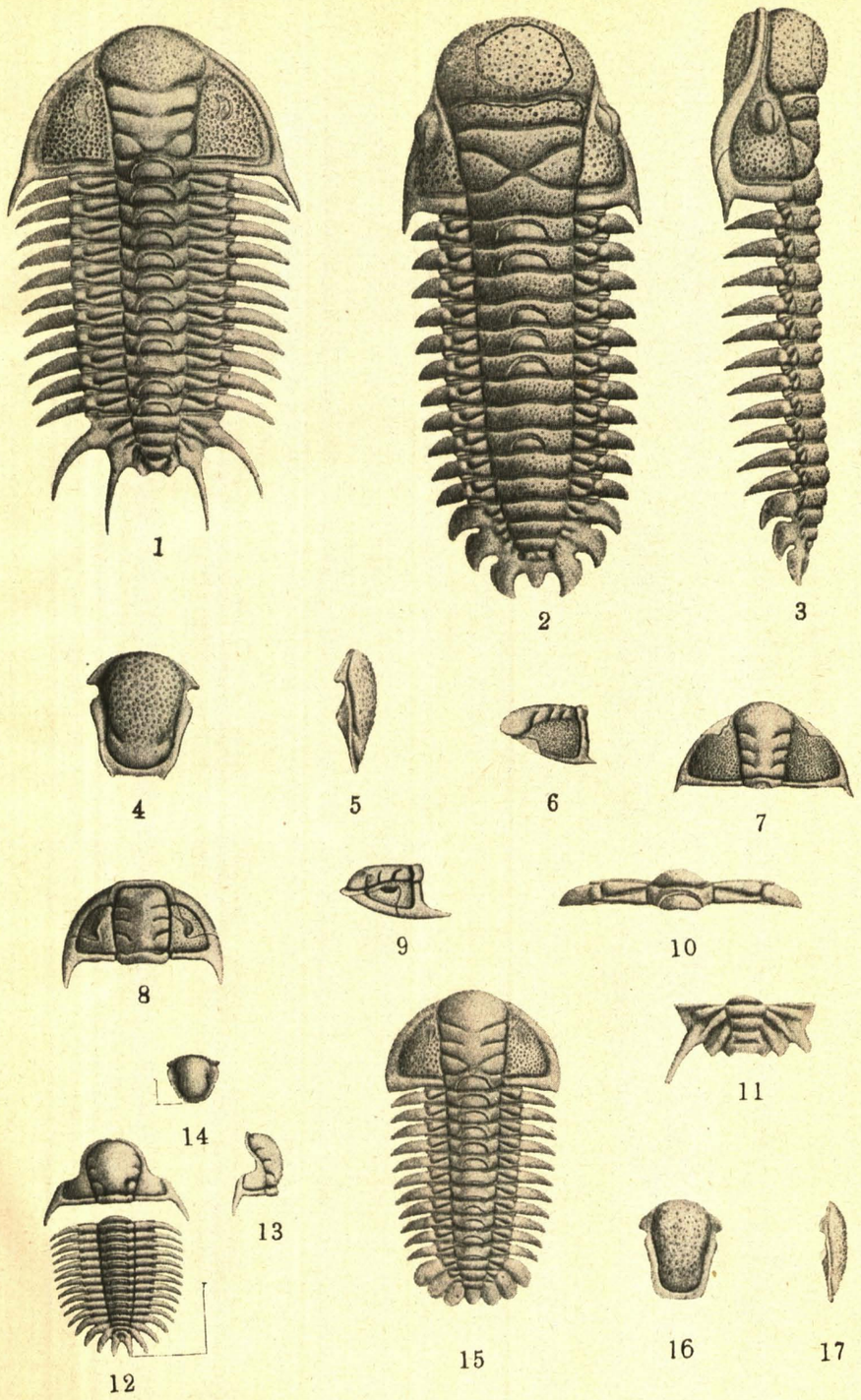
Actinopetis globosa (BARRANDE)

