referred to ichnogenus *Thalassinoides* Ehrenberg. Large burrow smooth-walled, essentially cylindrical, oriented vertically, whereas small burrow inclined or oriented horizontally, mostly in Y-shaped branches, typically enlarged at points of bifurcation. They occur frequently around the quarries of Nalkahmba and Palasan. These burrows have been widely reported from the Cretaceous sediments of Bhuj[6,16], Upper Cretaceous of Germany (Sax)[12], and from east-central Utah[1].

The Ranipat Formation containing an assemblage of ichnofossil, including *Ophiomorpha*, *Planolites*, *Skolithos* and *Thalassinoides*, belongs to the *Skolithos–Cruziana* ichnofacies[3,13,14], which is characteristic of nearshore-coastal, shallow-water, littoral and intertidal environments. Howard and Frey[1,14] attributed *Skolithos* to nearshore to offshore-marine environment. Seilacher[15] reported the presence of *Skolithos* in both shallow-water non-marine and marginal-marine environments. Camberlain and Clark[13] documented *Cruziana* ichnofacies in shallow marine environment. Thus the presence of ichnogenera, as described above, may indicate nearshore-marine or littoral-marginal-marine environment for the deposition of the Ranipat sediment. Coarse to medium sandstone bodies showing opposite to diagonally oriented cross-bedding (herringbone cross-bedding) may be attributed to sandy tidal-channel facies, and nearshore (barrier associated) facies[15], whereas associated fine sandstone, clay and mudstone resemble intertidal mudflat facies. The locally associated hummocky cross-stratification may indicate occasional record of stormy conditions in the tidally influenced deposits.

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An articulated rhynchosaur fossil from Maleri Formation (Upper Gondwana), Andhra Pradesh, South India

D. C. Das Sarma, G. Vijayasarathi, C. V. N. K. Rao, T. T. Nath, S. Anantaraman and M. N. Gururaja

Geological Survey of India, Southern Region, Bandlaguda GSI Complex, Hyderabad 500 660, India

Rhynchosaurs were a widespread group of reptiles during the Triassic period. We report the finding of a nearly complete articulated skeleton of a rhynchosaur from a new locality, in the Upper Triassic Maleri Formation in the Pranhita–Godavari valley in Andhra Pradesh. The specimen preserves the postcranial skeleton but for the left forelimb down to the tail in a pose that is reminiscent of the living posture and suggests quick burial before scavengers could disrupt the carcass. The skull was fragmented but could be restored.

RHYNCHOSAURS have been recorded from all continents except Australia and Antarctica[1]. The highly specialized Upper Triassic Rhynchosauridae comprise three interrelated[1] genera, *Paradapedon* from India[2–6], *Hyperodapedon* from Scotland[1], and *Scaphonyx*[7,8] from South America. These are known through partial skeletons, disarticulated bones, and restorations[1,6,7] based on these. In India, early records of rhynchosaurs were on the basis of tooth plates from Upper Gondwana rocks belonging to the Upper Triassic Maleri Formation in the Pranhita–Godavari valley of Central India and Tiki Formation of the Sone–Mahanadi valley[2,3]. Initially compared with *Hyperodapedon gordoni*[2], the Indian forms were renamed as *H. huxleyi* by Lydekker[4,5]. Huene[9,10] erected the genus *Paradapedon* for the species *huxleyi* and also provided a partial reconstruction from the fragmentary material[9]. An excellent collection of disarticulated skull and postcranial bones belonging to six skeletons allowed Chatterjee[6] a more complete osteological description as well as restoration of the species *Paradapedon huxleyi*. The Elgin rhynchosaur *Hyperodapedon gordoni* from northeast Scotland has been restored on the basis of skulls and partial skeletons from a collection of 31–37 individuals[1]. *Scaphonyx fischeri* from Santa Maria Formation of Brazil is also represented by a restoration[7].

The rhynchosaur skeleton reported here was found in red clays which along with sandstone lenses and lime

pellet rocks constitute the Upper Gondwana Maleri Formation of Upper Triassic age[9], 2.3 km south-west of Kataram village (18° 37' 30" N: 79° 56' E) in Karimnagar district, Andhra Pradesh, South India. The skeleton (Figures 1, 2) was discovered through its exposed skull part. The body was traced down the clay to the tip of the tail which lay about 1 metre deeper than the skull (Figure 1). Most of the fragmented skull bones could be reassembled and restored to their original position. The missing cranial bones are the parietals, nasals, lacrimals, part of prefrontals, parts of squamosals, part of right premaxilla, left quadratojugal, quadrate rami and ectopterygoids (Figure 2, *b-d*). The mandibles are complete except for the left articular, prearticular and surangular (Figure 2, *e*). The skull is 30 cm long and 45 cm wide (transquadrate). It bears toothless beak-like premaxillae. The maxillae have multiple rows of teeth with a longitudinal groove corresponding to a single row of teeth in mandible. The dentigerous space lateral to the groove is wider than that of medial one.

