

Trilobite trace fossils from the Bafliaz Formation, Western Pir Panjal and their significance

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Abstract

Two ichnogenera *Cruziana* and *Rusophycus* have been reported from the Bafliaz Formation of western Pir Panjal. These put the Lower Palaeozoic age of this volcanic suite beyond doubt. The correlation of this suite with the Panjal suite of Permo-Triassic age is, therefore, not warranted.

Introduction

The name Bafliaz Volcanics was applied to a suite of basic and intermediate rocks in western Pir Panjal by Wakhaloo and Shah (1968), who suggested a Lower Palaeozoic age for these rocks based on field evidences. This inference however, has been doubted by some workers, notably by Sharma (1976) who opines that this volcanic suite belongs to the Panjal volcanicity of Permo-Triassic age and the associated slates are the equivalents of the Agglomeratic Slate of Permian age known in other parts of Kashmir Himalaya. Since no fossils were known from the slates and phyllites associated with the Bafliaz Volcanics, the ages suggested were tentative and based only on the field interpretation of structure, lithological comparison, chemical and petrological composition, differences in grade of metamorphism and degree of deformation. Sharma and Gupta (1973) reported some 'trilobite fragments and trails' from the slates associated with the Volcanics in Thannamandi area. But, since no details were given, the doubt about the age persisted. One of the authors (S.K.S.) examined the material of Sharma and Gupta and found in it, trilobite furrows (*Cruziana*) and resting excavations (*Rusophycus*) in addition to fragments of thoracic segments and pygidia. Although the state of preservation is far from satisfactory the identification of these ichnogenera is not in doubt.

Geology and location

Bafliaz Volcanics comprising spilitic lavas and keratophyres are interbedded with a profusion of slate, agglomerate, ash and other sediments rendered phyllitic. The volcano-sedimentary material is an integral part of the Bafliaz Formation. It has only a superficial resemblance to the Agglomeratic Slate, a Formation of varying lithology and poligenetic nature. The undoubted Agglomeratic Slate, however, is also exposed throughout western Pir Panjal together with the Panjal Trap and sometimes in close proximity with the Bafliaz Formation, as in the Ratanpir section.

The fossils have been collected from Thannamandi section at Alal village (74°23'30E; 33°33'12"N) (Fig. 1). The rocks comprise sandy and pebbly phyllite, greyish-green in colour, with schistosity striking NW-SE and dipping NE. The bedding is not perceptible on account of tight isoclinal folding. The fossils stand out in relief on weathered surfaces.

Systematic description of the trace fossils

The rocks at Alal contain abundant trilobite produced traces especially *Cruziana* and *Rusophycus* with the latter predominating in numbers over the former. The

fossils are also found near Thannamandi but the state of preservation is not as good. The material is lodged in the Geology Museum of the University of Jammu.

Ichnogenus *Cruziana* d'Orbigny 1842

Cruziana sp. A

(Fig. 3)

Material: One black with a single specimen showing both lobes and a few showing a single lobe.

Description: The specimen has regular, deeply impressed, closely spaced and clearly separated V-markings giving a V-angle of about 120° . Some of the V-marks split into two but regularity of the trace is maintained. The traces lack external lobes and markings and genal spine grooves. The width is 0.6 cm and the maximum length without axial termination is 0.8 cm.

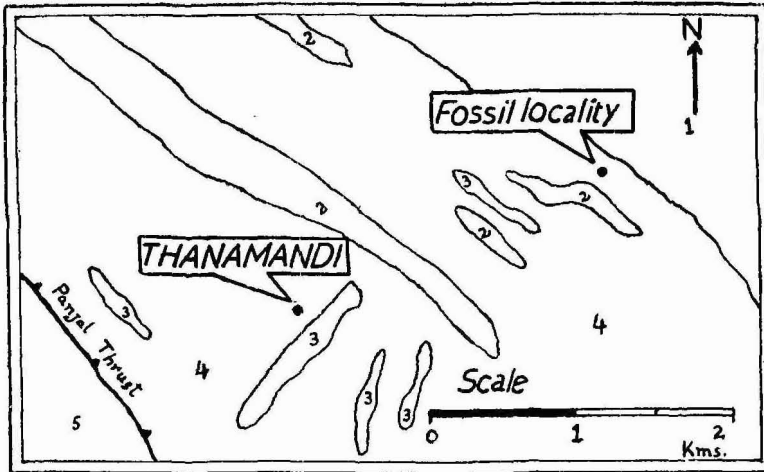


Figure 1. Geological sketch map of Thannamandi area showing the fossil locality. 1=Dhera Gali Formation, 2=Bafliaz lavas, 3=Acid and intermediate intrusives, 4=Bafliaz Slate, 5=Panjal Volcanics.

