55. A Discovery of the Microfossil Faunas from the Otake Formation in Okayama Prefecture, Western Japan^{†)}

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From the stratigraphical and structural points of view, the Carboniferous and Permian sedimentary rocks and the Upper Triassic sequence in the Hina area of Yoshii, Shitsuki county in Okayama Prefecture, have been studied by Kobayashi (1950), Kobayashi and Hamada (1978), Nakano (1952), Yoshimura (1961), and Sada *et al.* (1979).

Kobayashi (1950) divided this Paleozoic into the Hina Limestone, Otake Formation, Mihara Formation, Koyama Limestone and Uji Formation in ascending order. Recently Kobayashi and Hamada (1978) reported the Middle or Late Tournasian trilobites from the Hina Limestone. In 1961 Yoshimura studied this Paleozoic and established the Yoshii Group, and divided it into lower Otake and upper Mihara Formations, but its geologic age has been undetermined by fossil.

Recently we have studied their stratigraphy and discovered the conodonts and radiolarians from the Otake Formation. Its lower member is composed of fine to medium grained sandstones and alternating beds of sandstones and mudstones and its upper member of thick cherts. The Mihara Formation overlying the Otake Formation consists of sandstone and mudstone alternation.

We consider the conodonts and radiolaria from the upper Otake cherts are useful for age determination. The fossils and their localities are as follows: Loc. 81133 *Hindeodus typicalis* (Sweet) Pa element, Loc. 81154 *Neogondolella* spp., Loc. 81155 ? *Diplognathodus* sp. Pb element, Loc. 81163 *Neogondolella* spp., Loc. YS101 *Albaillella* sp. D of Ishiga *et al.*, Loc. YS107 *Hindeodus* sp., Loc. YS109 *Albaillella* sp. D of Ishiga *et al.* and *Paronaella* sp., Loc. YS110 *Albaillella* sp. D of Ishiga *et al.*, Loc. YS119 *Paronaella* sp. and *Neogondolella* sp., Loc. YS195 *Hindeodus* sp., and Loc. YS233 *Neogondolella* sp.

Hindeodus typicalis (Sweet) Pa element was originally described from the Mianwali Formation of Chhidru Nala in Salt Range, West Pakistan. It was reported also by Igo (1981) from the Permian Karasawa Limestone in Kuzuu town, Tochigi Prefecture. *Neogondolella* spp. are of Permian type. *Albaillella* sp. D of Ishiga *et al.* (1982) is thought to be a Middle Permian good indicator. The Otake Formation characterized by the conodonts and radiolaria is regarded as the Middle Permian, and is correlated with the thick cherts of the Middle Permian Notabiyama Formation (Oho, 1985) which thrust over the Upper Permian Maedani Formation in the northern part of the Taishaku Limestone upland in Hiroshima Prefecture.

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Figs. 1-6. 1: *Hindeodus typicalis* (Sweet) Pa element, lateral view, $\times 180$, Loc. Y81133. 2-4: *Neogondolella* spp. 2: Oblique oral view, $\times 75$, Loc. Y81154. 3: Oblique oral view, $\times 100$, Loc. Y81163. 4: Lateral view, $\times 100$, Loc. Y81154. 5: *Albaillella* sp. D of Ishiga *et al.*, $\times 120$, Loc. YS101. 6: ? *Diplognathodus* sp. Pb element, lateral view, $\times 180$, Loc. Y81155.

Fig. 7. Geologic map of the Hina area in Okayama Prefecture, western Japan.

The thick Carboniferous cherts are distributed in the Yuki area in Hiroshima Prefecture, to the northwest of Hina and thrust over the non-calcareous rocks with the lenses of cherts comprising the Permian conodonts. The Carboniferous cherts contain abundant conodonts indicating the Morrowan to the possible Desmoinesian. The Carboniferous conodont faunas consist of *Ozarkodina* sp. Pa element (= *Spathognathodus campbelli* Rexford, *Hindeodus* sp. Pa element (= *Anchignathodus minutus* (Ellison)), *Idiognathoides sulcatus sulcatus* Higgins and Bouckaert, *Neognathodus bassleri symmetricus* (Lane), etc. The conodont faunas of the Yuki area are not in same age to the Otake faunas of Hina.

Now it is concluded that the thick chert strata accompanied with the non-calcareous rocks in the so-called "Kibi highland" in Okayama and Hiroshima Prefectures are of Morrowan to possible Desmoinesian age and of Permian age.

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