The earlier study on the breeding of *T. verrucosus* was based on 4 breeding pairs and did not have in-depth analysis of the timing of courtship, mating and egg-laying[14]. The present study shows that the timing varies between pairs. Unlike in other amphibians, egg-laying in salamanders takes a long time. Although nuptial dance and ventral amplexus have been reported[15–20], the studies were not for the Indian species. They were either from Nepal[15,16] or laboratory studies conducted in Europe. The present study clearly indicates that the animals do not seem to have any alternate mating strategy as was being speculated[20].

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Middle Cretaceous carbonate build-ups and volcanic seamount in the Shyok suture, Northern Ladakh, India

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Along the Shyok suture zone in northern India, a ~ 200 m thick limestone succession has been identified as a carbonate platform margin with build-ups. This limestone succession is directly overlying volcanic rocks of island arc affinity. The partly recrystallized reefal limestone which rests on a volcanic seamount or ridge contains abundant rudists, corals, gastropods, algae and a rich orbitolinids assemblage of Late Aptian–Early Albian age. This faunal assemblage reflects a shallow-water tropical environment for the carbonate build-ups and also shows a close affinity with those recorded from the Yasin Group in north-western Pakistan. The presence of Late Aptian *Horiopleura*, Radiolitidae and different forms of *Orbitolinae* and other microfaunal assemblage in the reefal limestone, dates the underlying volcanic edifice as Middle Cretaceous or older.

Rudists, nerineids, corals and foraminifers of Lower Cretaceous age are widely distributed as a reefal framework all along the tropical and subtropical Euro–African–Asiatic regions of the northern margin of the Tethys. However, prior to our findings, the Cretaceous carbonate build-ups associated with submarine volcanism have only been reported in the Caribbean, Sicily in Italy, Yasin in Pakistan and from dredged samples from a seamount in the central Pacific region.

IN northern India, the Ladakh block is in an intermediate position between the Indian Plate in the south and the Karakoram Plate in the north. To the west, it is separated from the Kohistan Complex by the Nanga Parbat–Haramosh syntaxis and to the east, it is cut-off from the Lhasa block by the Karakoram fault (Figure 1). The Ladakh block lies along a critical geological juncture and is characterized by two suture zones – the Indus and Shyok (Figure 1) – that mark the closing of different branches of the Tethys ocean and finally the collision of India with Asia, 60–50 Ma. The Shyok suture zone lies to the north of the Indus suture zone and is interpreted as an oceanic suture[1] or the relic of a back-arc basin[2].

The rocks of the Shyok suture zone, trending north-west-southeast (Figure 1) across the Nubra–Shyok valley, occur in intensely deformed tectonic slices between the Ladakh batholith, to the south-west and the Kara-

