An Occurrence of Dolichometopids in South Chôsen with a
Summary Note on the Classification of the
Dolichometopinae*

By

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WALCOTT's classification of the Corynexochidae was developed by RAYMOND and others. Recently I made a comprehensive study¹⁾ on the Dolichometopinae which is one of the two subfamilies of the Corynexochidae. Excluding 14 species²⁾ which had once been thought to be members of the subfamily, it comprises some 125 species, 11 genera including 9 subgenera.

In Asia the subfamily is represented by 11 species and 2 varieties in two genera, including three subgenera as follows:

Central Siberian Species:

- 1) *Poliellina obrutchevi* (LERMANTHOVA), 1925.
- 2) *Poliellina laermanthovi* POLETAYEVA, 1926.
- 3) *Poliellina laermanthovi alta* POLETAYEVA, 1936.
- 4) *Poliellina sayanicus* POLETAYEVA, 1936.
- 5) (?) *Poliellina anomalis* POLETAYEVA, 1936.

Eastern Asiatic Species:

- 6) *Amphoton deois* (WALCOTT), 1905 = *Amphoton steinmanni* LORENZ, 1906.
= *Amphoton alia* ENDO and RESSER, 1937.
- 7) *Amphoton deois asiaticus* LORENZ, 1906.
- 8) *Amphoton derceto* (WALCOTT), 1905 = *Amphoton parallela* ENDO and RESSER, 1937.
- 9) *Amphoton* (*Amphotonella*) *alceste* (WALCOTT), 1905.
- 10) *Amphoton* (*Amphotonella*) *hyrie* (WALCOTT), 1906.
- 11) *Amphoton* (*Sunia*) *typica* KOBAYASHI, 1942 = *Amphoton typica* SUN, 1937, nom. nud.
- 12) *Amphoton* (*Sunia*) *divergens*, ENDO and RESSER, 1937.
- 13) *Amphoton* (*Fuchouia*) *manchouriensis* WALCOTT, 1911, = *Fuchouia quadrata* ENDO and RESSER, 1937.

* Transactions of the Palaeontological Society of Japan, No. 161.

1) T. KOBAYASHI: On the Dolichometopinae. Jour. Fac. Sci. Imp. Univ., Sect. 2, vol. 6 (in print)
A complete bibliography is given in this paper.

2) Four Asiatic species are cited in the text; the remaining nine are as follows.

1. *Bathyurus senectus* BILLINGS, 1861.
2. *Dolichometopus* (?) *convexus* BILLINGS, 1865.
3. *Dolichometopus* (?) *gibberulus* BILLINGS, 1865.
4. *Dolichometopus* (?) *rarus* BILLINGS, 1865.
5. *Dolichometopus tatei* WOODWARD, 1884.
6. *Bathyuriscus* (*Kootenia*) *dawsoni* WALCOTT, 1889.
7. *Barrandia* (?) *mccoyi* WALCOTT, 1884.
8. *Dolichometopus* (*Housia*) *varro* WALCOTT, 1916.
9. *Bathyuriscus batis* WALCOTT, 1916.

Of them *Fuchowia* is so far limited in its occurrences to the Sosan area and Tschangsingtao island, although it occurs there abundantly. *Amphotonella* is known from Shantung and Shansi, but it is not a common subgenus. *Amphoton* s. str. on the other hand is distributed very widely in North Chosen, South Manchoukuo and North China and *A. deois* is the most common species in the lower part of the Fuchou series.

Beside them there are several species described from Southern and Northern Asia as listed below, but their generic references were found to be incorrect.

