



THE MIOCENE PERIPLOMATIDS(?) FROM THE BHUBAN FORMATION OF KOLASIB, MIZORAM : A REAPPRAISAL

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ABSTRACT

The identification of the three so-called periplomas from the Bhuban Fm (Miocene) of the Kolasib region (north Mizoram) is not trustworthy as these are based on external properties only: their validity depends on their internal features such as the chondrophore, clavicle, relative sizes of the adductor impression, and the grade of indentation of the pallial line.

Keywords: Miocene; Periplomas; Bhuban Fm; Kolasib; Mizoram; northeastern India.

INTRODUCTION

Mazumder and Tiwari (2012) have claimed to discover *Periploma* Schumacher, 1817 (Bivalvia: Periplomatidae) from south Asia (including the Indian subcontinent). Nine specimens (all casts) are assigned to three taxa (not “species”): Introduction, p.75) since these are merely ‘informal’ identifications without a formal ‘binomial’ sanctification).

The purpose of this paper is to apprise the readership of the Palaeontological Society of India (and particularly the future workers) about the shortcomings, confusions and inadequate identification of the genus *Periploma* for want of reliable morphological features, and yet claiming this to be its “first record from south Asia including the Indian subcontinent”! The incongruencies are chronicled below for cognizance by all the readers.

PREVIOUS WORK

The authors have enlisted more than two dozens of references (Introduction, p.75) pertaining to the “extensively studied” works on Miocene bivalves from the Indian subcontinent, including Myanmar”. However, a few (Cotter, 1923; Eames, 1951) are unrelated (non Miocene). Sale (1932), being merely an abstract, cannot be deemed by any imagination of thought, a work of “extensive study”! Sale and Evans (1940), and Eames (1950) have indeed compiled an elaborated list of Miocene (and other) invertebrates, but a mere listing, although enhances our knowledge of Miocene faunal diversity in south Asia, does fail in quenching our thirst for knowing about the specific fauna in detail according to the subsequent advancement of our science. La Touche (1891, with incorrect pagination, p. 80) is entirely unrelated and there is nothing of any palaeontological context!

Thus, while the list of ‘References’ has been unreasonably inflated, many important works (of varying magnitudes) on the Miocene bivalves have been ignored; to cite a few for example are: Vredenburg (1924, 1928), Eames (1935), Kanjilal and Srinivasan (2002), Borkar *et al.* (2004), Kulkarni *et al.* (2009), Mazumder (2010), etc.

MATERIAL

A total of nine specimens were collected from three quarries, namely K5, K9, and K17, from the Kolasib town (north Mizoram) west of the Kolasib – Silchar road (a part of NH 54). At the locality K9 the collection comes from the ‘calcareous sandstone bed’ (thickness 1.6m), while at the rest of

the two localities (K5 and K17), specimens come from the ‘grey sandstone bed’ (thicknesses being 14.6m, and 8.4m respectively). These specimens were referred to three taxa, namely *Periploma (Aelga)* sp.1 (Sp. Nos. K17/B/62, 73, and 74), *P. (A.)* sp.2 (Sp. Nos. K17/B/61, 70, and K5/B/43), and *P. (A.)* sp.3 (Sp. Nos. K9/B/104, 105, and 106). Of these K17/B/73 and K5/B/43 are not figured; while the rest are illustrated. Although the authors have declared that all their specimens are bivalved (articulated), at least one of these, i.e. K9/B/105, is disarticulated (Pl. II, fig. 1c)!

The authors have admitted that the collected specimens are casts and are not well preserved (Introduction, p. 75). Obviously, the vital information about the articulation pattern of the valves are not available, and consequently the identifications are based “entirely upon measurements”, and the external morphology. All sincere students of palaeontology now know well that this attitude towards identification of a taxon is unsafe and may lead one astray, because external geometry may merely be an answer to the environmental stress even among genetically unrelated organisms.

HORIZONS AND AGE

Both the ‘grey sandstone bed’ and the ‘calcareous sandstone bed’ (deemed ‘informal’ ones) belong to the “Upper Bhuban Unit” (= Member?), Bhuban Formation of the Surma Group. The readership may be apprised that the ‘grey sandstone’ is older than the ‘calcareous sandstone’ (Mazumder, 2010, p.45). Absence of a geological map and a detailed succession of (formal) beds is felt a need.