Figure 1. Field photograph of the postcranial skeleton of the rhynchosaur fossil from the Upper Triassic Maleri Formation, India. The right forelimb dislodged during extraction is not shown. Part of the scapula, a few dorsal and cervical vertebrae and ribs are concealed under clay. The scale on the skeleton is 30.5 cm.

Figure 2. Diagrammatic representation of the rhynchosaur skeleton shown in Figure 1. (a) Disposition of the postcranial skeleton up to the atlas-axis complex. Dotted lines indicate the probable position of the missing left forelimb with the preserved part shown in solid line. Partially broken but refitted left mandible is shown in dashed lines. (b–d) Dorsal, right and left lateral views of the reconstructed skull (missing bones shaded). (e) Mandible (missing parts shaded)

The skeleton is 2.25 m in length with hindlimbs sprawling apart by about 90 cm (Figure 2, *a*). This is by far the largest rhynchosaur reported so far[1,6]. The body consists of 53 amphicoelous vertebrae of which 24 are presacrals including well-preserved atlas-axis complex, two sacrals and 27 caudals. Most of the neural spines are broken. Sacral vertebrae are robust and are in articulation with pubic bones. The length of the tail is about 75 cm occupying about one-third of the total body length. The left pelvis has become tilted presumably during fossilization and overrides the sacral vertebrae. The left hindlimb is complete down to the claws except for three phalanges of the Vth digit. The powerful claws decrease in size laterally with each claw bilaterally compressed with a sharp ventral edge. The right hindlimb is also complete except for the pes. The right forelimb became dislodged during extraction but could be subsequently fitted in its original position. The manus is incomplete with eleven phalanges spread at the distal end of the limb. The left forelimb is represented by a fragmentary bone belonging to the proximal part of the humerus.

The completeness of the articulated skeleton, the large size and its preservation in a pose which is reminiscent of the living posture, as expressed in the firm grip of the left claw and the upsurging body with a twisted vertebral column, make this specimen a unique one among the rhynchosaur fossils.

The material has been deposited in the Regional

Palaeontological Laboratory, Southern Region, GSI Complex, Hyderabad.

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Palynological evidence for Upper Permian Raniganj coals in western part of Talcher coal field, Orissa, India

R. S. Tiwari, Archana Tripathi and B. N. Jana

Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 007, India

The coal-bearing sediments exposed in Madalia river section near Patrapara village at the westernmost region of Talcher coal field, Orissa, have yielded four sequentially identifiable palynoassemblages. The Upper Permian Raniganj Formation has been identified in the area. This opens the possibility of coal deposits in the Supra Barakar sequence in western Talcher coal field.

THE Talcher coal field (20° 53′–21° 12′ N, 84° 20′–85° 23′ E) is the southeasternmost basinal region of Mahanadi graben. Regionally a northwesterly plunging synclinal structure is seen, with younger horizons outcropping progressively towards the west. The stratigraphic succession includes Talchir, Karharbari, Barakar and Kamthi formations[1]. The major coal-seams occur in Karharbari and Barakar formations which are developed along the eastern and southern parts of the basin. In the central part, the subsurface data have revealed the presence of a thick coal sequence. In the westernmost region, a 2-m-thick coal seam is exposed in Madalia river, near Patrapara village, which was first described by Blanford *et al.*[2] under Lower Damuda Group (i.e. Barakar Formation). These beds were described to be unconformably overlain by Mahadeva Group (now classified as Kamthi). Fox[3] opined that if there were no Upper Damuda and Panchet rocks in this field, a large stratigraphical break might separate the Lower coal-measures and the Mahadevas. In recent work of the Geological Survey of India[1] also, the coal exposures near Patrapara village have been included in the Lower Damuda Group (i.e. Barakar Formation). However, the palynological analysis has revealed a Late Permian Raniganj affinity for the coal seam at Patrapara section (Figure 1), and indications are also recorded to suggest the occurrence of this horizon in the central part of the coal field.

Ten samples collected from sections exposed on both the banks of Madalia river (Figures 2 and 3,*a*) were analysed. On the right bank, a 10-m-thick sequence includes coal, shale (compact whitish to blackish-grey, false-bedded) and clay (white to greyish and purple). A 2-m-thick pebbly sandstone rests on the highly denuded surface of the clay bed. On the left bank of the river, a 1.4-m-thick coal seam is exposed overlying a grey to bluish, compact shale. Above this coal seam a 0.5-m-thick coarse-grained sandstone and grey shale containing *Glossopteris* leaves are exposed.