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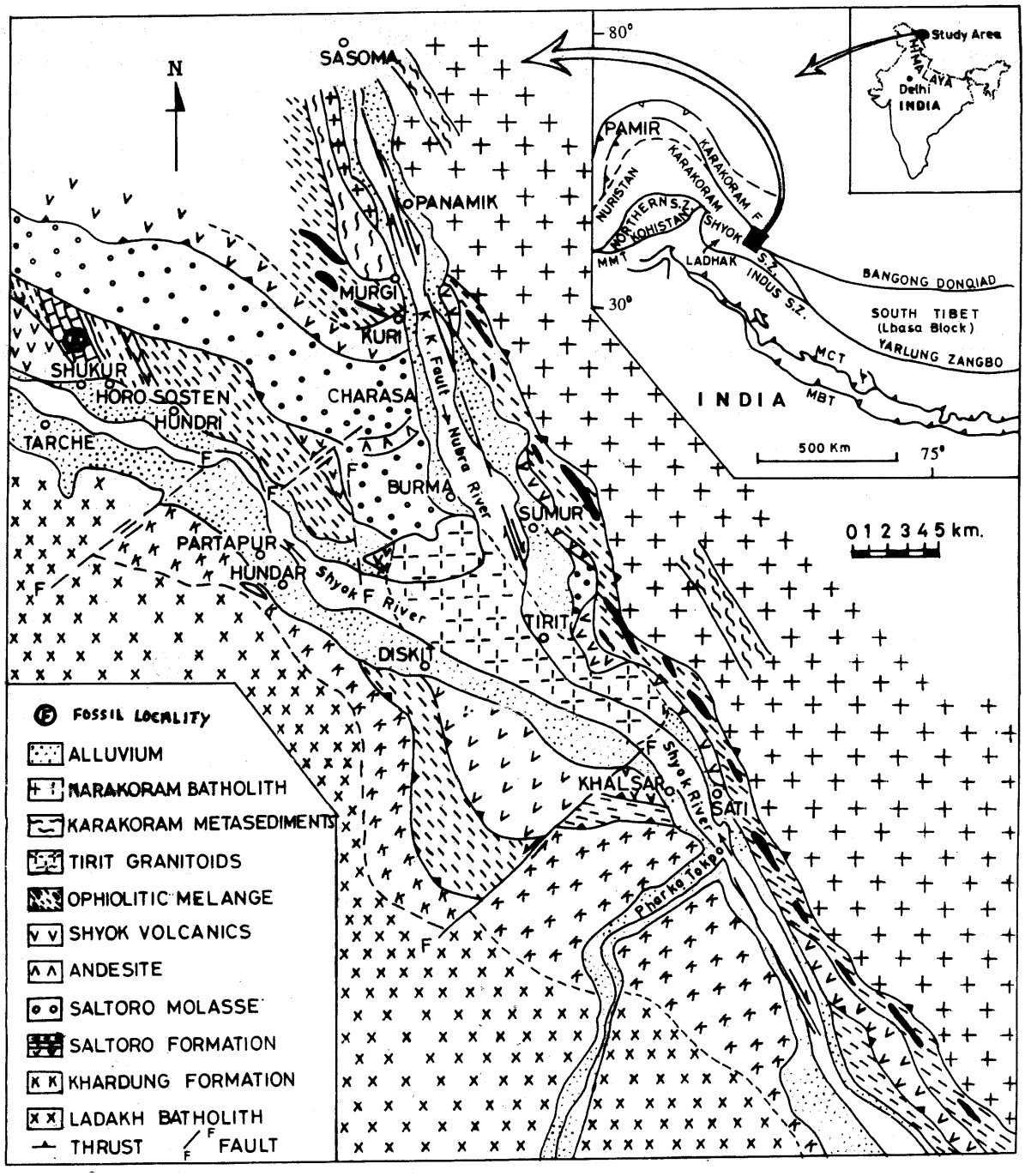

Figure 1. Geological map of the Shyok suture zone in the Nubra–Shyok valley, Saltoro Hills, northern Ladakh. The fossil-bearing locality in the Aptian–Albian Saltoro Formation is between Horo Sosten and Shukur. K.K. Fault, Karakoram fault (after Upadhyay *et al.*[3]).

koram batholith to the north-east (Figure 1). Across a traverse through the Shyok–Nubra river valleys and the adjoining part of the Karakoram terrane, these tectonic slices comprise a variety of sedimentary, metamorphic and volcano-plutonic rocks referred to as an accretionary complex[3–5]. The geological structure of the Shyok suture zone has recently been given and discussed elsewhere[3,4,6].

We report a ~ 200 m thick partly recrystallized limestone sequence within the marine Saltoro Formation of the Shyok suture zone, yielding abundant Late Aptian rudists, Aptian/Albian foraminifera and other faunal associations (Figures 1–4). The Saltoro Formation is a 1000–1500 m thick stratigraphic unit consisting of thinly and mostly even-bedded, highly fissile and cleaved slates, siltstones, turbiditic sandstones and

Figure 2. Field relationship of the volcanic rocks and the fossiliferous limestone near the village of Horo Sosten. The tectonized contact between the volcanic rock and the overlying limestones of the Saltoro Formation is also seen.

Figure 3. Field outcrop view of limestone with rudists and other mollusc shells. Saltoro Formation, Aptian–Albian near the village of Horo Sosten.

