37. A Permian Trilobite from Spitsbergen, Norway with a Note on the Biogeographic Bearing of Genus Neoproetus

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Recently Nakazawa made a short visit to Spitsbergen to see the Upper Palaeozoic geology and collected some fossils including a few trilobites here described. They are a carapace whose cephalon is imperfect (AP6) and two pygidia (AP9) one of which consists of an external and internal moulds. These trilobites were found at Ahlstrand-halvøya (peninsula), Wedel Garlsberg Land in the middle part (AP6) and the upper part (AP9) of the Permian Kapp Formation which is rich in brachiopods and bryozoans besides some corals. According to Nakazawa and Nakamura (communication) the age of the brachiopods is within the range from Kungurian to lower Tartarian (Dzhulhian).

From this island Osmolska (1968) has already described Ditomopyge roemeri spitsbergensis n. subsp. and Paladin trigonopyge n.sp. from Upper Carboniferous (?) Treskeilodden Beds, Hornsund, Vestspitsbergen. These two species are, however, different from the trilobites before hand which belong to an identical species, but it looks intimately related to Ditomopyge roemeri (von Moeller, 1867) from the Urals. Nevertheless, it is considered a new species as here denominated Neoproetus borealis.

Neoproetus borealis Kobayashi, sp. nov.

Of the cephalon its anterior and lateral parts are unpreserved and it is known only of its posterior portion. The glabella is strongly convex and its main lobe remarkably expanded forward and occupies about a half of the basal breadth of the glabella; a pair of basal lobes elongated in club shape. The posterior lateral (S1), occipital and axial furrows are all profound; neither preoccipital median furrow nor other lateral furrows present on glabella; palpebral area narrow on lateral side of basal lobe. The occipital ring is very thick sagittally, in comparison with axial ring of the thorax, but narrows behind the basal lobes. A short genal spine with a median furrow is seen on the left cheek. The right spine of the same length is also preserved.

The thorax is composed of nine segments, but the fourth segment overlaps the fifth one, although the latter is exposed only a bit at its left terminus. In the first segment the axial ring is a little broader than the pleura, but they are the same in breadth in the ninth segment. The pleural furrow runs near the anterior margin and the narrow anterior band forms a sharp triangular facet at the geniculation at about one-third from the axial furrow. The lateral margin of the pleura is well rounded.

The pygidium is two-thirds as long as wide and more or less lenticular in outline, but the anterior margin is more broadly arcuate than the other. The marginal border of moderate breadth is well defined on the lateral and posterior sides. The axial lobe is nearly a third of pygidium in breadth, composed of ten rings and a minor terminal part, strongly convex, but suddenly reduces the inclination in order to form depressed square areas along the axial furrow. The pleural lobe is divided into seven ribs which are nearly flat on the inner side,
but abruptly arching down to the other side as far as the marginal border; a node present at this geniculation; pleural furrow deep; weak interpleural furrow incised near the terminal part; marginal furrow shallow; marginal border more or less convex and slanting toward the outer margin.

Test smooth, but in thorax and pygidium minute longitudinal ridges which are aligned on the axial rings and pleurae are most distinct along the posterior margins of the rings. Similar ornaments are seen also along the posterior margin of the occipital ring, although they are not so distinct as in thorax and pygidium.

The important characteristics of this species are the lack of the median pre-occipital lobe on the cephalon and its association with the broad paucisegmented pygidium. This combination warrants its being congeneric with the so-called *Ditomopyge roemeri* from the Urals, although the pygidium is shorter in this than in that species. Moeller's species, however, cannot be retained in *Ditomopyge*, because the median preoccipital lobe is obscure in the cephalon and the pygidium is too short for *Ditomopyge*. On the contrary these two species look diagnostic of *Neoproetus*. The chain of nodes along the pleural geniculation of the thorax and pygidium and the lateral depressed square area of the axial ring of the latter are also distinctive of this species.

The genus *Neoproetus* was primarily founded by Tesch (1923) as a subgenus on *Proetus* (*Neoproetus*) *indicus*, nov. from Dunkelroter Kalkstein (Middle Permian) of Timor. Later *Neoproetus* was profused by Gheyselinck (1927) by adding some species (*baugensis, brevicauda, gerthi, teschi, trigonoceps*) from Timor and *Griffithides verrucosus* which is Gemmellaro's species from Sicily (1896). In Thailand *Neoproetus* (*Triproetus*) *subovalis* Kobayashi and Hamada, 1979 occurs in the Upper Carboniferous (upper Moscovian) and *N. aff. subovalis* in the Lower Permian (Sakmarian), both in Changwat Loei. Subgenus *Triproetus* has three short divergent furrows in front of the basal furrow of the glabella.

