

ADDITIONAL RECORDS OF FOSSILS AND FOSSILIFEROUS BANDS FROM THE LOWER GONDWANAS OF ZEWAN SPUR, KASHMIR*

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ABSTRACT—The note records the occurrence of lycopods in the Lower Gondwanas of Zewan Spur, Kashmir. Two lycopod fossils (stem and cone with stem), two stems comparable to *Vertebraria* and vertebrate bones from Zewan Spur are described.

INTRODUCTION

The Zewan Spur ($34^{\circ}03' : 74^{\circ}54'$) of Srinagar District, Kashmir has always attracted attention of geologists and students due to its easy approach, well developed section of Lower Gondwana (*Gangamopteris* beds) and Zewan Series, and occurrences of plant and animal remains.

Plant-bearing Lower Gondwana beds in Kashmir were first reported by F. Noetling (Holland, 1903) from Risin Spur ($34^{\circ}04' : 74^{\circ}56'$), which is about 0.75 kilometre east of Zewan Spur. Later, several such fossiliferous localities were found by Middlemiss (1909, 1910), Wadia (1928, 1934-35) and Bose (1925).

Oldham (1904) was the first to give the geological description of Zewan Spur, but the detailed account was made by Hayden (1907). Later, Middlemiss (1909) suggested a little modification of Hayden's section. Plant collections of Oldham and Hayden were studied by Seward (1908).

Hayden collected plants from two bands of Lower Gondwana of Zewan Spur, i.e., Bed

No. 3—Carbonaceous shale with *Gangamopteris kashmirensis* in abundance, together with fragments of *Psygnophyllum hollandi*, *Psygnophyllum kidstoni* and *Cordaites*; Bed No. 13—Hard siliceous shale with a few fragments including *Gangamopteris* and *Cordaites*. Regarding animal remains Hayden mentions (1907, p. 28) : "I found no trace of either *Amblypterus* or *Archaeosaurus*".

Kalapesi and Bana (1953) have reported a few new forms but details of their collection are not available. Their collection includes :—

Plants : *Gangamopteris orisiensis*, *Palissya indica* Oldham, *Otozamites* aff. *hislopi* Oldham.

Insects : *Prognoblattina columbiana* Schudder.

Fish : *Amblypterus kashmirensis* Woodward
Palaeoniscus sp. indt.

The author feels that identification of *Palissya* and *Otozamites* may have to be revised as the presence of these indicates Upper Gondwana affinity.

The recent collection of Lower Gondwanas from Liddar Valley, Kashmir made by the

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author included *Lepidostrobus* Brongniart (Srivastava and Kapoor, 1967) which convinced him of the promising chances of the presence of lycopods in these beds. Consequently, a thorough search was made for it and the note is the outcome of the efforts made in this direction.

In 1964, the author was deputed to carry out geological work in Zewan Spur in connection with the XXII International Geological Congress (New Delhi, 1964). Along with Shri C.P. Vohra, Geologist, he geologically mapped the area in detail and measured the thickness of each band. These observations have revealed many interesting results, which will be published when laboratory work is completed. The plants and fish scales were recorded from several very thin bands of tuffaceous shales between bed No. 3 and bed No. 13 (Hayden's) by Dr. P. L. Robinson of Indian Statistical Institute, Calcutta and the author in 1964. They also collected one fossil cone from the same bed along with *Gangamopteris kashmirensis* and *Cordaites* reported earlier by Hayden (1907).

Shri Vohra and the author also found a lenticular tuffaceous band in dark grit (Bed No. 20 of Hayden) in which apical portion of *Gangamopteris kashmirensis* Seward and two stems comparable with *Vertebraria* were found. Another specimen of lycopod stem was collected from tuffaceous shale (Bed No. 20 of Hayden).

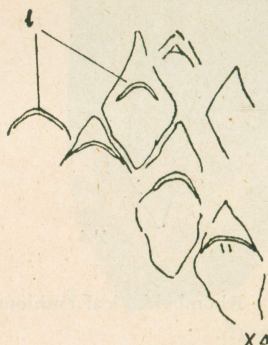
MATERIAL

The plant remains are preserved as impressions both in tuffaceous shale and siliceous shales (cherty shales). Bones and scales are completely petrified and embedded in cherty shales. It is difficult to separate complete specimens.