- 1) *Bathyriscus howelli* TOLL, 1899, (non WALCOTT, 1886) = *Anomocare sibiricum* HOLM and WESTERGÅRD, 1930.
- 2) *Bathyriscus* (?) *stoliczkai* REED, 1910. " *Anomocarella* "
- 3) *Bathyriscus* sp. undt. by WALCOTT, 1913. *Aojia* ?
- 4) *Bathyriscus* B. sp. undt. by WALCOTT, 1913. *Pagodia* ?
- 5) *Dolichometopus* (?) sp. by MANSUY, 1916. ?
- 6) *Corynexochus* sp. by REED, 1934 = *Anomocare handwarence* REED, 1934.
- 7) *Dolichometopus subtuberculate* REED, 1934 = *Tonkinella kashmirica* REED, 1934,
= *Tonkinella breviceps* KOBAYASHI, 1934.
- 8) *Bathyriscus wongi* SUN, 1935. *Pagodia*
- 9) *Amphoton* (?) *subhorridus* ENDO and RESSER, 1937. *Aojia* (?)

Thus all of the South Asiatic dolichometopids were eliminated from the Dolichometopinae with the result that the distribution of the subfamily in Asia is confined to the north of the Tsinling-Keijo line¹⁾. But after I had finished a manuscript of this study I found a few specimens of dolichometopids in a collection from the Bunkei area in South Chosen. Though poorly preserved, they are, I think, worth while describing because they have just been discovered on the south side of the line. One is *Amphoton microlops*, new species, from the *Kogenium* zone²⁾ and the other *Amphoton derceto* (WALCOTT) var. *spinula*, new variety, from the *Kootenia* zone which lies below the preceding. Incidentally it should be noted that this variety is reported to occur in the Mapan formation in South Manchoukuo. In this paper the new species and the new variety above mentioned are described and in adding a new subgenus, *Athabaskiella*, the proposed classification of the Dolichometopinae is briefly summarized.

Family Corynexochidae ANGELIN, 1854.

Opisthoparian trilobites mostly heteropygous to isopygous with long glabella; no frontal limb; eyes generally large; hypostoma linguoid; thorax composed of 7 to 12 segments; pygidium generally having entire margin. Cambrian.

Subfamily Corynexochinae RAYMOND, 1928.

Small Corynexochidae with medium sized eyes at mid-length of glabella; fixed

1) T. KOBAYASHI: (1930), Cambrian and Ordovician Faunas of South Korea and the Bearing of the Tsinling-Keijo Line on Ordovician Palaeogeography. Proc. Imp. Acad., vol. 6.

2) For the Stratigraphic succession of the Chosen group in the Bunkei area the reader is referred to "A Study on the Geology of the Bunkei District in South Chosen etc. by T. KOBAYASHI and K. AORI (Proc. Imp. Acad., vol. 18.).

cheek wide; thorax of 7 to 8 segments; pygidium without well defined border. Cambrian, developed in Paradoxidian.

Subfamily Dolichometopinae WALCOTT, 1916.

Large Corynexochidae mostly having large eyes close to glabella; thorax of 7 to 12 segments; pygidium with a marginal border. Cambrian, developed in the Arcto-Pacific province in the Middle Cambrian period.

Dolichometopsis branch.

Genus *Dolichometopsis* POULSEN, 1927.

Heteropygous (?) Dolichometopinae with subquadrate glabella, narrow free cheeks, a long genal spine issuing from a point anterior to the intergenal angle, and a few bifurcating ribs of pygidium. *Dolichometopsis resseri* POULSEN, 1927. Lower Cambrian Cape Kent formation of Northwest Greenland and (?) early Middle Cambrian *Ptarmigania* formation of Wasatch Mountains.

Dolichometopsis minuta POULSEN, *D. septentrionalis* POULSEN.

Doubtful generic reference: *Dolichometopsis alia* RESSER, *D. comis* RESSER, *D. communis* RESSER, *D. gravis* RESSER, *D. gregalis* RESSER, *D. lepida* RESSER, *D. mansfieldi* RESSER, *D. media* RESSER, *D. potens* RESSER, *D. poulsenii* RESSER, *D. propinqua* RESSER, *D. stella* RESSER.

Subgenus *Ptarmigania* RAYMOND, 1928.

Heteropygous Dolichometopinae with forwardly expanded glabella, long genal spines, 9 thoracic segments and sinuated pygidium. *Bathyriscus rossensis* WALCOTT, 1917. Early Middle Cambrian or *Ptarmiganian*.

