RECENT RESEARCHES IN PALAEOONTOLOGY, PALAEOBOTANY, AND STRATIGRAPHY IN THE PALAEOONTOLOGIC DIVISION, GEOLOGICAL SURVEY OF INDIA

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This note gives a brief summary of various palaeontologic, palaeobotanic and stratigraphic investigations carried out in the Palaeontologic Division of the Geological Survey of India by the author or his colleagues in collaboration with him. The paper on Indobrachyops panchetensis gen. et. sp. nov. is jointly with the distinguished vertebrate palaeontologist, Baron F. Von Huene, University of Tubingen, Germany. These papers are being published shortly in the Records Geological Survey of India, Palaeontologia Indica or in the publications of the Palaeontological Society of India, as indicated below.

The papers summarised are:

(i) On Indobrachyops panchetensis gen. et. sp. nov., from the Upper Panchets (Lower Trias) of the Ramiganj Coalfield, by Baron F. Von Huene and M. R. Sahni.

Detailed description is given of a new Labyrinthodont and the age of the Panchets is discussed. It is suggested that the lower beds of the Panchets may be of U. Permian age, the rest being Triassic.

Generic diagnosis—Skull triangular, slightly broader than long with characters of the Brachyopidae; no otical notch or intertemporal; double condyles, orbits not large, situated at middle of side-length; very large and broad palatal openings; base of skull covered by parasphenoid; pterygoid and palatine very narrow, prequadrate palatal opening relatively small, Choana very small, situated far in front. L. Trias Holotype No. 17754 (Journ. Pal. Soc. India, Vol. 3 in Press).

(ii) A fossil reptilian egg from the Uttatars (Cenomanian) of Southern India, being the first record of a vertebrate fossil egg in India, by M. R. Sahni.

The fossil egg found by the author constitutes the first record of a vertebrate (reptilian) fossil egg in India. While chelonian relationships are suggested, no actual associated remains of this group have been found; on the other hand, Dinosaurian bones are known from the horizon concerned. Exact affinities uncertain. Occurrence, Utattur stage, Cenomanian, S. Indian Cretaceous. Holotype No. 17755 (Rec. Geol. Sur. Ind., in Press).

(iii) Supplement to a monograph of the Terebratulidae of the British Chalk, by M. R. Sahni.

This embodies the results of examination of about 340 British Chalk Terebratulidae and a few specimens from below the Uintacrinus zone of the German Chalk. Except one species, Concinnithyris rowei sp. nov. and two varieties Gibbithyris grandis var. nana nov. and Gibbithyris ellipsoïdalis var. quidhamptonensis nov. all the other forms described are referable to known forms. Concinnithyris rowei is a small, pentagonal, uniplicate form with massive, epityrid beak and large foramen. Gibbithyris grandis var. nana and Gibbithyris ellipsoïdalis var. quidhamptonensis are identical with the respective species except for their diminutive size. The following list includes the remaining species described in this paper which embodies diagnostic emendations and revised stratigraphic ranges of several known...
forms—Concinthys subundata sp. indet. Terebratula biplicata, C. albensis var. latifrons, C. albensis var. minor, Concinthys sp. indet. aff. albensis, C. protohesa; Gibbithyris grandis, G. media, G. ellipsoidalis, G. gibba, G. subrotunda, G. semiglobosa; Chatunothyris subcardinalis; Carneithyris gracilis, Carn. carnea, Terebratula gen. et. sp. indet; Neolithyridra obesa; Ornatothyris sulcifera.


(iii) Revision of the Cretaceous Terebratulidae of Southern India with description of two species from the East Coast Gondwanas, by M. R. Sahni.

The investigation suggests that (a) the accepted limits of the Cenomanian, Turonian and Senonian of the S. Indian Cretaceous need substantial emendation; (b) the known horizons of certain species are, by comparison with those of related European species somewhat unexpected; (c) the Albian is probably represented; (d) the East Coast Gondwanas appear to be a coastal facies of the lowermost known Cretaceous of the region; (e) though several European genera are represented, identity of species is not so common as Stoliczka believed; (f) variations in species suggest that certain generic diagnoses need emendation.