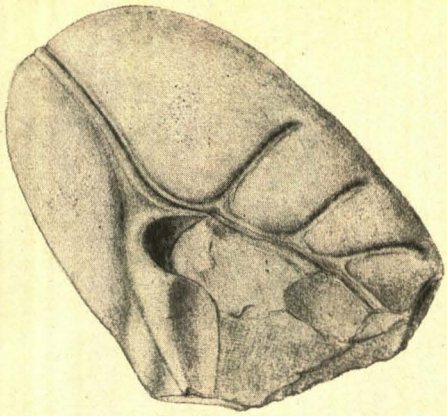
5. — Pygidium, 2·5 x.
horizont: Chlustina Beds — $d\varepsilon 1b$.
locality: Zahořany, near Beroun.

Parapilekia olešnaensis (RŮŽIČKA)

6. — Cephalon, 2 x. Orig. Růžička, 1926.
horizont: Olešná Beds — $d\alpha_2$.
locality: Olešná.

7. — Incomplete pygidium, 2 x.
horizont: Olešná Beds — $d\alpha_2$.
locality: Olešná.





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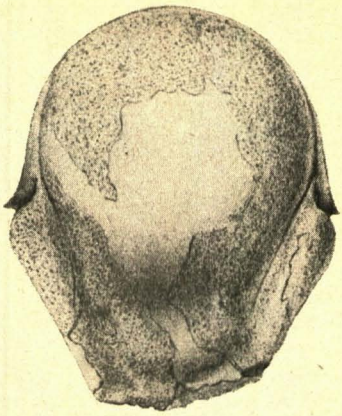

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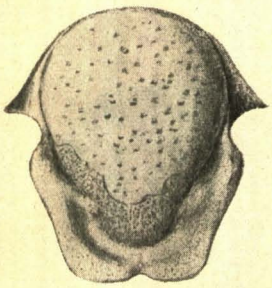

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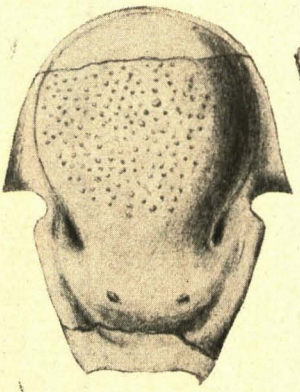

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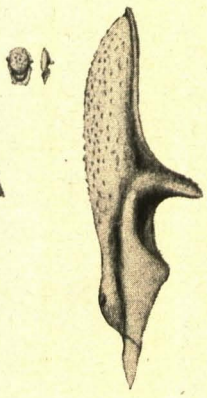

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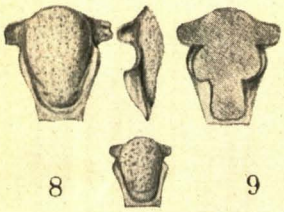

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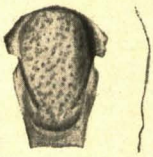

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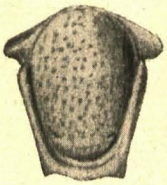

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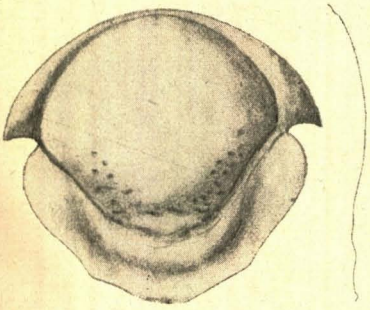

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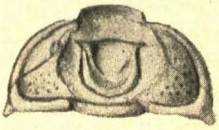

