11. Advance Reports on the Carboniferous Trilobites of Japan. II^{*)}

One New Subgenus and Three New Species

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Here are described one new subgenus and three new species of trilobites from Japan as follows:

1. *Brachymetopus* (*Brachymetopella*) *akiyoshiensis*, subgen. et sp. nov.
2. *Cummingella otai*, sp. nov.
3. *Paladin longispiniferus*, sp. nov.

Genus *Brachymetopus* M'coy, 1847

The type-species of this genus and its subgeneric division into *Brachymetopus* and *Brachymetopina* having paucisegmented pygidium with marginal spines and multisegmented pygidium with entire margin respectively have long been a moot discussion among Reed (1903) and several others. Lately Hahn ignored the division when he confirmed that marginal spines in the early post-larval stage disappeared in the grown stage in *Brachymetopus maccoyi spinosus* Hahn, 1964.

In the Akiyoshi brachymetopid, however, it is certain that pygidial spines are maintained until the grown stage. Not only this Japanese species, but some others have common characteristics of cephalon and pygidium beside the spines. Therefore a new subgenus *Brachymetopella* is here instituted.

Brachymetopus is a cosmopolitan genus appearing in late Devonian lasting through Carboniferous. *Brachymetopella* is a Carboniferous branch issued from this trunk in Eurasia from the east of the Urals. A companion genus, *Cheiropyge* is another from late Carboniferous through Permian which was distributed in the Himalayas, Caucasus ? and the Urals in Eurasia and Alaska and the United States of America.

Subgenus *Brachymetopella*, nov.

Diagnosis:—Cephalon semicircular to broad subtrigonal in out-

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line; glabella long, subcylindrical or longiconic and unfurrowed; basal lobes obsolete; frontal limb short; marginal border and furrow well developed; eyes far posterior, fairly large, prominent, close to glabella; facial sutures widely divergent from eyes, if opened. Pygidium roundly triangular, well inflated and depressed near margin; axis multisegmented; pleural ribs in about seven pairs, prolonged beyond margin into sharp spines even in grown stages; these ribs generally double but the last pair may be united as a post-axial piece and median spine. Test granulose except for furrows.

Type-species:—*Brachymetopus* (*Brachymetopella*) *akiyoshiensis*, sp. nov.

Remarks:—This subgenus can readily be distinguished from *Brachymetopus*, s. str. by long, nearly parallel-sided glabella, obsolete lateral furrows including preoccipital ones and short preglabellar limb in cephalon and by subtriangular or truncate oval outline of pygidium, greater number of axial rings and smaller number of pleural ribs which are, however, generally bisected by interpleural furrows and sharp marginal spines.

Cheiropyge Diener, 1897 differs from *Brachymetopella* in the pygidium suddenly arched down near margin and simple pleural ribs ending at blunt projections, instead of sharp spines. The glabella is short, frontal limb moderate in length, marginal band broadened toward sagittal point in the typical cephalon.

Beside the type-species the present subgenus comprises (1) *Brachymetopus* (*Brachymetopus* ?) *pseudometopina* Gauri and Ramovš, 1964, (2) *B. pseudometopina jesenicianus* G. and H. Hahn, and Ramovš, 1977, (3) *B. vyssotzkii* Weber, 1937, (4) *B. strzelickii uralicus* Weber, 1937 and (5) *B. moelleri* Weber, 1937.

Distribution:—Carboniferous; Yugoslavia, the Urals, Central Asia and Japan.

***Brachymetopus* (*Brachymetopella*) *akiyoshiensis*, sp. nov.**

Description:—Cephalon semicircular, strongly vaulted toward glabellar centre, provided with genal spines; glabella long cylindrical, rounded in front, strongly convex; lateral furrows obsolete; dorsal and occipital furrows profound; frontal limb short, separated from border by broad, deep furrow; cheeks rising toward eyes which are located near glabellar posterior and as high as glabella; fixed cheeks narrow; free cheeks moderate in size. Facial sutures are opened in the holotype specimen.