The ‘age’ assigned to the Bhuban Fm is “Lower Miocene” (caption and Introduction) (=Early Miocene!), and the Bhuban Fm, Surma Gp of “Lower Miocene to Middle Miocene” (Abstract) (=Early Miocene to Middle Miocene!). Krishnan (1982, p. 46) considers the Upper Bhuban “stage” of Aquitanian (earliest Miocene) age while Mazumder (2010, p. 47) assigns the Upper Bhuban Fm an age spanning from Aquitanian to Burdigalian (Early Miocene). Further, the authors regard the “Bhuban Fm, Surma Gp of Lower to Middle Miocene (Abstract) (=Early to Middle Miocene!) age, but Mazumder (2010, Table 1, p. 46), and Rajkonwar *et al.* (2013) considers the Surma Gp (including the Bhubans an age spanning from “Upper Oligocene to Miocene”, followed up conformably by the Tipam Gp (Late Miocene to Early Pliocene)! The discrepancies need to be redressed.

It is to be borne in mind that only few bivalves have registered a rapid evolutionary progress; they are facies dependant benthic biota, and more often than not, of no great temporal value. Assessing very precise ages on the basis of bivalves only is, thus, risky until and unless these are associated with other time-sensitive organisms.

The 'Periplomatids'

The claimed discovery is interesting. Since this group of bivalve is the first record from the Indian subcontinent, the readership deserve to know the chief morphological attributes of *Periploma*, and its subgenus *Aelga* Slodkevich, 1935. A brief review of the genus (and its subgenus) is, therefore, supplemented below for a reasonable appreciation by all.

The genus *Periploma* Schumacher, 1817 (Superfamily **Pandoracea** Rafinesque, 1815; Griffin and Pastorino, however, refer it to the Superfamily **Thracioidea** Yonge and Morton, 1980 ; Family **Periplomatidae** Dall, 1895) is typified by *P. inequivalvis* Schumacher, 1817 (monotype) = *Corbula margaritacea* Lamarck, 1801: Recent, Florida (Valentich-Scott and Coan, 2010). The type species is ovate-quadrangle, smooth, thin; RV more convex than LV and overlapping it; beaks opisthogyrate, with radial fissure; anteriorly directed chondrophore supported by clavicle; anterior muscle scar long and narrow, posterior small; pallial sinus short and rounded (Myra Keen, 1969). A recent work on periplomas (Valentich-Scott and Coan, 2010) demonstrates a great variation in outline in some species of *Periploma*.

Aelga (type-species: *Tellina besshoensis* Yokoyama, 1924; OD; Miocene, Japan), deemed a subgenus of *Periploma*, is large, sub ovate; beaks opisthogyrous; surface with undulating comarginals; chondrophore massive and shallow, clavicle long, curved. *Aelga* is comparatively more ovate than *Periploma* s.s. which has an attenuated posterior end (Myra Keen, 1969, p. N849).

Judging by the shell-geometry of periplomas in general, it is evident that their shell outline is quite variable (may be due to niche-selection?), and cannot be deemed singularly good enough for a reliable taxonomic identification. Attention may be invited to the fact that even some other pandoraceans (e.g. the Thraciidae Stoliczka, 1870) have matching outlines. The umbonal slit is also not a very characteristic feature, being present in some other pandoraceans (e.g. **Laternulidae** Fischer, 1887) too. However, their articulation is differently fashioned. Thus, the placement of the present Kolasib taxa to periplomatids is premature; only internal features like chondrophore, clavicle, pallial sinus, adductor scars may settle the issue in favour of a reliable taxonomic placement of the three Kolasib forms under scrutiny.

There are certain additional visible morphological features in the figured specimens about which the authors have not discussed anything specifically. Firstly, the taxon *P. (A.)* sp. 2 possess an anterior (can be judged by the position of the beak "posterior to the midline") gape as can be seen in *Offadesma isolatum* Griffin and Pastorino (2006, p. 76, figs. 6-7) - another periplomatid! However, *Offadesma* Iredale, 1930 is characterized (and distinguished from *Periploma* by the absence of lithodesma, but for the preservation constraint no decision in this regard can be taken till the internal features are seen. Secondly, the flexure of the ventral margins in the specimen nos. K17/B/62 (Pl. III, fig.1: *P. (A.)* sp. 1), K17/B/61 (Pl. III, fig. 2: *P. (A.)* sp.2, and K9/B/106 (Pl. III, fig. 3: *P. (A.)*

sp. 3) which may be of significance regarding their habit and habitat. Thirdly, the region of maximum inflation (with respect to the umbones) are different in the opposite valves (e.g. *P. (A.)* sp.1: Sp. No. K17/B/62, Pl. I, fig. 1c; *P. (A.)* sp. 2: Sp. No. K17/B/61, Pl. I, fig. 2c). The flexure of the ventral margins is more pronounced in these forms. Similar sinuous ventral commissure has been noticed in *P. (A.) primavarensis* Griffin, 1991 (Griffin and Pastorino, 2006, p. 75), but this feature alone cannot be considered of sufficient taxonomic value because a few other unrelated bivalvian genera (e.g. *Trisidos* Roeding, 1798: **Arcidae** Lamarck, 1809; *Hornesia* Laube, 1866: **Bakevelliidae** King, 1850; some mytilids, etc.) also variously display sinuosity of the ventral commissure (Savazzi, 1984), the grade of which is probably governed by niche requirements and adaptation. Nevertheless, the internal features are still required for an authentic taxonomic assignment of the present Kolasib material.