Ptarmigania agrestis RESSER, *Ptarmigania aurita* RESSER, *P. dignata* RESSER, *P. exigua* RESSER, *Dicellosephalus* (?) *expansus* WALCOTT, *Ptarmigania longula* RESSER, *P. natalis* RESSER, *P. ornata* RESSER, *Dicellosephalus* (?) *quadriceps* by WALCOTT (non HALL and WHITFIELD).

Main stem and direct off-shoots.

Genus *Poliella* WALCOTT, 1916.

Heteropygous Dolichometopinae with glabella somewhat expanded in front, eyes at the middle of cranium, 7 to 11 thoracic segments and effaced interpleural furrows of pygidium. *Bathyriscus (Poliella) anteros* WALCOTT, 1916. Lower and Middle Cambrian of North America.

Bathyriscus (Poliella) caranus WALCOTT, *Poliella castlensis* RESSER, *Dolichometopus occidentalis* MATTHEW, [= (?) *Dolichometopus pupa* MATTHEW,] *Bathyriscus (Poliella) primus* WALCOTT, *Poliella virginica* RESSER.

(?) *Bathyriscus (Poliella) balus* WALCOTT, *Bathyriscus (Poliella) chilo* WALCOTT, *Bathyriscus (Poliella) sylva* WALCOTT.

Subgenus *Poliellina* POLETAYEVA, 1936.

Similar to *Poliella* but having upturned frontal rim, 10-12 thoracic segments and depressed thick marginal border. *Poliellina laermanthova* POLETAYEVA, 1936.

Early Middle Cambrian of West Sayan, Irkutsk and Montana.

Poliellina anomalis POLETAYEVA, *P. laermanthova alta* POLETAYEVA, *Olenoides obrutchevi* LERMANTOVA, *Bathyriscus (Poliella) powersi* WALCOTT, *Poliellina sayanicus* POLETAYEVA.

Genus *Bathyriscus* MEEK, 1873.

Parapygous Dolichometopinae with glabella expanded in front, 9 thoracic segments and narrow border of the pygidium. *Bathyriscus* (?) *haydeni* MEEK, 1873. Middle Cambrian of North America.

Bathyriscus adeus WALCOTT, *B. attossa* WALCOTT, *B. brighamensis* RESSER, *B. marjumensis* RESSER, *B. polithus* RESSER, *Embolimus rotundata* ROMINGER, *Poliella wasatchensis* RESSER.

Subgenus *Athabaskia* RAYMOND, 1928.

Bathyriscus with 7 to 8 thoracic segments and pleural furrows of pygidium deepening and widening on a concave border. *Athabaskia ostermeri* RAYMOND, 1928. Lower (?) and Middle Cambrian of western North America.

Bathyriscus anax WALCOTT, *B. bantiuss* WALCOTT, *B. belus* WALCOTT, *B. (?) bithus* WALCOTT, *Clavaspidella excavata* RESSER, *Bathyriscus gracilis* RAYMOND, *B. howelli* WALCOTT, *Dolichometopus humei* KOBAYASHI, *Clavaspidella minor* RESSER, *Bathyriscus piedmontensis* RESSER, *Clavaspidella wasatchensis* RESSER.

Subgenus *Athabaskiella*, KOBAYASHI, 1942, (nov.)

Similar to *Athabaskia* but the pygidium pauci-segmented, much longer, axis short and post-axial ridge distinct. *Bathyriscus (Poliella) probus* WALCOTT, 1916. Late Middle Cambrian Marjum of Utah.

Subgenus *Glossopleura* POULSEN, 1927.

Similar to *Athabaskia* but glabella subquadrate and longer; frontal rim upturned; free cheek relatively wide and furrows of the pygidium faint. *Dolichometopus boccar* WALCOTT, 1916. Middle Cambrian of the Arcto-American province.

