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SCYTHIAN OSTRACODES FROM KASHMIR HIMALAYAS

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ABSTRACT

This paper records occurrence of an ostracode assemblage, representing both the long ranging and short ranging types, recovered by processing the limestone samples, with acetc acid, from the Scythian sequence, equivalent to the 'Khunamuh Formation' of Nakazawa *et al.*, (1975), exposed at Khreuh and Mandakpal in the Kashmir Himalayas. Besides the ostracodes, other microfossils include conodonts, foraminifera, micromolluscs, indeterminate fragments of skeletal remains and micro fish teeth, scales, spines and coprolites.

INTRODUCTION

Although several papers on the occurrence of ostracodes from the Triassics, by Kozur (1968, 1969, 1971, 1973), Méhes (1911), Grekoff (1963), Schneider (1957, 1960 a, b), Luebimova (1956), Kollmann (1963), Anderson (1964), Styk (1958), Bartenstein (1962), Sohn (1965, 1968, 1970) etc., have been published, yet our present knowledge of the occurrence of the Triassic ostracodes throughout the world is quite scanty. In India, the Triassic ostracodes are still little known, except few brief reports on the occurrence of the ostracode genera from the Triassic rocks in Kashmir by Sahni and Chhabra (1974 b), Agarwal (1979, 1980), Agarwal, Singh and Sahni (1979) and Agarwal, Chhabra and Singh (1980) : from Kalapani Limestone Malla Johar, Kumaun, by Agarwal and Kumar (paper communicated); from Spiti by Goel and Srivastava (1979). Therefore any addition to the present information of the Ostracoda from the Triassic, particularly from India, is of more than casual interest.

The present paper records and illustrates an ostracode assemblage from Scythian rocks of Khreuh and Mandakpal in the Kashmir Himalayas. Though the recovered ostracode genera are poorly preserved and numerically scarce, their significance should not be underestimated. It is interesting that in the same samples occur together both long ranging as well as short ranging types of pre-Triassic and post-Triassic affinity.

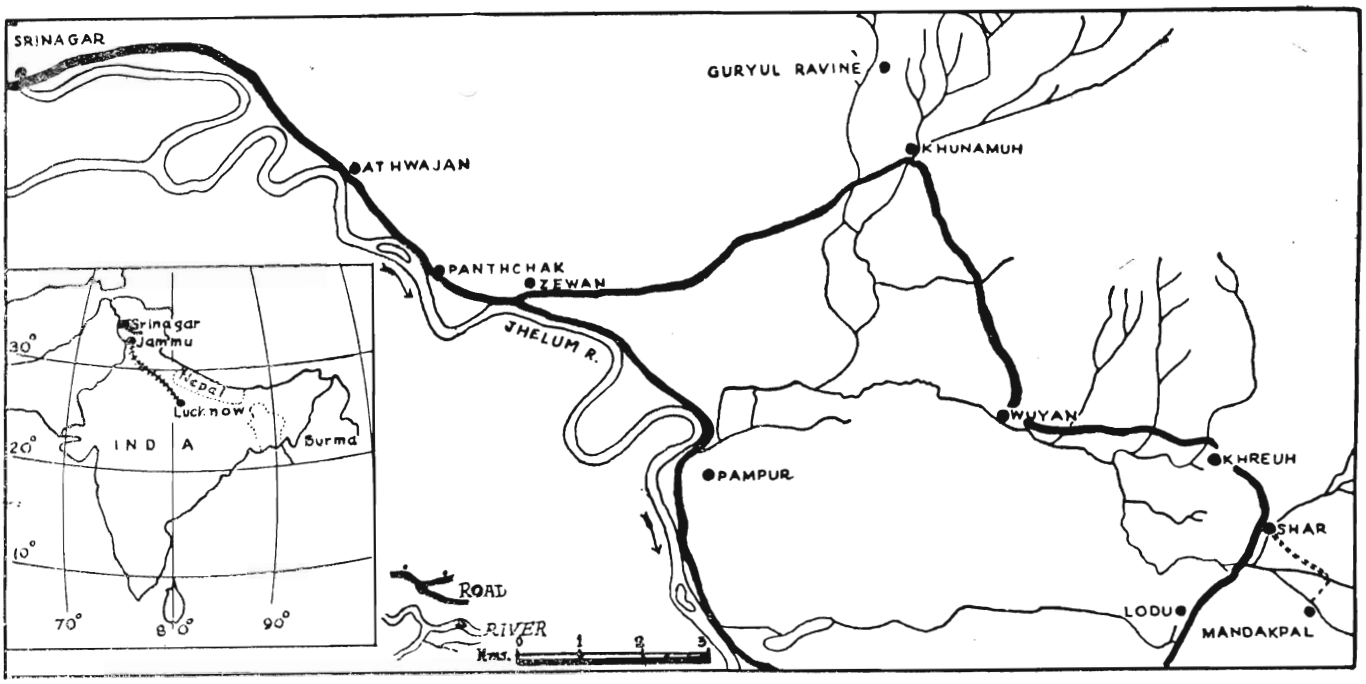

Fig. 1. Sketch map of a part of Kashmir Valley showing localities investigated.