Reader's attention is further elicited towards the fact that at least one of the three taxa, namely *P. (A.)* sp. 1, possess LV which is more convex than the RV (Systematic Palaeontology, p. 75). The dorsal views provided on Pl. I, figs. 2c and 3c, and the ventral view in Pl. III, fig. 3 reveal that the valves of *P. (A.)* sp. 2, and *P. (A.)* sp. 3 respectively are seemingly equally inflated, and, therefore, their placement under *Periploma* is questionable! Besides, *P. (A.)* sp.3 (Pl. II, fig. 1c) is a disarticulated valve which shows a glimpse of its articulating element. Yet the authors have refrained from describing it, and have instead sought an excuse of being unable to examine the "internal characters" for the "specimens being casts of both valves": the manoeuvre is a gross violation of honest scientific spirit!

The whole exercise seems to be a work in haste as is also evident from the botched up dimension tables (on p. 75 and 78) which are exactly the same with identical specimen numbers for both *P.(A.)* sp. 1, and *P. (A.)* sp. 2 respectively! Another bizarre treatment is designating 'holotypes' and 'paratypes' for informal and unnamed taxa (see 'Dimensions' on pp. 75, and 78) which are not declared 'new'!

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REFERENCES

- Borkar, V.D., Kulkarni, Kantimati G. and Bhattacharjee, Satarupa.** 2004. Molluscan fauna from the Miocene sediments of Kachchh, Gujarat, India – Part I. Oysters. *Geophytology*, **34** (1 and 2): 1-7.
- Eames, F.E.** 1936. *Ostrea (Crassostrea) gajensis* from Baripada, Mayurbhanj State. *Records of the Geological Survey of India*, **71** (2): 150-151.
- Griffin, M. and Pastorino, G.** 2006. The genus *Offadesma* Iredale, 1930 (Bivalvia: Periplomatidae) in the Miocene of Patagonia. *The Veliger*, **48** (2), 75-82.
- Kanjilal, S. and Srinivasan, M.S.** 2002. New Bivalves from the Miocene of Little Andaman Islands, Bay of Bengal. *Journal of the Geological Society of India*, **60** (5): 527-536.
- Krishnan, M.S.** 1982. *The Geology of India and Burma*, 6th Ed., 536 p., CBS Publishers & Distributors Pvt. Ltd., New Delhi.
- Kulkarni, Kantimati G., Bhattacharjee, S. and Borkar, V.D.** 2009. Molluscan Fauna from the Miocene Sediments of Kachchh-Part 2. Bivalve subgenus *Indoplacuna*. *Cenozoic Research*, **6**: 71-81.

- Mazumder, B. I.** 2010. Anomiid Bivalves from the Lower Miocene of Kolasib, Mizoram. *Journal of the Palaeontological Society of India*, **55** (1): 45-49.
- Mazumder, B.I. and Tiwari, R.P.** 2012. Three species of *Periploma* (Bivalvia: Periplomatidae) From the Bhuban Formation (Lower Miocene) of Kolasib, Mizoram, India. *Journal of the Palaeontological Society of India*, **57** (1): 75-81.
- Myra Keen.** 1969. Superfamily PANDORACEA Rafinesque, 1815, p. N843-N852. In *Treatise on Invertebrate Paleontology* (Eds. Moore, R.C. *et al.*), Pt. N, **2** (of 3), Mollusca 6, Bivalvia, Geological Society of America and The University of Kansas,
- Rajkonwar, C., Tiwari, R.P. and Patel, S.J.** 2013. *Arenocolites helixus* isp. nov. and associated ichnofossils from the Bhuban Formation, Surma Group (Lower-Middle Miocene of Aizawl, Mizoram, India. *Himalayan Geology*, **34** (1): 18-37.
- Savazzi, E.** 1984. Adaptive significance of Shell Torsion in Mytilid Bivalves. *Palaeontology*, **27** (2): 307-314.
- Valentich-Scott, P. and Coan, E.V.** 2010. Three new species of *Periploma* (Bivalvia, Periplomatidae) from the Panamic Province. *Zootaxa* **2673**: 65-68.
- Vredenburg, E.W.** 1924. On some fossil forms of *Placuna*. *Records of the Geological Survey of India*, **55** (2): 110-118.
- Vredenburg, E.W.** 1928. Descriptions of mollusca from post-Eocene Tertiary formation of northwestern India: Gastropoda (in part) and Lamellibranchiata. *Memoirs of the Geological Survey of India*, **50** (2): 351-506.

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