Glossopleura alabamensis RESSER, *G. arrecta* RESSER, *G. bassleri* RESSER, *Bathyriscus belesis* WALCOTT, *Dolichometopus bion* WALCOTT, *Glossopleura bosworthensis* RESSER, *G. buttsi* RESSER, *G. curtecei*, RESSER, *G. expansa* POULSEN, *Ptarmigania germana* RESSER, *Glossopleura gigantea* RESSER, *Bathyriscus howelli lodensis* CLARK, *Glossopleura intermedia* RESSER, *G. longifrons* POULSEN, *G. mckeei* RESSER, *G. minima* DEISS, *G. mohavensis* RESSER, *G. nitida* RESSER, *G. packi* RESSER, *Ogygia parabola* HALL and WHITFIELD, *Ogygia producta* HALL and WHITFIELD, *Glossopleura prona* RESSER, *G. similis* RESSER, *G. stephensis* RESSER, *G. sulcata* POULSEN, *G. thompsoni* DEISS, *G. utahensis* RESSER, *G. virginica* RESSER, *G. walcotti* POULSEN, *G. williamsi* KOBAYASHI.

(?) *Glossopleura alta* DEISS, *Ptarmigania altilis* RESSER, *Glossopleura fordensis* DEISS, *G. inornata* DEISS, *Glossopleura perryi* DEISS, *Ptarmigania sobrina* RESSER.

Genus *Amphoton* LORENZ, 1906.

Heteropygous Dolichometopinae with long unfurrowd glabella; no genal spines;

7 thoracic segments; a few ribs on pygidium; and thick, depressed and posteriorly sinuated border of pygidium. *Dolichometopus deois* WALCOTT, 1905. [= *Amphoton steinmanni* LORENZ, 1906, *Amphoton alia* ENDO and RESSER, 1937.] Early Middle Cambrian or Changhian of Eastern Asia.

Bathyriscus asiaticus LORENZ, (= *Fuchouia quadrata* ENDO and RESSER), *Dolichometopus derceto* WALCOTT, (= *Amphoton parallela* ENDO and RESSER), *Amphoton derceto spinula* KOBAYASHI, *Amphoton microlops* KOBAYASHI.

Subgenus *Amphotonella* KOBAYASHI, 1942.

Similar to *Amphoton* but having forwardly tapering glabella, genal spines and non-sinuated pygidium. *Dolichometopus alceste* WALCOTT, 1905. Early Middle Cambrian of Eastern Asia and Victoria in Australia.

Dolichometopus hyrie WALCOTT, *Ptychoparia minima* CHAPMAN, *P. thieli* CHAPMAN.

Subgenus *Sunia* KOBAYASHI, 1942.

Similar to *Amphoton* but having long nuchal and genal spines, thicker cephalic border and larger pygidium. *Sunia typica* KOBAYASHI, 1942. Middle Cambrian of Eastern Asia and Australia.

Dolichometopus dirce WALCOTT, *Amphoton divergens* ENDO and RESSER, *A. spinigerum* WHITEHOUSE.

Subgenus *Fuchouia* ENDO and RESSER, 1935.

Similar to *Amphoton*, but having subtrapezoidal cranidium, oblique eyes, genal spines and narrow borders. *Bathyriscus manchouriensis* WALCOTT, 1911. Changhian of Eastern Asia.

Genus *Dolichometopus* ANGELIN, 1878.

Parapygous Dolichometopinae with strongly convex cephalon, unfurrowed glabella, large postero-lateral limb of fixed cheek and effaced pygidium. *Dolichometopus svecius* ANGELIN, 1852. Late Paradoxidian from the Baltic region to Vermont (?) through New Brunswick.

Dolichometopus acadicus MATTHEW, 1897.

? *Dolichometopus vermontensis* HOWELL, 1937.

Prosymphysurus branch.

Genus *Clavaspidella* POULSEN, 1927.

Similar to *Athabaskia* but anterior half of glabella strongly expanded, four pairs of lateral furrows short but distinct, fixed cheek wide; pygidium sinuated at the rear. *Clavaspidella sinupyge* POULSEN, 1927. Late Middle or early Upper Cambrian Cape Frederik VII formation (boulder) in Northwest Greenland.