Of the 10 samples, five yielded rich palynoflora which could be analysed quantitatively; one sample (PPD-6) was assessed only for its qualitative composition because of poor yield, while the remaining four samples were either barren or extremely poor in palynofossils. Four assemblages have been identified in the sequence exposed on the right bank of the river (Figure 2).

The Assemblage-I (sample no. PPD-1), the oldest in the profile, depicts abundance of striate disaccate (mainly *Striatopodocarpites* Sedova 1956 and *Faunipollenites* Bharadwaj 1962). The presence of *Microfoveolatispora* Bharadwaj 1962 (*M. raniganjensis* Bharadwaj 1962), *Horriditriletes* Bharadwaj and Salujha 1964, *Reticulatisporites* Ibrahim emend. Potonié and Kremp

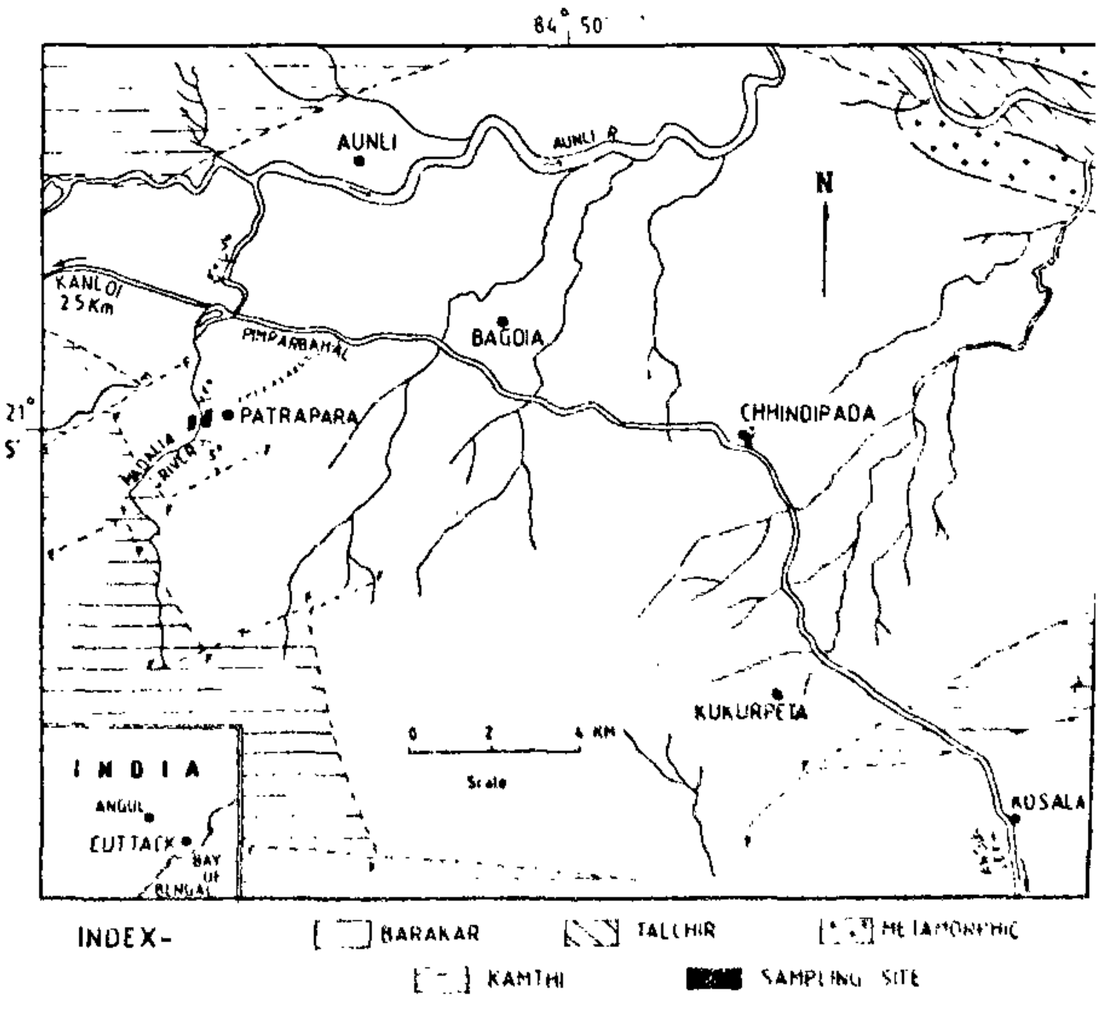

Figure 1. Geological map of central and western part of Talcher coal field, showing the location of outcrops in Madalia river at Patrapara village (after Raja Rao[1]).