

***Deltoblastus*, Paleontologic Data for Plate Tectonic Relationship of India and Timor**

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Abstract

On the common occurrence of *Deltoblastus batheri* (Wanner) in India and Timor, the plate tectonic relationship of the two regions during the Permian Period is discussed.

Permian limestone within a thick Paleozoic and Triassic section exposed north of Sinthan Pass in the Kashmir Himalaya yielded four calyses of the blastoid *Deltoblastus batheri* (Wanner) as reported by Gupta and Webster (1976). They pointed out the nearly identical preservation of these specimens to that of the numerous specimens (over 10,000 known) from Timor, the type locality of *D. batheri* (Wanner, 1924). In both areas the specimens are preserved as primary calcite and commonly coated with a red or brown hematitic stain. It is the purpose of this paper to raise certain questions on the tectonic implications of the discovery of the same species in India and Timor in the hope that they may aid future studies of late Paleozoic plate tectonics of the Gondwana-Asian area.

Presently, Timor is nearly 8,000 km from the Kashmir Himalaya and the provenance of the Permian clastic sediments of Timor is not clear. Audley-Charles (1965) suggests that the Permian rocks of Timor had two sources, the autochthonous units were derived from the Kimberley block of northern Australia, and the allochthonous units were derived from the western margin of the Westralian Geosyncline. Fitch and Hamilton (1974, p. 4982) state 'Recent offshore drilling on the northwestern Australian continental shelf, however, shows that Upper Permian, Triassic and Jurassic rocks are dominantly clastic sediments derived from a continental terrain (India?) that lay to the northwest, but that was rifted away in Cretaceous time. Correlative and similar strata are among the Australian facies materials in Timor'. Definitive data are needed to solve this problem. There appears to be no question that the reefal limestones are allochthonous (Brouwer, 1942; Van Bemmelen, 1949; Audley-Charles, 1965; among others). These limestones contain rich diverse Permian fauna, including *Deltoblastus batheri*, described by Wanner, among others, in several major papers between 1912 and 1949.

Some similarities and differences between the Timor and Kashmir Himalaya Permian and Triassic sections should be noted as we are not implying that these two sections were very close together at the time of their formation. We do not know their relative positions at the time of deposition, but they probably were more closely related than they are today. Both areas have a thick section of Permian clastics overlain by Triassic limestones, Early Triassic in Kashmir and Late Triassic in Timor. The *Deltoblastus* bearing beds in Kashmir occur in a thick section of shales and limestones in the upper-most part of the Permian section (Gupta and Webster, 1976). In Timor, the *Deltoblastus* bearing beds are reefal and thrust from the north (Audley-Charles, 1965). They are time equivalent to some of the autochthonous clastics. Fossil preservation is nearly identical in the two areas. The Timor fauna is exceed-

ingly diverse and rich, whereas the fauna from the Sinthan sections of Kashmir is not adequately known.

From the Marbal Pass section which lies close to Sinthan Pass, Waterhouse and Gupta (1979) have described 16 species of brachiopods of late Middle Permian age. The brachiopod fauna from Marbal Pass belongs to the *Costiferina alatus* fossil community, in the *Lamnimargus himalayensis* Zone which is correlated with the lower and middle Punjabi Stage. Permian brachiopods and fossils belonging to other groups have also been described from other parts of Himalaya (Kashmir, Ladakh, Spiti, Kumaun, Sikkim, Bhutan, Nepal) and Peninsular India (Umaria, Mahendergarh, Daltonganj and Badhaura). Some of the brachiopods and pelecypods from these regions have close similarities and affinities with the fauna described from Australia.

In reconstructions of Gondwanaland, Australia is put adjacent to India by some authors (Carey, 1958; Tarling, 1971) and separated slightly by others (Schopf, 1970; McElhinny, 1970). If India is placed adjacent to Australia and Timor is assumed to be off the north coast of the Kimberly area, the Kashmir region would be some 5,000 kilometers from Timor. If the alternative interpretation is used and India and Australia are not adjacent, then the Kashmir region would be some 6,500 kilometers from Timor. Recognizing that the reefal limestones of Timor are allochthonous and perhaps moved considerable distance by continental drift before Miocene thrusting placed them in their present position, some adjustments would be necessary for exact distance differences between the two areas at the time of deposition.

Perhaps the presence of *Deltoblastus* in both areas does imply the closer proximity of the two areas during the Permian since blastoids generally have a restricted geographic distribution at the genus level (Breimer and Macurda, 1973). Future plate tectonic studies of the two areas should provide a more precise answer. In any case, both India and Timor were part of the Tethys belt and *Deltoblastus* is thought to be restricted to the Tethys faunal realm.

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