Clavaspidella platyrrhina POULSEN, *C. quinesulcata* POULSEN.

Genus *Prosymphysurus* POULSEN, 1927.

Similar to *Clavaspidella* but lateral glabellar furrows absent and pygidium

longer and not sinuated. *Prosymphysurus kochi* POULSEN, 1927. Late Middle or early Upper Cambrian Cape Frederik VII formation (boulder) of Northwest Greenland.

Genus *Acheilops* ULRICH, 1930.

Similar to *Clavaspidella* and *Prosymphysurus* but eyes attached to glabella; frontal limb, rim and anterior fixed cheek absent. *Acheilops dilatatus* ULRICH, 1930. Late Upper Cambrian Eminence formation of Missouri.

Hemirhodon branch.

Genus *Anoria* WALCOTT, 1924.

Similar to *Glossopleura* but eyes smaller and located at mid-length of cranium and pygidium longer; thorax of 7 segments. *Dolichometopus tontonensis* WALCOTT, 1916. Middle Cambrian of Western North America.

Dolichometopus baton WALCOTT, *Dolichometopus* ? *bessus* WALCOTT, *Anoria utahensis* RESSER.

Genus *Hemirhodon* RAYMOND, 1937.

Similar to *Anoria* but glabella expanded forward and pygidium broad, having interpleural furrows and broad border. *Hemirhodon schucherti* RAYMOND, 1937. Late Upper Cambrian of Vermont.

Corynexochus juvenis RAYMOND, *Hemirhodon minor* RAYMOND, *H. vivator* RAYMOND.

Isolated shoots.

Genus *Klotziella* RAYMOND, 1928.

Parapygous Dolichometopinae with forwardly expanded glabella, four pairs of lateral furrows, small eyes, broad fixed cheek, no genal spine; thorax of 8 segments; thick triangular ridge on the inner side of thoracic pleura; and broad pygidium. *Bathyriscus ornatus* WALCOTT, 1908. *Ogygopsis* shale of Middle Cambrian Stephen formation of British Columbia.

Genus *Orria* WALCOTT, 1916.

Macropygous Dolichometopinae (?) with narrow square glabella, transversal postero-lateral limb of fixed cheek, large free cheek having nerve-like lines, 9 thoracic segments subtruncated at lateral ends and distinct interpleural furrows, short axis and narrow rim of pygidium. *Orria elegans* WALCOTT, 1916. Late Middle Cambrian Marjum formation of the House Range, Utah.

Amphoton derceto (WALCOTT).

1905. *Dolichometopus derceto* WALCOTT, Proc. U. S. Nat. Mus., vol. 29, p. 95.

1913. *Dolichometopus derceto* WALCOTT, Cambrian Faunas of China, p. 217, pl. 22, figs. 4, 4a.

1937. *Amphoton parallela* ENDO and RESSER, Manchurian Sci. Mus., Bull. 1, p. 206, pl. 38, figs. 2-4, 10-12, ? 6-8, not pl. 38, fig. 13 and pl. 39, fig. 19-20. !

This includes *Amphoton* having a glabella which is subsquare or only a little

expanded forward but not contracted in the middle. In other features it is quite similar to *Amphoton deois*. Eyes are large, located posteriorly, and generally connected with the glabella by eye-ridges; lateral furrows vary in their depth.

ENDO and RESSER's pygidia of *parallela* are different from that of WALCOTT's *derceto* but almost identical with that of *deois*. Because ENDO and RESSER's as well as WALCOTT's pygidia are detached from other parts of the carapace, which of the two kinds of pygidia belongs really to this species can not be determined. Furthermore, it is probable that the difference between the two pygidia represents different morphic stages of growth, because WALCOTT's pygidium, 2.5 mm. long, is undoubtedly an immature one. Among ENDO and RESSER's cranidia there are two kinds. One (fig. 13) has an occipital spine while the other has no spine. Therefore the former is distinguished here from the latter as a new variety, *spinula*.