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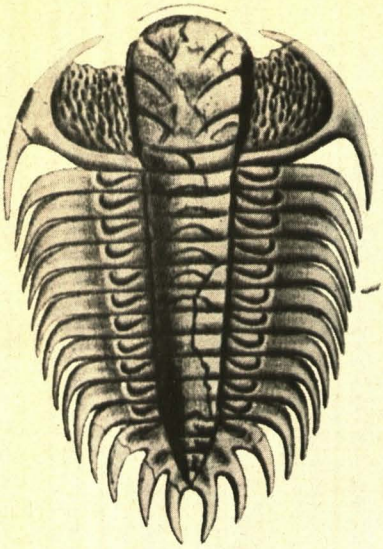

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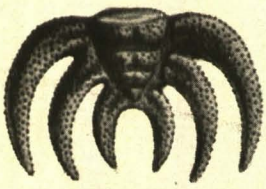

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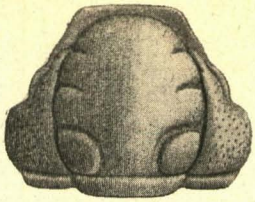

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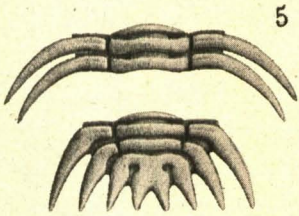

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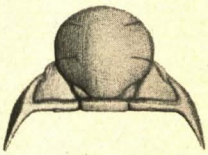

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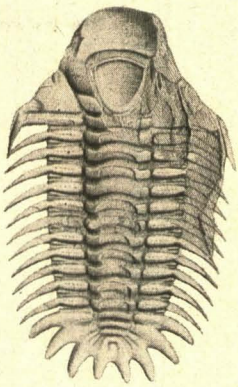

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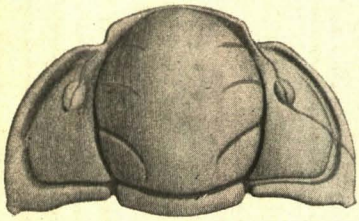

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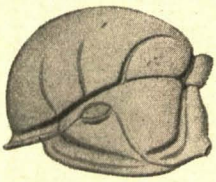

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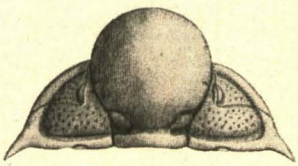

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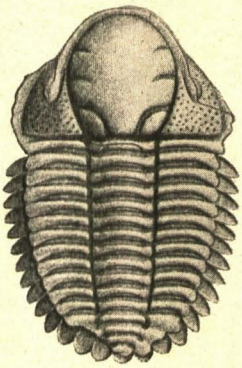

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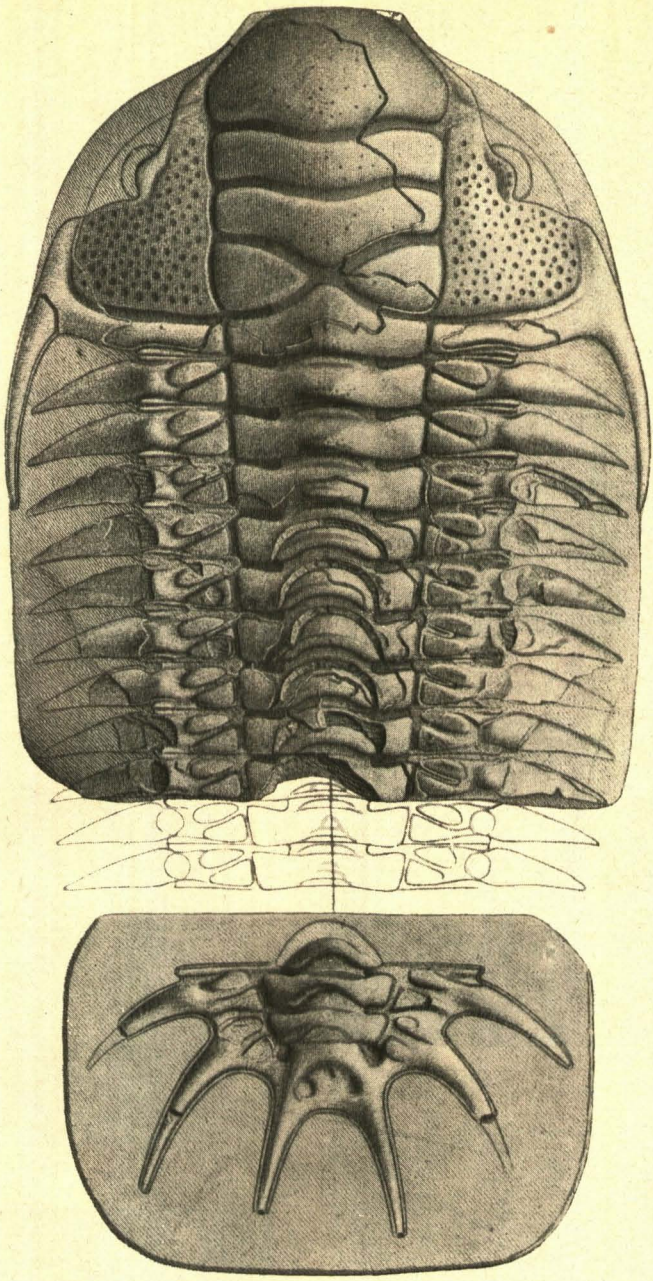

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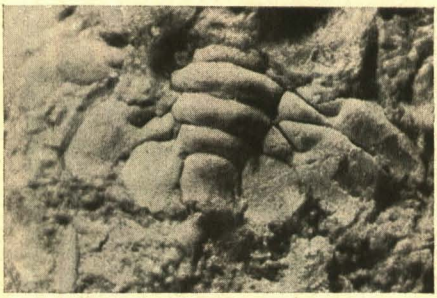

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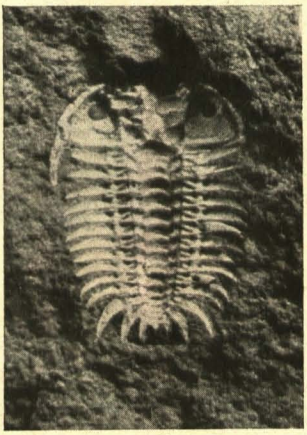

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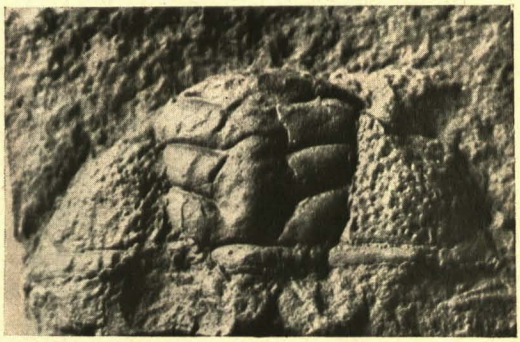

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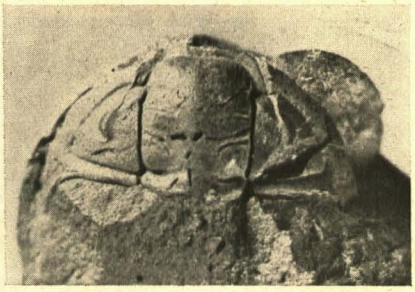

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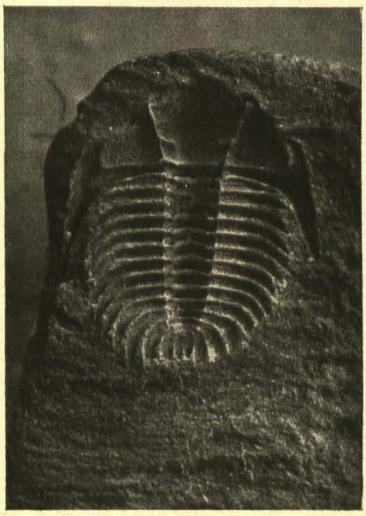

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