The following genera and species are described, and emendation to diagnoses of genera and species given where necessary.

Genus Rectithyris Sahni 1929.

1. Rectithyris expansa sp. nov. Shell very wide, beak straight; wide area below beak ridges; foramen large; brachial valve much flatter than pedicle; Holotype No. 17706; Budavada, U. Gondwanas.

2. Rectithyris recurvata sp. nov. Shell of moderate size; as wide as long, ventrally inflated; growth stages prominent; beak ridges strong; margin of pedicle valve recurved anteriorly; Holotype No. 17709; Budavada, Upper Gondwanas.

Genus Concinthys Sahni 1929.

3. Concinthys otatoorensis (Stoliczka) 1872; Lectotype No. 1582; Utattur stage (Cenomanian).

4. Concinthys indoalbensis sp. nov.—Shell large, smooth, oval, uniplicate; anterior margin insinuated; beak massive, short; foramen large, obliquely truncated, slightly labiate. Beak ridges absent. Lectotype No. 1557, Utattur stage (Cenomanian).

5. Concinthys rectithyroides sp. nov.—Shell medium sized, triangular, subdepressed, brachial valve gently convex; anterior median depression shallow, no distinct lateral plicae; pedicle valve with low, broad folds and subdulc sulci. Holotype no. 17712.

6. Concinthys andurensis sp. nov.—Shell large, smooth, relatively depressed; subpentagonal or oval; beak rounded, short, incurved; foramen wide, short; wide sulcus anteriorly in brachial valve. Lectotype No. 1553. Trichinopoly stage (Turonian) to Arriyalur stage (Senonian).

7. Concinthys andurensis var. brevirostris nov.—Shell oval; beak obliquely truncated, short; ventral plication strong. Figured specimen no. 17714; basal Trichinopoly to Upper Arriyalur stage (Senonian).

8. Concinthys obesa (Sow.) 1872; Plesiotype No. 1539, Arriyalur stage (Senonian).

9. Concinthys acutiplicata sp. nov.—Shell medium sized, elongate, beak massive, well curved, foramen moderate; beak ridges absent, pedicle valve strongly arcuate with strong median fold separating deep, subparallel furrows; brachial valve comparatively flat with strong plications; cardinal processes flat and platelliform; Holotype No. 17717, Arriyalur stage (Senonian).

10. Terebratula (?) Concinthys) arabillii Forbes, 1846; Holotype probably in British Museum; Arriyalur stage (Senonian).

11. Rectithyris odiumensis sp. nov.—Shell subcircular, beak comparatively short, narrow and curved. Foramen quadrate, reformate; symphytium narrow towards the top, forming only a small part of foraminial
Text fig. 1. Fossil reptilian egg from the Utattur stage (Cenomanian) of Southern India.
12. *Rectithyris subdepressa* (Stoliczka) 1872; *Lectotype* No. 1535. *Arrivalur* stage (Senonian).

13. *Rectithyris ovalis* sp. nov.—Shell large, depressed, perfectly oval; beak spread out, short, moderately incurved; foramen large, reformat; beak ridges well defined, mesothyrid. Anterior commissure of the pedicle valve broken by an upward insinuation but no evidence of fold or sinus; *Holotype* No. 17727; *Arrivalur* stage (Senonian).

14. *Rectithyris rotunda* sp. nov.—Shell massive, rotund, as wide as long; beak massive, straight, terminated by a large vertically placed foramen; beak ridges distinct, mesothyrid; brachial valve margin recurved, forming a large flat area anteriorly and a fairly deep furrow laterally; *Holotype* No. 17729. *Arrivalur* stage (Senonian).

Genus *Moraviaturia* gen. nov.—Genotype *Terebratula diphyrca* Stoliczka 1872. Generic diagnosis as for Genotype.

15. *Moraviaturia diphyrca* (Stol.).—Shell massive, laterally extended, wider than long, growth stages prominent anteriorly, sometime becoming step-like as in *Ornatothyris sulcifera* (Morris); beak large, massive, incurved, foramen large, with a labiate tendency. No beak ridges. Brachial valve very slightly convex, distinct sulcation present. Valve margin recurved inwards. Pedicle valve moderately convex near the umbonal region; anterior margin of pedicle valve turned at right angles to form a flat junction with the corresponding recurved dorsal valve. Lateral furrow deep, formed due to the inturning of the lateral margins of the valve, flattens out anteriorly. Radial striations distinct. *Geno-Lectotype* No. 1585 Loc. Moraviatur. Range.—*Uttatur* stage.