Amphoton derceto (WALCOTT) var. *spinula* KOBAYASHI new variety.

Pl. 18 (11), Figs. 12-13.

1937. *Amphoton parallela* ENDO and RESSER, Manchurian Sci. Mus., Bull. 1, p. 206, pl. 38, fig. 13.

In the collection at hand there are external and internal moulds of a cranidium. There are three pairs of lateral furrows which are not so strongly impressed on the external as in the internal mould. Its occipital ring is triangular and a very tiny spine issues from its posterior angle.

Occurrence:—This was obtained from a talus hanging on the west side of Teibansan, about 200 m. southeast of Kanairi. *Nissusia*, *Stenotheca* and a few others are contained in the same kind of boulders. From the locality and the lithic aspect it is presumed that the boulders were derived from the 2₁ division of the Eiko formation exposed on Teibansan hill.

Amphoton microlops KOBAYASHI, new species.

Pl. 18 (11), Fig. 11.

A cranidium at hand is about 9 mm. long. It resembles *A. deois* very closely, but the glabella is flat and its anterior half strongly expanded. Whether or not the flattening of the glabella was caused by a secondary depression is however uncertain. Its neck-ring is uniform in breadth, instead of narrowing laterally as in *deois*. Eyes are relatively small, corresponding to one-third the glabella whereas the length of the eye is equal to about a half of the glabellar length in *deois*. The eye-band is semi-circular, elevated laterally and disconnected from the glabella by a narrow space. The fixed cheek in front of the eye is as wide as the frontal border. The cheek and border are depressed below the flat glabella.

Although the specimen is not well preserved, it is quite evident that it belongs to a new species. The relatively small size and posterior position of the eyes are the most distinguishing characteristics of the species.

Occurrence:—The specimen was found in the 3 divisions of the Kanai formation at a point on the north side of Arakol adjacently southeast of Kanairi, in

the Bunkei area, Keisho-hōku-dō, South Chosen in association with *Obolus* sp., *Peronopsis coreanicus*, *Pseudagnostus primus*, *Ptychoparia* sp., *Anomocarella brevifrons* and some other fossils. (SHIRAKI's collection, 咸 3).

南鮮産 Dolichometopids と Dolichometopinae 分類の總括 (摘要)

小 林 貞 一

1) 印度及印度支那より從來報告されたる Dolichometopids は本亞科に屬するものにあらず。泰嶺—京城線以南に於ける眞の Dolichometopids の産出は茲に記載せる開慶産の 2 種が最初なり。

a) *Amphoton darceto* WALCOTT var. *spinula* KOBAYASHI, var. nov. 額江層産

b) *Amphoton microlops* KOBAYASHI, sp. nov. 下乃層産

2) Dolichometopinae は下記の 11 属 9 亞属に分類する事を得。

Corynexochidae ANGELIN, 1854.

a) *Corynexochinae* RAYMOND, 1928.

b) *Dolichometopinae* WALCOTT, 1926.

Dolichometopsis POULSEN, 1927.

(*Ptarmigania* RAYMOND, 1928)

Poliella WALCOTT, 1916.

(*Poliellina* POLETAYEVA, 1936)

Bathyriscus MEEK, 1873.

(*Athabaskia* RAYMOND, 1928)

(*Athabaskiella* KOBAYASHI, subg. nov.)

(*Glossopleura* POULSEN, 1927)

Amphoton LORENZ, 1906.

(*Amphotonella* KOBAYASHI, 1942)

(*Sunia* KOBAYASHI, 1942)

(*Fuchonia* ENDO and RESSER, 1935)

Dolichometopus ANGELIN, 1878.

Clavaspidella POULSEN, 1927.

Prosymphysurus POULSEN, 1927.

Acheilops ULRICH, 1930.

Anoria WALCOTT, 1924.

Hemirhodon RAYMOND, 1937.

Klotziella RAYMOND, 1928.

Orria WALCOTT, 1916.