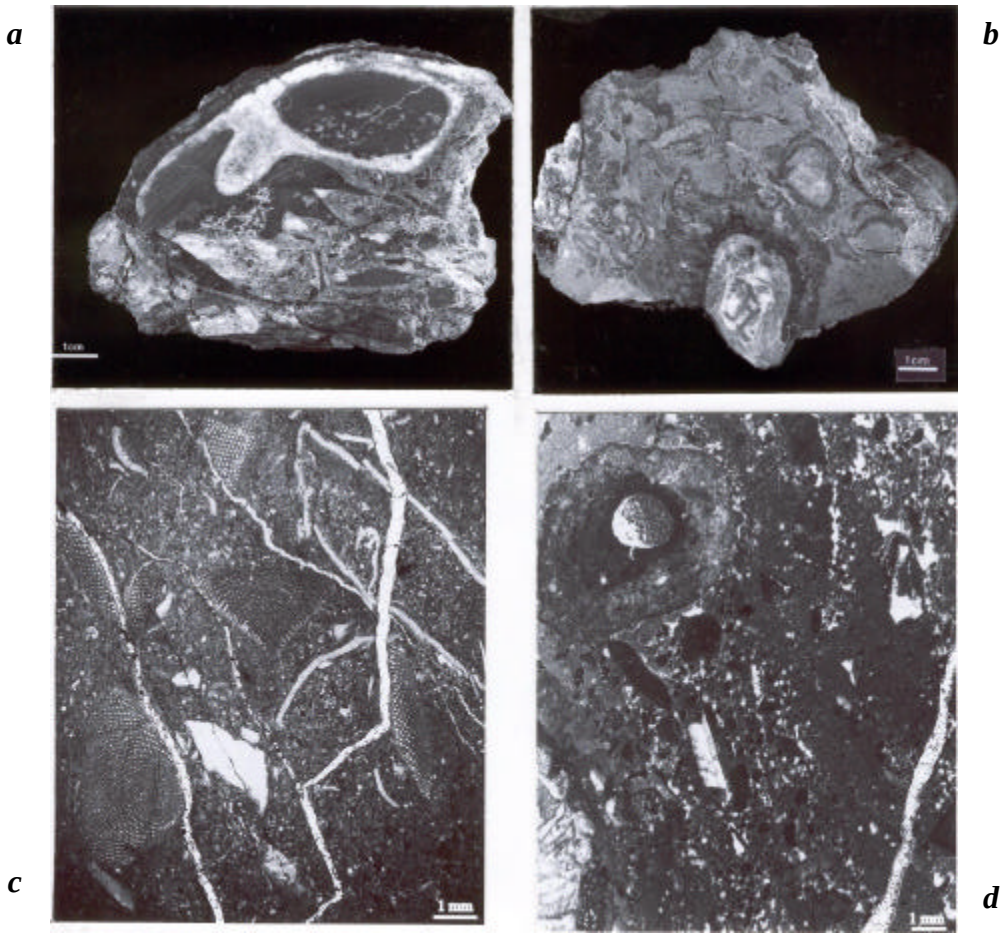

Figure 4. ***a***, *Horiopleura* sp. similar to *Horiopleura hydeni* Douvillè, 1926 of Late Aptian age (identification by Peter Skelton, England); ***b***, Radiolitdae (identification with the help of Daniel Bernoulli, Switzerland); ***c***, *Orbitolina* bearing organic limestone. *Orbitolina* are similar to *Orbitolina discoidea-concoidea* of Aptian/Albian age. Foraminifera have been identified by the present author and specific forms have been identified with the help of Daniel Bernoulli, Switzerland and Richard Hoefling, Germany; ***d***, Well-preserved oncoid and fragments of other organisms with geopetal fabrics.

limestones. The rocks yielding Aptian–Albian fossils are dark-grey to light-grey limestones and tectonically lie above volcanic rocks of island arc affinity[3,4] (Figure 2). The occurrence of volcanic clasts in the basal limestone section suggests that the contact was originally a depositional one, which has been tectonically overprinted. The upper part of the Saltoro Formation comprises sandstone turbidites interbedded with thinly to medium-bedded black, pyritic shales, grey-to-green fissile slate, siltstone.

The fossiliferous limestone is very rich in thick-shelled bivalves, gastropods and other molluscs, echinoids and corals. Bivalves are mostly rudists, *Horiopleura* and Radiolitidae (Figures 3 and 4 *a* and *b*) which cannot be identified to species level. The restricted and well-defined geographical distribution of *Horiopleura* is limited to the Aptian and Albian stages[7]. The presently recorded Caprotinid *Horiopleura* genus (identification by Peter Skelton) from the Shyok suture zone of northern Ladakh is similar to the *Horiopleura hydeni* Douvillé, 1926 of Aptian age. The large size of the present specimens (Figures 3 and 4) suggests the uppermost Aptian age. The occurrence of Late Aptian *Horiopleura hydeni* and of Radiolitidae, corals, nerineids and other molluscs from a dark limestone sequence resting above the volcanic rocks has been mentioned and described from the Yasin Group sediments exposed along the Northern suture in northern Pakistan[8–12]. This suggests that the Saltoro Formation of northern Ladakh is an equivalent of the Yasin Group of northern Kohistan, west of the Nanga Parbat–Haramosh syntaxis, deposited ~ 700 km further west.