DESCRIPTION

1. LYCOPOD STEM Plate 2, figure 1

The figure shows a small portion of stem 2 cm long and 2.9 cm wide along with a single linear leaf having thin parallel veins. The stem shows rhomboid leaf cushions spirally disposed, 12 in each diagonal row, 4 mm long 3 mm wide. Crescentic ligular scars are seen inside the leaf cushions. (Text-figure 1).



Text-figure 1—Lycopod stem. Some of the leaf cushions showing crescentic ligular pits (l).

The impression of the stem is poorly preserved. It does not show all the structures. However, the rhomboidal leaf cushions and crescentic ligular scars indicate affinities with *Lepidodendron* (Seward, 1963).

Specimen No.—G.S.I. Type No. 18222.

Horizon—Tuffaceous shale (Bed No. 20).

Collector—Dr. P. L. Robinson and H. M. Kapoor.

2. LYCOPOD CONE WITH STEM Plate 2, Figure 2

The specimen consists of a cone which appears attached to a stem, bearing leaf cushions and leaves.

The cone is oval, 2.4 cm × 1.4 cm. A few sporophylls are preserved; these are very thin,

more than 1 cm long wedge-shape and curved, and are closely packed covering the central portion. Attachment of cone to the stem is not clear.

The stem at the apical end is 1.2 cm wide; towards the base width is 6 mm. Leaf cushions rhomboidal, vertically elongated, 5 mm long and 2 mm wide, spirally arranged; 8 leaf cush-



Text-figure 2—Rhomboidal leaf cushions with wedge-shape ligular pits (*l*).

ions are seen arranged in a diagonal row. Leaf scars not clear, ligular scars wedge shaped (Text-figure 2).

Leaves more than 13 mm long, lanceolate with single median vein; apex acute; closely packed, attached to stem at a very acute angle and seen only on the lateral sides of the stem.

The specimen is preserved in a very poor condition, as such it is difficult to know further details of the cone and the stem. However, on

the basis of shape of leaf cushions, ligular scars and leaves, this can be definitely said that stem and the cone belong to Lycopodiales. The central portion of the cone is filled with the chert.

Specimen No.—G.S.I. Type No. 18223.

Horizon—Cherty shale (Bed No. 13).

Collector—Dr. P. L. Robinson and H. M. Kapoor.

3. STEM COMPARABLE TO *Vertebraria*
Plate 2, figures 3 and 4.

Two stem impressions, preserved in the same block, show two grooves and three ridges (i.e. two lateral and one median) running parallel to one another. Ridges elevated and flat. Grooves at places widen and cut across the ridges.

In figure 4 grooves and ridges are of almost equal width, i.e., 1.5 mm (the width of the stem being 8 mm). In figure 3 grooves are 1 to 1.5 mm wide (width of the stem is 4 mm).

Elevated flat ridges and grooves at places widening and cutting across the ridges show the tendency to develop a pattern akin to *Vertebraria*.

Sahni (1921) collected impressions of branched axis from Risin Spur, which was 20 cm long, 1 cm thick and with thin branches (?roots) seen coming off at two places. He considered this impression as probably belonging

EXPLANATION OF PLATE 2

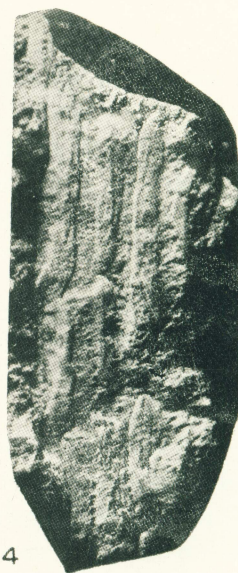
1. Lycopod stem. ($\times 2$). G.S.I. Type No. 18222.
2. Lycopod cone with stem. ($\times 2$). G.S.I. Type No. 18223.
3. Stem comparable to *Vertebraria*. ($\times 1$). G.S.I. Type No. 18224 a.
4. Stem comparable to *Vertebraria*. ($\times 1$). G.S.I. Type No. 18224 b.
5. Animal remains. ($\times 0.75$). G.S.I. Type No. 18225.