Pygidium roundly triangular, strongly inflated and provided with six pairs of marginal spines; axial lobe broad, breviconic, composed of more than 20 rings, each decorated with a row of tubercles; post-

Figs. 1, 2. *Brachymetopus (Brachymetopella) akiyoshiensis*, subgen. et sp. nov. 1a-d. a, Dorsal; b, anterior; c, right lateral; d, left lateral views of the holotype cephalon. $\times 6.8$. 2a-d. a, Dorsal; b, posterior; c, right lateral; d, left lateral views of the paratype pygidium. $\times 5.5$.

Figs. 3a-c. *Cummingella otai*, sp. nov. a, Dorsal; b, anterior; c, left lateral views of the holotype cephalon. $\times 5.3$.

Figs. 4a-d. *Paladin (Weberides) longispiniferous*, sp. nov. a, The holotype; b, paratype; c and d, pygidia and two paratype cranidia. a, $\times 4.0$; b, $\times 4.6$; c, $\times 4.3$; d, $\times 4.3$.

axial piece depressed and produced into a spine; pleural lobe composed of six pairs of double ribs, convex, but depressed near margin and ending at short spines; riblet with a row of tubercles.

Occurrence:—*Profusulinella beppensis* zone at Nakano, Shohoji, both in the Akiyoshi limestone plateau, Yamaguchi Prefecture, West Japan.

Genus *Cummingella* Reed, 1942

Cummingella otai, sp. nov.

Description:—Cephalon suboval in outline, strongly convex, highest in broad anterior of glabella which is contracted at mid-length; large lunate eyes opposed in posterior of glabella; cheeks narrow, steeply slanting laterally. Lateral glabellar furrows obsolete, but occipital one distinct; fixed cheek very narrow; free cheek mesially carinate and furrowed on two sides of the carina; lateral border stout. Gibbous anterior lobe of glabella striated more or less transversally and overlapping frontal border. Facial suture apparently running forward from eye along the glabellar margin.

Remarks:—This massive cephalon having hourglass shaped glabella, very large eyes and narrow free cheek agrees with *Cummingella*, particularly *C. jonesi* (Portlock), but the glabellar furrows, even basal ones are obsolete. The medial carina bounded by a deep furrow on each side on the free cheek is the most distinctive characteristic from the known species of *Cummingella*. This would be a highly specialized terminal species.

Occurrence:—The solitary cephalon was collected in the *Millerella* sp. zone at a point 247 m ESE from Ryugoho Triangulation, Akiyoshi-dai (Akiyoshi limestone plateau), Yamaguchi Prefecture.

Genus *Paladin* Weller, 1936

Paladin longispinifers, sp. nov.

1968. *Weberides* ? sp. Araki and Koizumi, p. 158, pl. 2, figs. 3, 4, 11.

Description:—This is a *Paladin* having a relatively small pygidium for the genus which is triangular in outline and possesses an extraordinarily long caudal spine. Glabella nearly parallel sided, but somewhat contracted at the middle of its length and a little invading into frontal border; anterior lobe more or less broader than posterior lobe; basal lobe subtriangular; two or three rudimentary lateral furrows impressed on internal mould in front of the basal furrow.

Remarks:—According to Reed (1942), *Weberides* has 15 to 18 axial rings and 10 to 12 pleural ribs, but in this species the axial lobe consists only of 13 to 14 rings and no more than 8 or 9 ribs are countable on the pleural lobes. This is an isolate species of *Weberides*, or

the *Paladin mucronatus* group.

Occurrence:—Upper Visean Onimaru Series; Yukisawa, Yahagi, Takada city, Miyagi Prefecture, North Japan.

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^{*)} See the preceding article for Araki and Koizumi, 1968 and Gauri and Ramovš, 1964.