In thin section different limestone microfacies are observed, including floatstones, grainstones, boundstones and packstones, with well-preserved geopetal fabrics (Figure 4 *d*). The overall microfacies association is rich in rudists, gastropods, crinoids, corals, bryozoans, hydrozoans, foraminifers, algae and oncoids (Figure 4 *c* and *d*). Floatstones are rich in *Lithocodium/Bacinella*, encrusting foraminifera of the type *Placopsilina*, indeterminable rudist fragments, echinoid spines, *dasycladacean* algae (indet.) and orbitolinids ex group *Orbitolina lenticularis* of probable Aptian/Albian age. The matrix of the different limestones is rich in peloids. Grainstones are also rich in peloids, *Orbitolina* and quinqueloculinid and triloculinid Miliolidse, whose preservation point to a Cretaceous age (identification by Daniel Bernoulli and Richard Hoefling). Other thin sections also yielded a rich foraminiferal assemblage, including *Orbitolina concoidea-discoidea*, *Palorbitolina*, and *Texularia* of Aptian–Albian age (Figure 4 *c*).

This carbonate microfacies association and faunal assemblage thus documents the presence of shallow-marine, open shelf/platform margin reefal build-ups, which grew on a volcanic seamount or ridge. Presence of *Lithocodium/Bacinella* algae suggests that they might have acted as binding organisms, while the volcanic edifice was a submarine high on which the build-ups grew.

The present microfaunal assemblage may again be correlated with the Aptian–Albian Yasin Group of northern Kohistan[12] and with a volcano-sedimentary succession yielding Aptian–Albian *Orbitolinae* reported along the Shyok suture, exposed farther south-east near Pangong Tso lake in north-eastern Ladakh (~ 150 km southeast of the present locality)[13,14]. Razdan and Raina[15] have also reported *Orbitolina* sp. and *Assilina* sp. in limestone bands forming part of their Cretaceous–Palaeocene Diskit Formation. Similarly, K.P. Juyal (WIHG, Dehradun, pers. commun.) has also recorded Middle Cretaceous foraminifera from the Shyok suture zone. Therefore, the presence of Late Aptian *Horiopleura* and different forms of *Orbitolinae* and other microfaunal assemblage in the reefal limestone dates the underlying volcanic edifice as Middle Cretaceous or older.

Rudists, nerineids, corals and foraminifers of Lower Cretaceous age are widely distributed as a reefal framework all along the tropical and subtropical Euro–African–Asiatic regions of the northern margin of the Tethys. The places of their greatest development are Pyrenean–Cantabrican region, Portugal, Algeria, Tunisia, Spain, Serbia, Yugoslavia, Israel, Pakistan, Nagri in western Tibet and the Urgonian facies of southern and south-eastern France[9,10,16]. However, prior to our findings, the Cretaceous carbonate build-ups associated with submarine volcanism have only been reported in the Caribbean[17,18], Sicily in Italy[19], Yasin in Pakistan[12] and from dredged samples from a seamount in the central Pacific region[20].

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Errata

Noctiluca blooms in Port Blair Bay, Andamans

M. Eashwar, T. Nallathambi, K. Kuberaraj and G. Govindarajan

[*Curr. Sci.*, 2001, **81**, 203–206]

Both axis titles have been omitted in Figure 3. The *x*-axis should read 'Dates, July 2000' and the *y*-axis should read '*Noctiluca*' cells $\times 10^3$ l^{-1} Chlorophyll *a*, mg mg^{-3} Chlorophyll *a* to *c* ratio'.

UGC's UPE scheme

Shridhar Gadre *et al.*

[*Curr. Sci.*, 2001, **81**, 334]

The last sentence of the third paragraph should read: In such cases, these selected universities may not be able to nurture and nourish all the good intellectual and academic talent deprived of support and sustenance because of inadequate funds and facilities.

National Chemical Laboratory advertisement

[*Curr. Sci.*, 2001, **81**, 420]

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