S—Scales of fishes. V—Vertebra of fish.

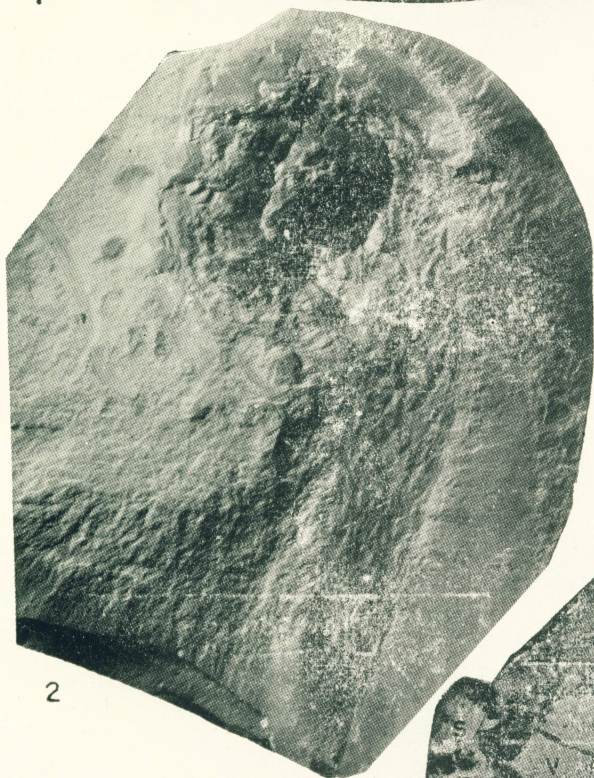
F—Femur of amphibian.



1



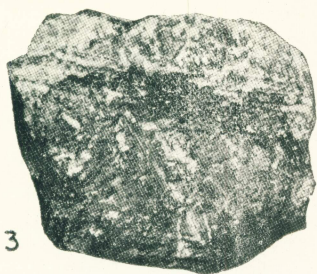
4



2



5



3

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to *Gangamopteris kashmirensis* Seward as the bed shows only the impression of this frond. Further details of his specimen are not available.

Present specimens were collected from a new bed (No. 20 of Hayden—See Introduction), from where author could collect only a single leaf (apical portion of *Gangamopteris kashmirensis* Seward).

Specimen No.—G.S.I. Type No. 18224 a and b.

Horizon—Tuffaceous shale (Bed No. 20).

Collector—H. M. Kapoor.

4. ANIMAL REMAINS
Plate 2, figure 5

The present collection shows detached bones (vertebrae and femur) and scales and probably belong to species, *Amblypterus kashmirensis* Woodward, *Amblypterus symmetricus* Woodward, *Archaeosaurus ornatus* Woodward (Seward and Woodward, 1906), *Archaeosaurus kashmirensis* Tewari (1960), *Lysipterigium deterii* Branson (1935) and *Actinodon risinensis* Wadia and Swinton (1928) reported from the neighbouring Risin Spur.

Specimen No.—G.S.I. Type No. 18225.

Horizon—Cherty shale.

Collector—Dr. P. L. Robinson and H. M. Kapoor.

CONCLUSIONS

The stem and the cone with stem of present collection are first record of lycopods from Kashmir, though the lycopods are represented in Palaeozoic Gondwanas of Peninsular India by a single genus *Cyclodendron* (= *Bothrodendron*) and lycopodaceous microspores and magaspores (Surange, 1966) and from extra-peninsula these were unknown.

The occurrence of this group in Kashmir Gondwanas owes its importance to the location

where they are considered to represent the northernmost extension of Gondwanaland, during Carboniferous and Permian times. It is possible, that the lycopods might have migrated to Kashmir from northern continent, as these are different from the genus known from other parts of India. It will not be out of place to refer to the author's find of *Lepidostrobus* Brongniart, a characteristic northern hemisphere fossil, from another locality of Kashmir (Srivastava and Kapoor, 1967).

Stems of *Vertebraria* are not known from Vihi Valley of Kashmir (i.e., Zewan Spur, Risin Spur, Guryul Ravine etc.) and the absence of this was attributed to the absence of *Glossopteris*. The stems developing pattern akin to *Vertebraria* is of significance due to the fact of its occurrence from the youngest fossiliferous bed (not earlier known) associated with a single specimen of *Gangamopteris kashmirensis* Seward. The stem comparable to *Vertebraria* either represent an earlier evolutionary stage of *Vertebraria* and stem of such type belonged to *Gangamopteris kashmirensis* Seward or the stem represents the earlier stage of growth of *Vertebraria* and belonged to *Glossopteris* which might have appeared by the time of deposition of this youngest bed of Gondwanas in Zewan Spur. It is hoped that further search for this bed will throw light on this.

There is no published record of the vertebrate fossils from Zewan Spur, except an abstract of paper by Kalapesi and Bana (1953), though a couple of papers were published on Risin Spur, one of the type localities of Gondwana fossils. These fossils were known only from tuffaceous shales and the present find indicates that other beds are not barren of animal fossils present in Zewan Spur.

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REFERENCES

- BRANSON, C.C., 1935, A labyrinthodont from the Lower Gondwana of Kashmir and a new Edestid from the Permian of Salt Range. *Mem. Conn. Acad. Arts. Sci.*, Vol. 9, *Yale North Ind. Exptd.*, Article 2, pp. 23-26.
- BOSE, B. K., 1925, *Gangamopteris* bed of Bren Hill. *Proc. Ind. Sci. Congr.*, Vol. 12, p. 219.
- HOLLAND, H. H., 1903, General Report of the Geological Survey of India., pp. 22-23.
- HAYDEN, H. H., 1907, The stratigraphic position of *Gangamopteris* beds of Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 36(1), pp. 23-29.
- KALAPESI, A. S. and BANA, I. L. R., 1953, Stratigraphic and palaeontological features of the formations in Zewan and Risin Spurs of Kashmir. *Proc. Ind. Sci. Congr.*, Pt. 3., p. 71.
- MIDDLEMISS, C.S., 1909, Gondwana and related marine sedimentary systems of Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 37(4), pp. 286-328.
- IDEM, 1910, Revision of Silurian-Trias sequence in Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 40(3), p. 206.
- OLDHAM, R. D., 1904, Note on the Zewan beds in Vihi District, Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 31(1), pp. 5-6.
- SAHNI, B., 1921, A stem impression from the plant bearing beds near Khunamu (Kashmir) provisionally referred to *Gangamopteris kashmirensis*. *Proc. Ind. Sci. Congr.*, Vol. 17(4), pp. 179-180.
- SEWARD, A. C., 1908, Permocarboneous plants from Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 36(1), pp. 57-61.
- SEWARD, A.C. and WOODWARD, A.S., 1906, Permocarboneous plants and vertebrates from Kashmir. *Pal. Ind. (N. S.)*, Vol. 2, Mem. 3, pp. 1-13.
- SRIVASTAVA, J. P. and KAPOOR, H. M., 1967, Discovery of the *Lepidostrobus* Brongniart from Lower Gondwana formation of Kashmir, India. *Jour. Pal. Soc. Ind.*, Vol. 12, pp. 44-47.
- SURANGE, K. R., 1966, Indian Fossil Pteridophytes. *Bot. Monograph*, No. 4, C.S.I.R., p. 11.
- TEWARI, A. P., 1960, Note on the new species of *Archaeosaurus* from the Lower Gondwana of Risin Spur. *Curr. Sci.*, Vol. 29(4), p. 144.
- IDEM, 1960, A new species of *Archaeosaurus* from the Lower Gondwana of Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 82(2), pp. 427-434.
- WADIA, D. N., 1928, The geology of Poonch State, Kashmir and adjacent parts of the Punjab. *Mem. Geol. Surv. Ind.*, Vol. 51(2), p. 253.
- IDEM, 1934-35, The Cambrian Trias sequence of North-Western Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 68(2), pp. 121-176.
- WADIA, D. N. and SWINTON, W. E., 1928, '*Actinodon risinensis*' n. sp. in the Lower Gondwana of Vihi District, Kashmir. *Rec. Geol. Surv. Ind.*, Vol. 59(1), pp. 142-145.