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The Himalayan Triassics, comprising mainly calcareous sediments, have yielded a variety of marine fossils including brachiopods, molluscs, ammonites, foraminifera, ostracoda, conodonts, micro fish remains, microplanktons etc. The biostratigraphical zonation of the Triassic sediments has, till lately, been done on the basis of megainvertebrates, specially the ammonites, but the recent attempts of vtilising conodonts for this purpose have also been proved successful, as in Kumaun (Gupta, 1972; Sahni and Prakash, 1973 ; Misra, Sahni and Chhabra, 1973 ; Chhabra, Sahni and Kumar, 1973 and Sahni and Chhabra, 1974 a) ; Kashmir (Gupta, 1975; Gupta and Kachroo, 1977 and Singh, Chhabra and Agarwal, 1980); Spiti (Goel, 1977 and Bhatt and Joshi, 1978). Sohn (1968) has succeeded in showing the biostratigraphical usefulness of the ostracode fossils for demarcation of the Carnian and the Ladinian stages of various Triassic sections in Israel.

The authors recovered the ostracode assemblage from the Scythian rocks, equivalent to the 'Khunamuh Formation' (Nakazawa *et al.*, 1975) at Khreuh and Mandakpal, Kashmir Himalayas. The material collected by Chhabra in 1972-75 was treated with 10% glacial acetic acid for 10 days for extraction of the conodonts. Fragile and poorly preserved specimens of corroded carapaces and valves of the ostracodes were also recovered along with the associated microfauna comprising foraminifera, microgastropods, micropelecypods, micro fish teeth, scales, spines and coprolites, indeterminate fragments of the skeletal remains and the conodonts. Because of the corroded nature of the ostracode carapaces and valves, it has been possible to study only their external characters and outline, which form the basis for their tentative identification, up to the generic level only. Although the genera are well differentiated, yet their precise identification to specific level could not be possible for want of detailed characters. The fossil genera identified are, *Cytherella, Hungarella, Bairdia, Monoceratina, Judahella, Polycope, Aechmina, Paracypris, Macrocpyris, Pontocypris, Cytherepteron, Cytherelloidea, Covellina, Krausella* and *Roundyella.* It is quite significant that the genera so identified include both the pre-Triassic as well as post-Triassic types, with the exception of *Judahella* which is restricted to the Triassic, occurring in the same samples obtained from the undoubted Scythian sequence. Sohn (1970) made similar observation in Salt Range and Surghar Range, Pakistan, where he found occurrence of the ostracode taxa of both Palaeozoic and of Mesozoic affinities in Lower Triassic Limestone. This peculiarity may be due to survival of such forms from Permian into the Early Triassic or even later, as is clear from the types on hand.

LITHOSTRATIGRAPHY

At Guryul Ravine (34° 04′ 43″ N : 74° 57′ 30″ E) in Kashmir, a rock sequence comprising mainly alternating limestone and shales characterised by gradually increasing limestone percentage upward and changing into bedded limestone, has been found overlying conformably the Permian 'Zewan Formation' (Nakazawa *et al.*, 1975) with an abrupt change in lithology. It has been referred as the 'Khunamuh Formation' by Nakazawa *et al.*, (1975), after a nearby village, Khunmu, located 3 km due south of the Guryul Ravine, and representing a sequence from latest of Permian through the Lower Triassics. Similar rocks at Khreuh and Mandakpal are regarded as equivalent to the 'Khunamuh Formation'.