In South Asia *Phillipisia midlemissi* Diener, 1897 from the *Cyclolobus* stage (Upper Permian) in Central Himalaya belongs probably to this genus. In further west *Ditomopyge (?) roemeri* is reported from the upper Moscovian of Boka, Afghanistan by de Lapparent and Pillet (1967). In the Mediterranean region *Neoproetus verrucosus* afore mentioned is accompanied by *Phillipisia siculus* Gemmellaro, 1892 for which Kobayashi and Hamada proposed *Siciliproetus* and Owens (1983) considered it to be synonymous with *Neogriffithides*. Thus *Neoproetus* is distributed widely through the Tethyan sea from Sicily to Timor.

*Griffithides roemeri* Moeller in figs. 24, 31–32, pl. 3, Weber (1933), in figs. 8–11, pl. 9, Weber (1937) and *Ditomopyge roemeri roemeri* in figs. 6–7, pl. 1,
Osmolska (1968), all from the Urals are intimately related to this species, but a pygidium in fig. 22, Weber (1933) looks long like the pygidium of "Neoproetus" spitsbergensis. In Neoproetus borealis the anterior and postero-lateral margins are arcuate so similarly that the pygidium looks sublenticular in outline. In Neoproetus roemeri on the other hand the anterior margin is gently arcuate, while the postero-lateral margins describes a semicircle. Although the glabellar encroachment into the erected frontal border cannot be ascertained in this species, the cephalon of D. roemeri in fig. 11 (Weber, 1937) and in fig. 6, pl. 1 (Osmolska) are closely allied to the cephalon of N. borealis. Chamberlain (1970) identified the pygidia from the Gateway limestone (Guadalupian), West Texas with Ditomopyge roemeri s. str.

Of Ditomopyge roemeri spitsbergensis from the Treselodden beds, Spitsbergen, a cranidium, free cheek and three pygidia are illustrated by Osmolska (1986). It is said that "preoccipital median lobe marked, but preoccipital furrow indistinctly pronounced". Not only in illustration but also in the axial sections of the cranidium in her fig. 6a the lobe cannot actually be recognizable. Therefore the cranidium must be excluded out of Ditomopyge. The holotype pygidium of this species is an internal mould which is only a little wider than long. The axial lobe which is about a-third of the pygidial breadth is composed of 13 axial rings; pleural ribs number 8; marginal border place approximately horizontal.

A nearly complete dorsal shield of this species but without cheeks was obtained besides a cranidium from the Jungle Creek Formation in Northern Yukon, Canada (Ormiston, 1973). The shield has nine segments in thorax. The anterior band of its pleura has anteriorly pointed flange at pleural geniculation as does this species. The post-axial ridge is present in the internal mould of the pygidium. The preoccipital median lobe is completely fused with the main glabellar lobe. Thus it is not a Ditomopyge.

This cephalon is similar to Paladin and Kaskia, but closer to Neoproetus than any other Permian trilobites. The pygidium is on the other hand pauci-segmented, if compared with Paladin and Kaskia and longer than the above stated species of Neoproetus. Therefore this species is distinguished from Neoproetus s. str. as a new subgenus calling here Neoproetus (Neoproetella) spitsbergensis. Osmolska's cranidium has a median tubercle in the basal part of the glabella. Because it is absent in Ormiston's from Yukon, it is distinguished as N. (N.) spitsbergensis subsp. yukonensis subsp. nov.

Through Neoproetus roemeri and Neoproetus (Neoproetella) spitsbergensis the Arctic fauna was connected to the Texas fauna through Western Canada in one way and in another way to the Tethyan fauna through the Urals. Neither Neoproetus nor Ditomopyge is known from South America where Bolivicrania is a solitary Permian trilobite (1986).

Ditomopyge meridionalis Teichert has been described from Middle Permian of Western Australia, but Neoproetus is as yet unknown from this continent. In Eastern Asia Neoproetus (?) sinensis Grabau, 1936 was described from the Upper Permian Maping limestone, Kwangsi, South China whose granulate cephalon closely resembles Kathwaia capitorosa Grant, 1966 from Upper Permian of the Salt Range, West Pakistan. Paladin yanagisawai Endo and Matsumoto, 1962, from the Takakurayama Formation (Yabeina zone) of the Abukuma Mountains, North Japan was once located in Neoproetus in Hahn and Hahn's catalogue (1970), but Koizumi (1972) created a new genus Endops for it.
"Neoproetus" akagii Kobayashi and Hamada, 1984, from the Lower Permian Miharano Formation, Hiroshima Prefecture, West Japan is such an aberrant proetoid for which a new generic name is expected. Paladin (?) iwaizakiensis Kobayashi and Hamada from the Iwaizaki limestone (Yabeina shiroiwensis zone), Miyagi Prefecture, North Japan also has the cephalon resembling Neoproetus, but the marginal border is undeveloped in its pygidium. Thus none of them belongs to Neoproetus.

In looking over these species of Neoproetus and its allies this genus together with its subgenus, Neoproetella, indicates the connection of the Arctic fauna to the Texas fauna through West Canada on the eastern Pacific side and to the Tethyan fauna through the Urals on the Eur-Asiatic side during the Permian period and probably in the middle Permian age, but Neoproetus did not extend as far as Eastern Asia and Australia on the western Pacific side.

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References

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