Genus *Neolothyris* Sahni 1929.

*Neolothyris depressa* sp. nov.—Shell large, subpentagonal, depressed, irregularly striated, bicipitate; beak incurved, beak ridges strong, permesothyrid; foramen of medium size. *Holotype* No. 17731. *Lower Arrivalur* stage (Senonian).

18. *Neolothyris depressa* sp. nov. var *Karapudiensis*.—Shell small sized, uniplicate; Figured specimen No. 1543; *Trichinopoly* stage (Turonian) to *Arrivalur* stage (Senonian).

19. *Neolothyris flabellata* sp. nov.—Shell medium sized, subtriangular to elongate-subpentagonal; beak massive, permesothyrid, beak ridges well defined, foremen large, reformat. Brachial valve pinched anteriorly; no clearly defined fold or sinus; *Holotype* No. 17732; *Lower Arrivalur* stage (Senonian).

20. *Neolothyris* elongata sp. nov.—Shell elongate or subpentagonal, dorsally flattened, uniplicate, beak massive, over-hanging; foramen large; beak ridges permesothyrid, well defined; *Holotype* No. 17738. *Lower Arrivalur* stage (Senonian).

21. *Neolothyris gracilis* sp. nov.—Shell pod-shaped, narrow, elongate, anteriorly produced; beak small, over-hanging; beak ridges strong, permesothyrid; brachial valve with a shallow median sulcus and inconspicuous plicae; *Holotype* No. 17741. *Arrivalur* stage (Senonian).

22. *Neolothyris* ? *arrivalurica* sp. nov.—Shell smooth, depressed, oval-subpentagonal with thickening near umbonal region; beak short, incurved; foramen large; beak ridges strong, permesothyrid. Muscle scars elongate, narrow, divergent; *Holotype* No. 17743. *Arrivalur* stage (Senonian).

23. *Neolothyris* ? *mulurensis* sp. nov.—Shell large, depressed, oval to subcircular, incipiently bicipitate; beak permesothyrid, short, moderately incurved; umbonal region abruptly bicipitate; *Lectotype* No. 1573; *Arrivalur* stage (Senonian).

24. *Neolothyris olapaudiensis* sp. nov.—Shell narrow, elongate, oval, smooth, punctate; anterior margin with well produced uniplica. Beak permesothyrid; *Lectotype* No. 1536; horizon doubtful, *Uttatur* stage (Senonian) or *Arrivalur* stage (Senonian).

Genus *Gibbithyris* Sahni 1925.

25. *Gibbithyris indica* sp. nov.—Shell large, subdepressed, broadly ovate; close-set punctae along ventral median line; beak short, incurved, beak ridges indistinct, epithyrid;
dorsal sulcus broad and shallow, flanked by fairly well defined plicae; pedicle valve with wide, low plicae separated by shallow sulci; Lectotype No. 1572. Trichinopoly stage (Turonian) to Arriyarul stage (Senonian).

26. Gibbithyris cf. hibernica Davidson 1852 (see also Plesiototype No. 1562; Arriyarul stage (Senonian).

27. Gibbithyris carneiformis sp. nov.—Shell oval, equally biconvex; beak short, incurved; foramen small; Lectotype No. 1577. Trichinopoly stage (Turonian) to Arriyarul stage (Senonian). (Palaeontologia Indica, in Press.)


A Lower Permian fauna containing Eurydesma and other fossils is described. Relationships and general association suggest affinities with the L. Permian faunas of Argentine and Australia. The following species are recorded:—

1. Eurydesma hesdoensis sp. nov.—Shell broadly oval, strongly convex; umbones subcentral pointed, prosogyrate, slightly incurved; lunule deep; hinge short, narrow; elongate resiliifer; Holotype No. 17736.