Remarks: The species corresponds closely to the Ordovician species *C. breadstoni* Crimes (Crimes, 1975; Crimes and Marcos, 1976) except for the width of the specimen which is quite small in the present case. On account of this, the authors hesitate to assign the specimens to that species. It may, however, be mentioned that in northwestern Kashmir, where trilobite fauna is known in Cambro-Ordovician formations, most of the forms are stunted and the species, which are peculiarly endemic to Kashmir, are small compared to other species of the same genera known elsewhere (Reed, 1934; Shah, 1971). These forms could have well given rise to smaller sized traces.

Cruziana sp. B

(Fig. 2, also in Fig. 4)

Material: Four blocks bearing a large number of imperfectly preserved specimens in which both lobes are preserved in some cases.

Description: The internal lobes are well developed and external lobes are absent. The specimens have deeply impressed V-markings with the V-angle ranging from 120° to 150° . There is a discontinuity in markings which produces corrugations across the lobes. The width of the complete specimen is 0.6 cm and the maximum

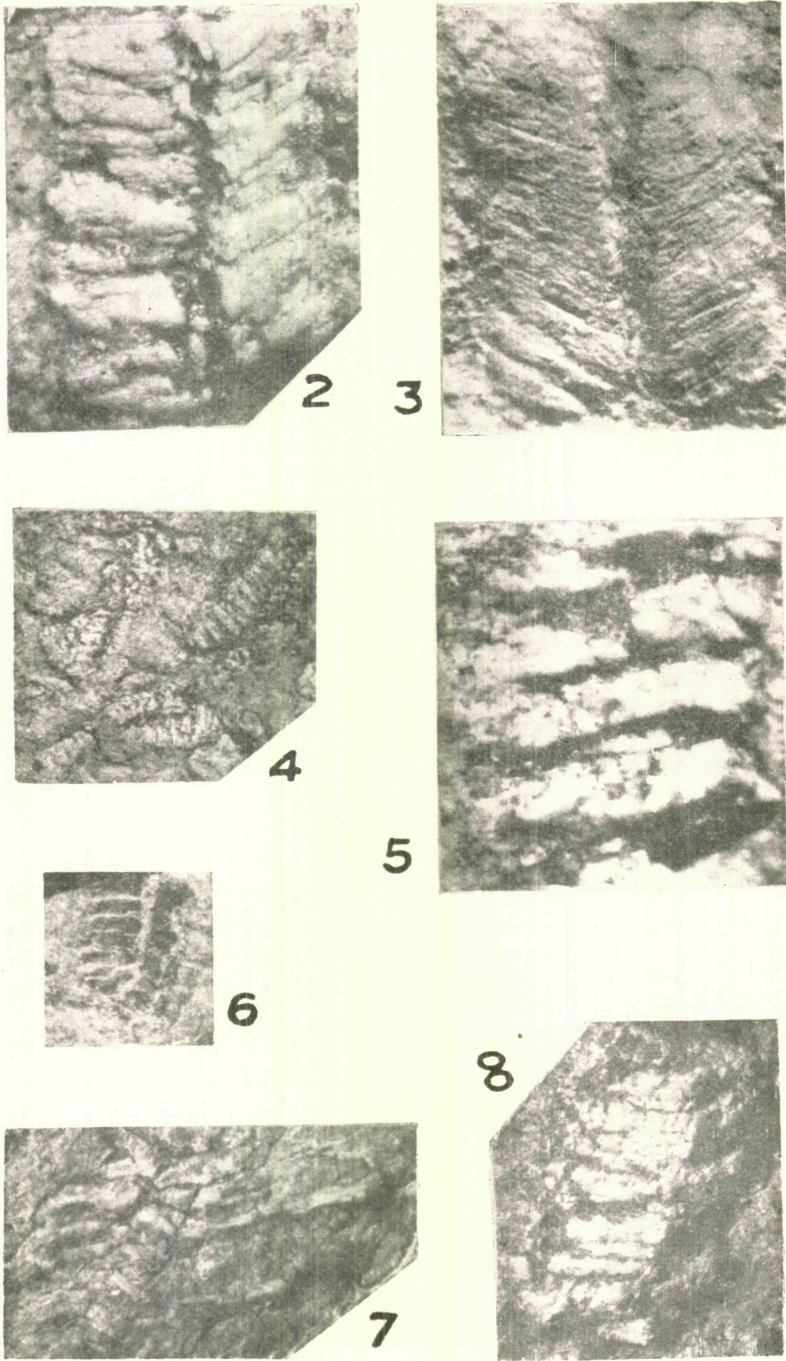


Figure 2. *Cruziana* sp. B $\times 6$.
 ,, 3. *Cruziana* sp. A $\times 6.5$.
 ,, 4. Block bearing *Cruziana* \times sp. B and *Rusophycus* $\times 1.2$.
 ,, 5. *Rusophycus* sp, one lobe $\times 7$.
 ,, 6. A thoracic fragment from an indeterminate trilobite with axis and one of the pleurae $\times 2$.
 ,, 7. A resting excavation (? *Rusophycus*) with traces of legs imprinted $\times 6$.
 ,, 8. *Rusophycus*, one lobe $\times 2.5$.

length is 1.00 cm. There is no axial termination. The calculated width of the other specimens, by doubling the lobe, ranges from 0.5 to 1.5 cm.

Remarks: The specimens do not correspond to any known species and may be a new species. The poorly preserved and the limited nature of the material does not warrant the creation of a new species at this stage. It may belong to the *Petraea* group (Seilacher, 1970).

Ichnogenus *Rusophycus* Hall 1852

Rusophycus sp.

(Figs. 5 and 8)

Description: A large number of specimens consist of trilobite resting excavations which are severely deformed for any specific identification. They range in width from 1.0 cm to 1.8 cm and up to a maximum length of 2.0 cm. They bear prominent V-markings.

A single specimen (Fig. 7) may well represent a resting excavation with traces of legs imprinted while the trilobite pulled itself aside out of the trace. Only one lobe of it is preserved.

Age of the Baffiaz Volcanics

The presence of *Cruziana* and *Rusophycus* in the volcano-sedimentary series of the Baffiaz Formation puts its Lower Palaeozoic age beyond doubt. While it is not possible to fix the precise age, a possible Ordovician age is indicated by the affinities of *Cruziana A* to *Cruziana breadstoni* known from Lower Tremadoc (Crimes, 1975). The Lower Palaeozoic age fits well with the opinion of Wakhhaloo and Shah (*op. cit.*). The correlation of these volcanics with the much younger Panjal Volcanics is not warranted.

References

- CRIMES, T. P., (1975) Trilobite traces from the Lower Tremadoc of Tortworth. *Geol. Mag.*, v. 112, pp. 33-46.
- D'ORBIGNY, A., (1842) *Voyage dans L'Amerique meridionale*. Bertrand, Paris and Levrault, Strasbourg, v. 3, pt. 4, partie (Palaeontology), 188 p.
- REED, F. R. C., (1934) Cambrian and Ordovician fossils from Kashmir. *Pal. Indian Geol. Surv. India, N.S.*, v. 21, pt. 2, pp. 1-38.
- SEILACHER, A., (1970) *Cruziana* stratigraphy of 'non-fossiliferous' Palaeozoic sandstones, *Trace Fossils* (Ed. Crimes and Harper). *Geol. Jour.*, Special issue, v. 3, pp. 447-476.
- SHAH, S. K., (1971) Palaeo-ecological studies of the Cambro-Ordovician formations of north-western Kashmir. *Univ. Rev. Jammu*, v. 4.
- SHARMA, T. R. and GUPTA, K. R., (1973) Trilobite fragments and trails from Dogra Slates of Thannamandi area, Kashmir Himalaya. *Proc. 60th Indian Sci. Cong. Abstracts*, p. 190.
- SHARMA, V. P., (1976) Stratigraphy and tectonics of the southeastern part of the Jammu Himalaya—a new approach. *Geol. Surv. India Misc. Pub.*, v. 34, pp. 185-216.
- WAKHALOO, S. N. and SHAH, S. K., (1968) A note on the Baffiaz Volcanics of western Pir Panjal. *Pub. Adv. Cen. Geol. Chandigarh*, v. 5, pp. 53-64.

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