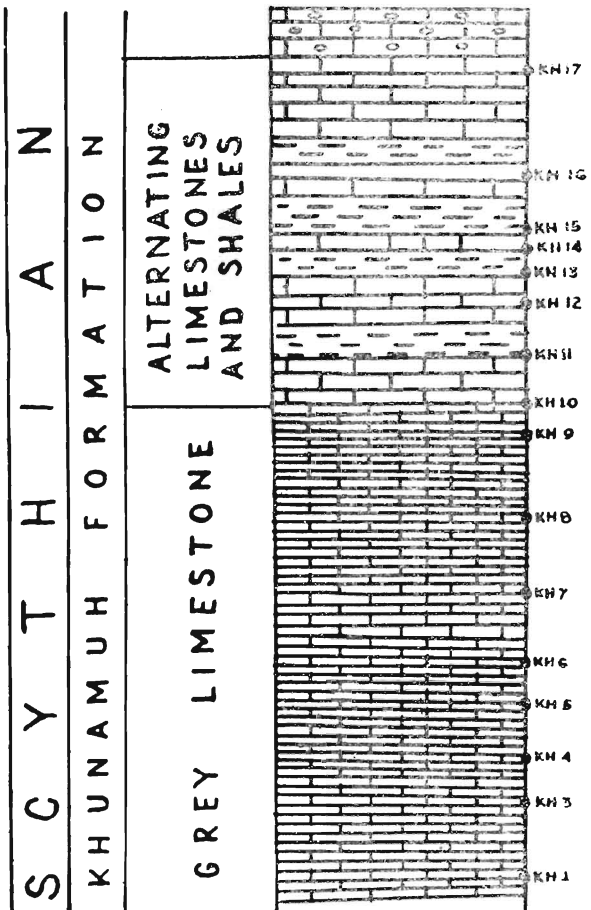

Fig. 2. Lithology of Scythian sequence at Khreuh showing beds from which samples were taken. (After CHHABRA, 1977).

The Scythian rocks, equivalent to the 'Khunamuh Formation', at Khreuh (34° 01′ N : 75°04′ E) in Anantnag district are situated 20 km southeast of Srinagar. They comprise 50 metres thick Grey Limestone and 35 metres thick alternating limestone and shales (Fig. 2). The corresponding rocks at Mandakpal (33° 59′ 30″ N : 75° 6′ E), also in Anantnag district, but further southeast of Khreuh, are exposed in a hill-spur near Upper Mandakpal village, one km south of Shar. They comprise 50 metres thick alternating sandy shales and thin-bedded limestone followed by 48 metres thick grey lime-

stone with few shales (Figure 3). They are found overlying conformably the upper part of the Zewan Formation (Permian) comprising mainly dark sandy shales interbedded with calcareous layers.

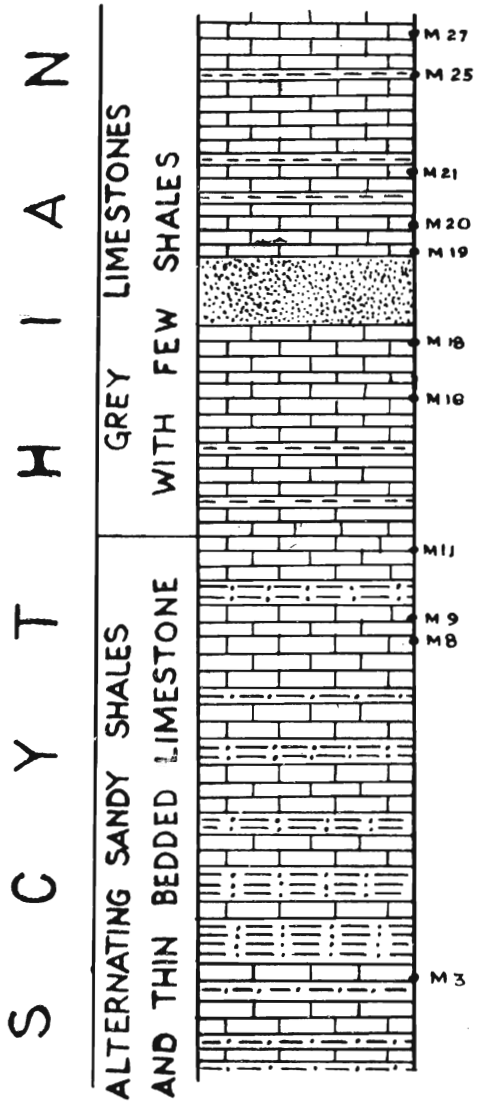

Fig. 3. Lithology of Scythian sequence at Mandakpal showing beds from which samples were taken. (After CHHABRA, 1977).

Eighteen samples from Khreuh and twelve from Mandakpal were taken for microfaunal investigations. During the course of sorting the conodonts, some acid insoluble microfossils were also recovered. Though the frequency of occurrence of the ostracode genera, in nearly all the samples, has been found to be fairly good, yet the number of well preserved specimens recovered is rather poor.

PREVIOUS WORK

After the impetus given by Griesbach (1880, 1891) to the study of the Himalayan Triassics, a number of workers such as Noetling (1905) and Middlemiss (1909, 1910) by their pioneering work, laid a solid foundation for future studies concerned with the geology and palaeontology of the Triassic rocks in Kashmir. The work of Middlemiss (1909, 1910) has recently been updated by Nakazawa *et al.*, (1975), who made a comprehensive study of Permo-Triassic sections, particularly at the Guryul Ravine, in the Kashmir valley. They proposed a term 'Khunamuh Formation', for a sequence, at the Guryul Ravine, from latest Permian through the Lower Triassics, comprising principally the alternating limestones and shales characterised by gradually increasing limestone content upward and changing into the bedded limestone, conformably overlying the 'Zewan Formation' with an abrupt lithological change. The rock succession, equivalent to the 'Khunamuh Formation' are also present at Khreuh and Mandakpal. The term 'Khunamuh Formation' is adopted in this paper to represent the Uppermost Permian and the Lower Triassics.

The first known report of the occurrence of the ostracodes in the Triassic rocks from India is by Sahni and Chhabra (1974 b) from Kashmir. The ostracodes from Scythian rocks in Kashmir were recorded from Khreuh (Agarwal, 1979), from Khreuh and Mandakpal (Agarwal *et al.*, 1979) and from Guryul Ravine (Agarwal, 1980 and Agarwal *et al.*, 1980) ; from Spiti (Goel and Srivastava, 1979) and from Middle Triassic Kalapani Limestone, Malla Johar, Kumaun Himalayas (Agarwal and Kumar, paper communicated). Besides above mentioned work, there is no other published record of the occurrence of the ostracodes from the Triassic rocks in India, known to the authors. The distribution of ostracode genera in the Lower Triassics in Kashmir Himalayas is given in Table 1.

Table I. Faunal Affinities of the ostracodes in Lower Triassics in Kashmir

Cross sign (×) shows the presence and a dash (—) marks the absence of an ostracode genera.

Ostracode genera	Khreuh	Mandakpal	Guryul Ravine
Cytherella	×	×	×
Hungarella	×	×	×
Bairdia	×	×	×
Monoceratina	×	×	×
Judahella	×	×	×
Polycope	×	×	—
Aechmina	×	×	×
Cytherepteron	×	—	—
Cytherelloidea	×	—	×
Paracypris	×	—	—
Macrocypris	×	—	×
Pontocypris	×	—	—
Cavellina	×	×	×
Krausella	×	×	—
Roundyella	—	×	—

The information of the occurrence of the ostracodes from certain Lower Triassic sections in the Kashmir Himalayas in this paper, though quite meagre, may be of some interest, as it is beginning to fill the gap of our present knowledge of the occurrence of the ostracodes from the Triassics of India. A further investigation of the Triassic ostracodes by other techniques, such as ultrasonic vibrator and conversion to fluoride, may prove fruitful in getting better preserved specimens with clearer structures required for precise specific identification.

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REFERENCES

AGARWAL, PREM N. 1979. Scythian ostracodes from Khunamuh Formation, Khreuh, Kashmir Himalayas. *Curr. Sci*, **48** (10) : 442-443.

AGARWAL, PREM N. (1980). A record of Lower Triassic Ostracodes from Guryul Ravine, Kashmir. *Geoscience Journal*, **1** (1): 93-94.

AGARWAL, PREM N., CHHABRA N. L. AND SINGH, S. N. 1980. Ostracodes from the Khunamuh Formation at Guryul Ravine, Kashmir Himalayas. *Proc. VIII Indian Coll. on Micropalaeontol. and Stratigr.* M. S. Univ. Baroda. (Abstract).

AGARWAL, PREM N. AND KUMAR, S. (Communicated). Ostracode fauna from the Kalapani Limestone, Malla Johar area, Kumaun Himalayas, Uttar Pradesh.

AGARWAL, PREM N., SINGH, S. N. AND SAHNI, A. 1979. Scythian ostracodes from the Khunamuh Formation of Mandakpal and Khreuh, Kashmir Himalayas. *VI Seminar on Himalayan Geol. & Palaeontol.* Centre of Adv. Study in Geol., Panjab. Univ., Chandigarh. (Abstract).

ANDERSON, F. W. 1964. Rhaetic Ostracoda. *Bull. Great Britain Geol. Surv.* **21** : 133-174.

BARTENSTEIN, H. 1962. Trias (Ausgewählte Beispiele aus dem norddentscen Keuper), *In* Simov, W. and Bartenstein, H. (eds.) *Leitfossilien der Mikropaläontologie.* Gebruder Borntraege, Berlin—Nikolassee : 67-72.

BHATT, D. K. AND JOSHI, V. K. 1978. Early Triassic conodonts from Spiti river section. *Curr. Sci.* **47** (4) : 118-120.

CHHABRA, N. L. 1977. Geology and Micropalaeontology of certain Triassic sections of Kashmir and Kumaun Himalayas. *Unpublished Acad. Thesis*, Lucknow University, Lucknow.

CHHABRA, N. L., SAHNI, A. AND KUMAR, S. 1973. Middle Triassic conodonts from Malla Johar, Tethys Himalayas. *Curr. Sci.* **42** (22) : 806-807.

COOPER, H. N. 1963. *Bibliographic index and classification of the Mesozoic Ostracoda.* Univ. of Dayton Press.

GOEL, R. K. 1977. Triassic conodonts from Spiti (Himachal Pradesh), India. *Jour. Palaeontol.* **51** (6) : 1085-1101.

GOEL, R. K. AND SRIVASTAVA, S. S. 1979. On the occurrence of Early Middle Triassic Foraminifers and ostracodes from Guling, Spiti (Himachal Pradesh). *Proc. 66th Session, Ind. Sci. Cong.*, pt. III, Sec. V. (50). (Abstract).

GREKOFF, N. 1963. Ostracodes du Trias : Colloque sur le Trias de la France et das regions limitrophes. *Mem. France Bureau de Researches Geologiques et Minieres.* **15** : 552-556.

GRIESBACH, C. L. 1880. Palaeontological notes on the Lower Trias of Himalayas. *Rec. Geol. Surv. India.* **13** (2) : 94-113.

GRIESBACH, C. L. 1891. Geology of Central Himalayas. *Mem. Geol. Surv. India.* **23.**

GUPTA, V. J. 1972. Conodonts in the Kumaun Himalayas. *Curr. Sci.* **41** (8) : 306.

GUPTA, V. J. 1975. Conodont biostratigraphy of the Middle and Upper Triassic rocks of Himalayas. *Stizber Akad-Wiss. Wein mathnaturwiss* **185** (31-4).

GUPTA, V. J. AND KACHROO, R. K. 1977. Carboniferous and Triassic conodonts from the Himalayas. *Cent. Adv. Study Geol., Panjab, Univ. Publ.* **11,**: 118-128.

KOLLMANN, K. 1963. Ostracoden aus der alpinen Trias II. Weitre Bairdiidae (Austria). *Geol. Bundesanst. Jahrb.* **106** - 121-203.

KOZUR, H. 1968. Einige seltene Ostracoden-Arten aus der germanischen Trias. *Monatsber. Deutsch. Akad. Wiss. Bertlin,* **10** (11) : 858-872.

KOZUR, H. 1969. Die Gattung Speluncella SCHNEIDER, in der germanischen Trias. *Frieb. Forschungsh.* C. **245** : 47-67.

KOZUR, H. 1971. Neue Ostracodenarten aus der Tethyalen Trias. *In* Bunze & Kozur : *Beiträge zur Ostracodenfauna der tethyalen Trias. Geol. Paläont. Mittl. Insbruck.* **1** (2) : 1-76.

KOZUR, H. 1973. Beiträge zur Ostracodenfauna der Trias. *Geol. Paläont. Mittl. Insbruck.* **3** (5) : 1-41.

LUEBIMOVA, P. S. 1956. Triassic and Jurassic Ostracoda of the eastern area of the Ukraine. *Mikrofauna* USSR, VNIGRI. *Trans. N. S.* **93** : 1-174.

MÉHES, G. 1911. Uber Trias-Ostrakoden aus dem Bakony. *Resultate wiss. Erforsch. des Balatonsees. Abh. Palaeontologie der Umgebun des Balatonsees.* **3** (6) : 38 p.

MIDDLEMISS, C. S. 1909. Gondwanas and related marine sedimentary system of Kashmir. *Rec. Geol. Surv. India.* **37** (4) : 286-327.

MIDDLEMISS, C. S. 1910. Revision of the Silurian-Triassic sequence in Kashmir. *Rec. Geol. Surv. India.* **40** (3) : 206-260.

MISRA, R. C., SAHNI, A. AND CHHABRA, N. L. 1973. Triassic conodonts and fish remains from Niti Pass, Kumaun Himalayas. *Himal. Geol.* **3** : 148-161.

MOORE, R. C. (ed.). 1961. *Treatise on Invertebrate Palaeontology.* Part Q, *Arthropoda* 3. Geol. Soc. America and Univ. Kansas Press. 442 p.

MORKHOVEN, F. P. C. M. van. 1962. *Post-Palaeozoic Ostracoda.* **I** : 204 p. Elsvier Publ. Co.

MORKHOVEN, F. P. C. M. van. 1963. *Post-Palaeozoic Ostracoda.* **II** : 478 p. Elsevier Publ. Co.

NAKAZAWA, K., KAPOOR, H. M., ISHII, K., BANDO, Y., OKIMURA, Y., AND TOKUOKA, T. 1975. The Upper Permian and the Lower Triassic in Kashmir, India. *Mem. Fac. Sci., Kyoto Univ. Ser. Geol. & Mineral.* **XLII** (1) : 1-106.

NOETLING, F. 1905. Die Asiatische Trias. *In* Frech, M. *ed. Lethaea Geognostica,* I. Teil, *Lethaea Palaeozoica.* **2** : 639-664.

SAHNI, A. AND CHHABRA, N. L. 1974 a. Middle Triassic conodonts from Kalapani Limetstone, Malla Johar, Kumaun Himalayas. *Himal. Geol.* **4** : 259-295.

SAHNI, A. AND CHHABRA, N. L. 1974 b. A record of Triassic ostracodes from Kashmir. *Curr. Sci.* **43** (10) : 325.

SAHNI, A. AND PRAKASH, I. 1973. Rhaetic conodonts from Niti Pass region, Kumaun Himalayas. *Curr. Sci.* **42** (6) : 218.

SCHNEIDER, G. F. 1957. In Mandelshtam, M. I., Schneider, G. F., Kuznetsova, Z. V., and Kats (Katz), F. Novye rody ostrakod v semeistvakh Cypridae i Cythereidae: *Vses. Paleontologicheskogho Obshchestva, Ezhegodnik* **16** : 181-183.

SCHNEIDER, G. F. 1960a. Fauna ostrakod Nizhnetreasovykh otlozhenii Prikaspiiskoi nizmennosti, *In* Brod, I. O. (ed.), *Geologiia i*

neftegazonosnost Iuga SSSR., *Turkemenistan i Zapadnyi Kazakhstan : Akad. Nauk* SSSR, *Kompleksnaia Iuzhnaia Geologicheskya Ekspeditsya, Trudy*, (5) : 287 p.

SCHNEIDER, G. F. 1960 b. Stratigraficheskoe znachenie Ostrakod nizhnetriasovykh otlozhenii Russkoi Platformy *In* LIUTKEVICH, E. M. (ed.), Trudy Vsesoyuznogo soveshchaniia po utochneniiu unifitsirovannoi Skhemy stratigrafii Mezozoiskikh otlozhenii Russkoi Platformy: *Vsesoyuz. Nauchno-Issled. Geologorazved. Neft. Inst. Trudy*, **29** : 32-35.

SINGH, S. N., CHHABRA, N. L. AND AGARWAL, P. N. 1980. Spathian Conodonts from Guryul Ravine, Srinagar District, Kashmir. *Proc. VIII Indian Coll. on Micropalaeontol. and Stratigr.*, M. S. Univ., Baroda. (Abstract).

SOHN. I. G. 1965. Significance of Triassic ostracodes from Alaska and Nevada. *U.S. Geol. Surv. Prof. Paper*, **501D**: 40-42.

SOHN, I. G. 1968. Triassic ostracodes from Makhtesh Ramon, Israel. *Bull. Israel Geol. Surv.* (44) : 1-71.

SOHN, I. G. 1970. Early Triassic marine ostracodes from the Salt Range and Surghar Range, West Pakistan. *In* KUMMEL, B. and TEICHERT, C., eds., *Stratigraphic Boundary Problems : Permian and Triassic of West Pakistan*. Univ. Press. Kansas., Dept. Geol., Univ. Kansas Spec. Publication (4) : 193-206.

STYK, O. 1958. Triassic microfauna in the neighbourhood of Chrzanow and in the northwestern part of the Mesozoic periphery of the Swiety Kryzyz Mts. *Bull. Poland Instytut Geologiczny*. 121, *Micropalaontological Researches in Poland*. **3** : 163-176.

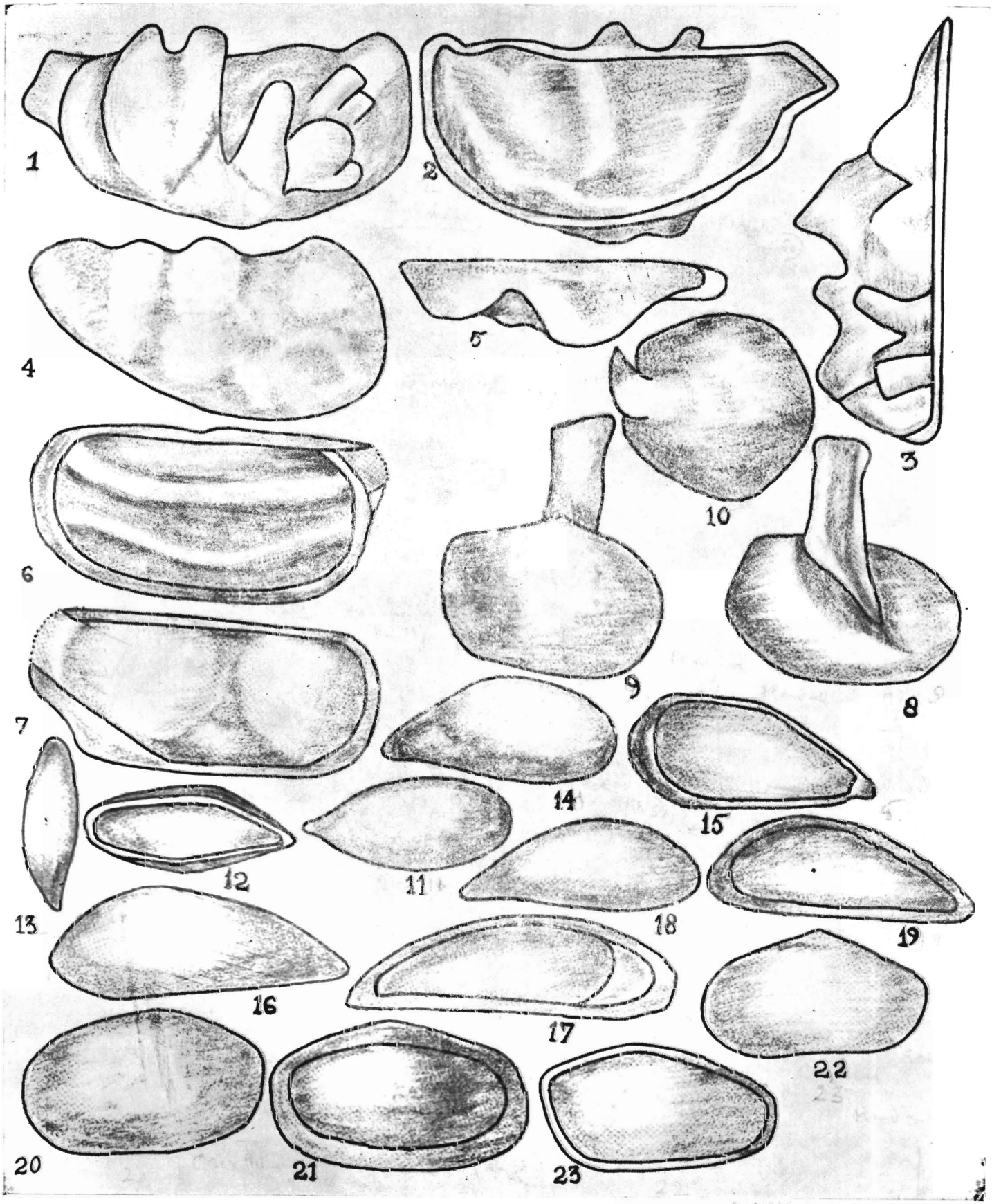
EXPLANATION OF PLATES

PLATE I

1, 2, 3. *Judahella*. from Khreuh ;1 —outside view, 2—inside view, 3—dorsal view. × 125.
4, 5. *Judahella* from Mandakpal; 4—outside view, 5—inside view × 100.
6, 7. *Cytherelloidea* from Khreuh; 6—outside view, 7—inside view × 125.
8, 9. *Aechmina* from Mandakpal; 8—outside view, 9—inside view, × 120.
10. *Polycope* from Mandakpal; Outside view, × 150.
11, 12, 13. *Paracypris* from Khreuh; 11—outside view, 12—inside view, 13—dorsal view × 120.
14, 15. *Paracypris* from Khreuh; 14—outside view, 15—inside view, × 120.
16, 17. *Pontocypris* from Khreuh; 16—outside view, 17—inside view, × 150.
18, 19. *Macrocypris* from Khreuh; 18—outside view, 19—inside view, × 125.
20, 21. *Cytherella* from Khreuh; 20—outside view, 21—inside view. × 120.
22, 23. *Cavellina* from Mandakpal; 22—outside view, 23—inside view. × 120.

PLATE II

1, 2. *Cytherella* from Khreuh; 1—outside view, 2—inside view. × 125.
3, 4. *Cytherella* from Khreuh; 3—outside view, 4—inside view, × 140.
5, 6. *Hungarella* from Khreuh; 5—outside view, 6—inside view. × 125.
7, 8, 9. *Cytherella* from Mandakpal; 7—outside view, 8—inside view, 9—ventral view. × 120.
10, 11. *Bairdia* from Khreuh; 10—outside view, 11—inside view. × 120.
12, 13. *Bairdia* from Mandakpal; 12—outside view, 13—inside view. × 120.
14. *Polycope* from Mandakpal; outside view. × 125.
15, 16, 17. *Monoceratina* from Mandakpal; 15—outside view, 16—dorsal view, 17—ventral view. × 120.
18, 19, 20. *Monoceratina* from Khreuh; 18—outide view, 19—ventral view, 20—dorsal view. × 125.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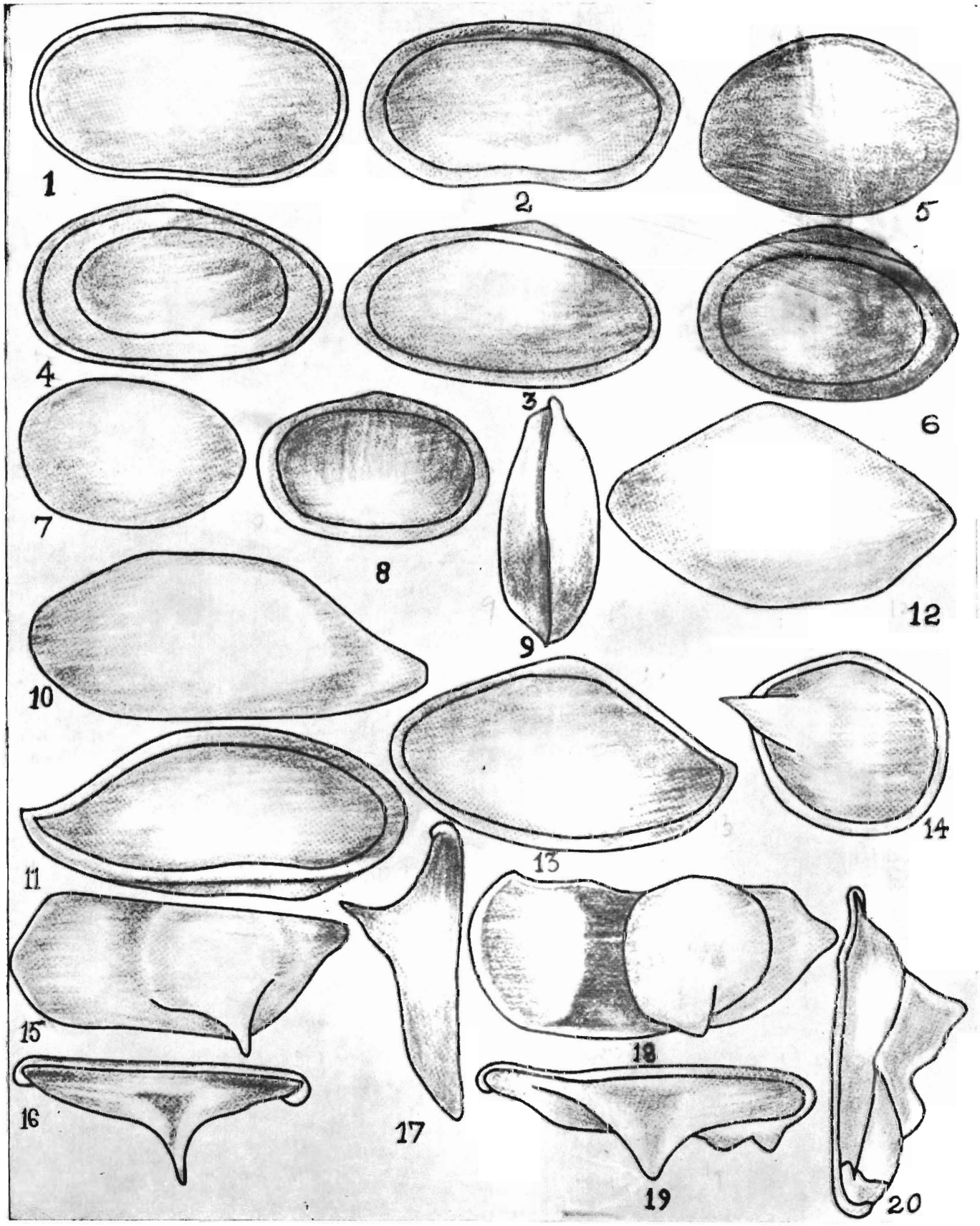

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