2. Eurydesma manendragarhensis sp. nov.—Distinguished from E. mytiloides, Reed, by its shorter dorsal margin, subcardate and shorter lunule, almost central instead of subanterior umbones; Holotype No. 17737.

3. Spirifer hesdoensis sp. nov.—Shell semi-elliptical to subtriangular, cardinal angles subacute, ventral valve with a prominent sulcus; 8 to 10 prominent ribs whose intersection with concentric lamellae forms rectangular areas, characteristic of the species; Holotype No. 17750.

4. Euomphalus hesdoensis sp. nov.—Shell almost circular, depressed, three to four whors; spire keeled, umbilicus feeble; shell surface uneven producing a more or less broad rib-like structure which is characteristic; Holotype No. 17747, Paratype No. 17748.

The other species recorded are: Aviculopecten squamuliferus Morris Nos. 17742, 17743 (Australia); Aviculopecten mitchelli, Etheridge and Dunn, No. 17744 (Australia); Eurydesma hobartense (Johnston) Nos. 17738, 17739 (Argentina, Australia); Eurydesma playfordi Dickens. Nos. 17740, 17741 (Australia); Liopteria ? dutoit Harrington; No. 17745 (Argentina); Euomphalus cf. oculusus J. D. Sowerby, No. 17746 (Australia); Pleurotomaria umarianensis Reed; No. 17749; Protoretetora cf. ampha Lonsdale; No. 17752 (Australia, etc.) Cri-noidal plate, No. 17753. (Rec. Geol. Sur. Ind., in Press).

(vi) Freshwater Mollusca and Plant remains from the Tertiary of Kargil, Kashmir by M. R. Sahni and N. C. Bhatnagar.

The mollusca are closely related to Eocene forms. The palm Sabal indicates a post Cretaceous age. Tentatively an Eocene age is assigned to these fossils. All specimens are from Kargil, Kashmir. The species described are:—

1. Unio kohlij sp. nov.—Shell quadrate with concentric striations, length greater than height, rounded anteriorly and posteriorly. Umbones inconspicuous; Holotype No. 17690.

2. Melania kargilensis sp. nov.—Shell turreted; spire narrows rapidly, whors high, 6-7 in number, cancellate, with prominent spiral lines and 3-8 well defined, occasionally nodose, ribs; Holotype No. 17692.

3. Viviparvs sp. indet.—Subglobular, body whorl large, spire short, three whors, aperture holostomatous; figured specimen No. 17698.

4. Planorbis sp. indet.—figured specimen No. 17689.


The authors discuss the merits of the two-fold and three-fold classification of the Gondwana system and come to the conclusion that neither of these can be regarded as truly scientific on the basis of available data. Some of the Gondwana referred to the Jurassic are undoubtedly of U. Triassic age, both on evidence of vertebrate fossils (Ceratodus) and freshwater mollusca, genus Tikhia, Sahni and Tewari. Certain strata in the Talcher Coalfield of Orissa, referred
to the Mahadevas contain *Glossopteris*, and so need revision. It is therefore preferable, in the opinion of the authors, to correlate the different Gondwana rocks with the subdivisions of the Standard stratigraphic scale without referring them to subdivisions, either of the two-fold or three-fold classification.

A complete revision of the Gondwana system is therefore called for. (Rec. Geol. Sur. Ind., in press).


The presence of spores of the *Lycopsida* and the *Sphenopsida* in the Cuddappah sediments confirms the conclusion that vascular plants had already originated in Pre-Vindhyan times, unless the age of the Cuddappas of this area is to be raised to the Vindhyan. (Records. Geol. Sur. Ind., in Press).

(ix) Other Research investigations.

In addition to the foregoing monographs and shorter papers now in the press, a number of research investigations carried out in the Palaeontologic Division of the Geological Survey of India as a part of the training programme are nearing completion. The field work by The Geological Survey of India party, connected with the Panchet tetrapods (vide below) was carried out under the author’s direction during December, 1957 and January and part of February, 1958, and has resulted in the discovery of several skulls of *Lystrosaurus* and other fossils, the first recorded skull of *Lystrosaurus* being discovered by the youngest member of the party, P.P. Satsanghi.

The investigations include the following items: