

ITALIAN EXPEDITIONS TO THE KARAKORUM (K^o) AND HINDU KUSH

Prof. A. DESIO *Leader*

IV - PALEONTOLOGY-ZOOLOGY-BOTANY

Volume I

1st Pt. FOSSILS OF KARAKORUM AND CHITRAL

2nd Pt. STUDY OF ENTOMOLOGICAL COLLECTION
OF KARAKORUM AND HINDU KUSH

3th Pt. LIST OF SPERMATOPHYTA COLLECTED
IN THE KARAKORUM

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Prof. ARDITO DESIO Leader

SCIENTIFIC REPORTS

I

Geography

II

Geophysics

III

Geology - Petrology

IV

Paleontology - Zoology - Botany

V

Prehistory - Anthropology

UNDER THE AUSPICES OF THE
ITALIAN NATIONAL COUNCIL OF RESEARCH

E. J. BRILL - LEIDEN

ITALIAN EXPEDITIONS TO THE KARAKORUM (K²) AND HINDU KUSH

Prof. ARDITO DESIO Leader

SCIENTIFIC REPORTS

IV - Paleontology - Zoology - Botany

Volume I

1st Pt. - FOSSILS OF KARAKORUM AND CHITRAL

by

M. AMIOT, R. CIRY, N. FANTINI SESTINI, I. PREMOLI SILVA, C. ROSSI RONCHETTI,
P. SARTENAER, A. VANDERCAMMEN, A. VON SCHOUPPÉ, C. ZANIN BURI

2nd Pt. - RESULTS OF THE STUDY
OF THE ENTOMOLOGICAL COLLECTION
OF THE KARAKORUM AND HINDU KUSH (1954 - 1955)

by

E. GRIDELLI and G. MÜLLER with collaborators

3th Pt. - LIST OF SPERMATOPHYTA COLLECTED
IN THE KARAKORUM ABOVE 4000 m (1953 - 1954)

by

L. H. J. WILLIAMS

E. J. BRILL - LEIDEN

1965

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PREFACE

The expedition to the Karakorum range which, during the summer of 1954 conquered K² (8611 m) — the second highest peak in the world — had, according to Italian tradition, a scientific as well as a mountaineering objective.

Besides the actual ascent, the programme of the expedition included research and study on the Geography, Geophysics, Geology, Anthropology and Ethnography of the area. Also, a small collection of specimens of local flora and fauna from elevated heights was made occasionally.

The expedition was carried out in three campaigns. A preliminary reconnaissance was made by Professor Desio with a guide (Mr. Riccardo Cassin), during the summer of 1953. The main stage followed in 1954 and lasted six months: it was carried out by an Italian team of five scientists (Professors Paolo Graziosi, Antonio Marussi, Bruno Zanettin, Ardito Desio and Dr. Guido Paganini, the physician of the expedition), eleven climbers and a photographer; a medical officer (Colonel Dr. M. Ata Ullah) and an assistant surveyor (Bad Shah Jan of the Survey of Pakistan), both from Pakistan, also joined the staff.

The scientific research was continued in the 1955 campaign which lasted about three months. The team this time consisted of three Italian scientists (Paolo Graziosi, Antonio Marussi and Ardito Desio) and three Pakistan assistants (Dr. N. M. Khan of the Geological Survey, Mr. M. Azizullah of the Survey of Pakistan, and Mr. Javed, a student at the University of Lahore).

The territory examined during the first campaign is to be found between the upper course of the Indus river, from Skardu as far west as the Stak valley, and the principal ridge of the Karakorum to the north. However, some reconnaissance was carried out westwards as far as Hunza and Gilgit and eastwards as far as Bagicha. The territory covered in 1955 lies between the Gilgit area and Chitral.

A new scientific campaign was organized by Professor Desio during the summer of 1961 in order to explore geologically the Wakhan territory, placed between the Hindu Kush and the Pamirs, and to extend westwards the geophysical observations. The leader was accompanied by Professor Marussi and two assistants (Dr. Giorgio Pasquarè and Dr. Ercole Martina) and by an Afghan geologist (Mr. Ajruddin).

While the geophysical programm was completely performed, the geological one was reduced to the survey of Central Badakhshan, for the expedition was not allowed to cover Wakhan.

In order to complete the geological researches over an area which had been omitted from the itineraries of previous expeditions and to clear up a number of unsolved problems of its stratigraphical geology, Prof. Desio, accompanied by two assistants (Dr. Ercole Martina and Dr. Roberto Galimberti) organized in 1962 a further campaign to the Western Karakorum. The territory covered this time is to be found between the Chogo Lungma and the Sosbun glaciers, and the high valley of the Hunza river.

The present volume is somewhat different from the others: it is the most heterogeneous one, in that it is concerned with varied arguments and it has been written by several authors. Moreover, this volume has an essentially documentary character. It consists of three parts: Paleontology, Zoology, and Botany.

The three parts have been developed in different ways, in that the respective material collected during the expeditions presents different aspects and interest, and because the authors themselves have carried out their studies according to their needs, habits, and orientation: it would have been incorrect to interfere with their methods. It is obvious that each author assumed the responsibility of his own scientific subject as well as of the development of his work.

Though it would have been suitable for all the works contained in the present volume to be written in the same language, since it was not possible to obtain this from the authors themselves, we did not feel we should translate them but preferred to have them published as they had originally been written. We limited ourselves to giving some conformity so far as it was possible, to the printing of the various parts of the volumes, and to matching, so far as possible, the structure of the present volume with that of the other volumes of the same collection.

The paleontological part, which has been co-ordinated by Prof. Carla Rossi Ronchetti, director of the Institute of Paleontology of the University of Milan, contains the descriptions of the fossils collected in various parts of the territory explored, fossils which belong to different groups, and to different ages that are however included between Permian and Cretaceous. Besides the fossils collected during the 1954, 1955, 1962 expeditions, the fossils collected by myself in the 1929 expedition on the northern slope of the Karakorum (Shaksgam Valley) are also described: these last had never been described before. Others, too, have been found and illustrated here for the first time.

The second and third parts of this volume are concerned with the systematic

studies of fauna and flora which were collected during the 1954, 1955, and 1962 expeditions. In this connection, it has to be recorded that in none of the programmes of expeditions organized and directed by me had I either planned to study or to collect animals and plants.

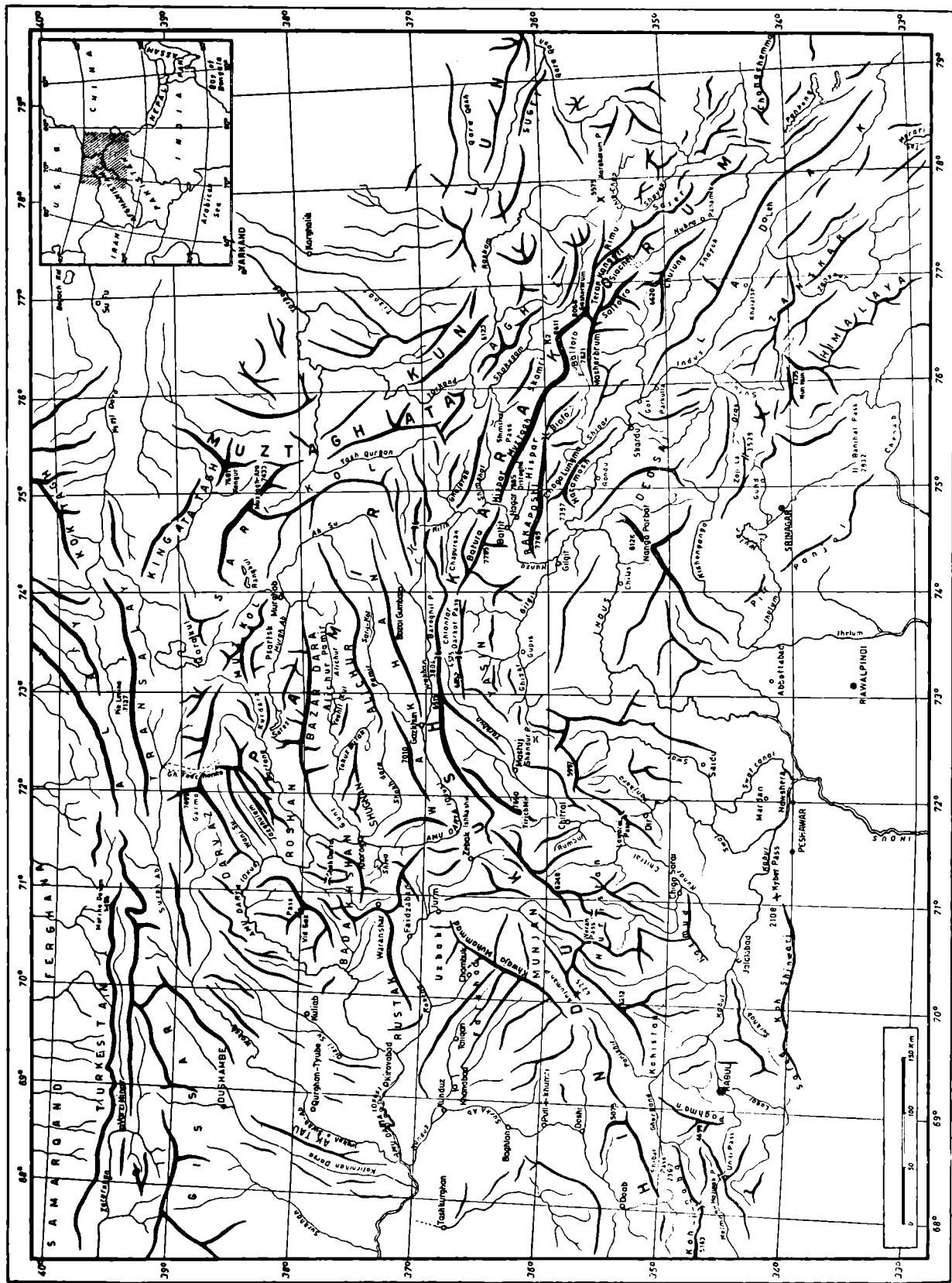
Notwithstanding this, I thought that at least in the highest regions, those most difficult to be reached, some occasional collections, which were not in our programme, might be of scientific interest, at least in that they can rarely be reached by any zoological or botanical expeditions. In view of this, some of us, particularly Prof. A. Marussi for that which concerns the zoological part and more precisely the insects, and Prof. A. Desio for that which concerns the plants living at over 4000 m a. s. l., carried out occasional collectioning excursions.

The second part of the present volume deals with the description of the insects collected during the 1954 and 1955 expeditions to the Karakorum and western Hindu Kush. The study of the entomological collection was organized and co-ordinated by Prof. E. Gridelli of the University of Trieste, and was continued, after his death, by Prof. G. Müller of the Museum of Natural History of the same town. Several experts co-operated in the systematic classification of the insects; also several new species were recognized among the material collected.

The third part of the present volume, as already mentioned, deals with botany. In this part the plants composing the collection from the Karakorum are not illustrated, but only a list of the species is given. A first systematic examination of the above-mentioned collection was made by Prof. A. Chiarugi of the University of Florence. After his death, also after the addition of new material subsequently collected, the whole small collection was examined by L. H. I. Williams of the British Museum (Natural History): his conclusions will be given in this part.

Before concluding this short preface, I wish to thank all the students who have co-operated in the description of the material collected during the expeditions directed by myself to the Karakorum and Hindu Kush, as well as all those who organized and carried out the paleontological, zoological, and botanical studies.

Ardito Desio



Orographic sketch-map of the Karakoram-Hindu Kush ranges and surrounding regions

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INTRODUCTION

This part of the present volume, devoted to botany, consists only of a list of the species which were collected occasionally during the expeditions directed by the author in 1953 and 1954 in the Karakorum, at over 4000 m a. s. l.

A first systematical examination of the above mentioned small collection was made by Prof. A. Chiarugi, director of the Institute of Botany of the University of Florence. After his death, also after the new material had been added, the whole small collection was examined by L. H. J. Williams of the British Museum (Natural History). My best thanks to prof. A. Chiarugi and Mr. L. H. J. Williams for his collaboration.

I thought it useful to add to the other documentary information of the present volume this list also, which can be regarded as a completion of the preceding botanic studies; at any rate, this may help to make clear the geographic distribution of the species.

Ardito Desio

LIST OF SPERMATOPHYTA COLLECTED BY PROFESSOR ARDITO DESIO IN THE KARAKORUM, 1953 & 1954

by

L. H. J. WILLIAMS

Department of Botany, British Museum (Natural History), London

The identification of the specimens was begun in Florence and completed at the Department of Botany, British Museum (Natural History), London, where large collections of plants from the Karakorum and neighbouring regions are available for comparison. The list has been prepared by Mr. L. H. J. Williams of the British Museum (Natural History).

GNETACEAE

Ephedra regeliana Florin

Presso il ghiacciaio Biafo, 3000-3050 m, 19 Settembre 1953.

RANUNCULACEAE

Ranunculus hirtellus Royle

Stak-la, sul passo, 12 Settembre 1953.

Delphinium brunonianum Royle

Stak-la, sul passo, 12 Settembre 1953. Sotto il Ganto-la, versante di Basha, sopra 4000 m, 14 Settembre 1953. Chagaran (Val Mustagh), bacinio Baltoro, 4450 m, 18 Agosto 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Aconitum rotundifolium Kar. & Kir.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

PAPAVERACEAE

Papaver nudicaule subsp. *rubroaurantiacum* Fedde

Urdukas (ghiacciaio Baltoro), 4000 m, 22 Agosto 1954. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Haigatum (ghiacciaio Hispar), 4100 m, 5 Settembre 1954.

CRUCIFERAE

Parrya exscapa C. A. Meyer

Baltoro, pendici occidentali del Falchan Kangri (Broad Peak), rocce silicee, 4920 m, 23 Luglio 1954.

Parrya exscapa var. *grandis* Pampan.

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954.

Parrya macrocarpa R. Br.

Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Cardamine loxostemonoides O. E. Schulz

Stak-la, sul passo, 12 Settembre 1953.

Ermania himalayensis (Cambess.) O. E. Schulz

Baltoro, pendici occidentali del Falchan Kangri (Broad Peak), rocce silicee, 4920 m, 23 Luglio 1954. Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), 4700 m, 8 Agosto 1954.

Phaeonychium parryoides (Kurz) O. E. Schulz

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954.

Phaeonychium parryoides var. *minus* Pampan.

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954.

Draba altaica var. *microcarpa* O. E. Schulz

Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m,
4 Settembre 1954.

Draba altaica (C. A. Meyer) Bunge

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 19 Agosto 1954.

Thlaspi alpestre L.

Ho Bluk, ghiacciaio Biafo, 4045 m, 1 Settembre 1954.

Chorispora sabulosa Cambess.

Stak-la, sul passo, 12 Settembre 1953.

CARYOPHYLLACEAE

Silene moorcroftiana Wall. ex Benth.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-
husband, 4300 m, 14 Agosto 1954. Chagaran (Val Mustagh), bacino
Baltoro, 4450 m, 18 Agosto 1954.

Silene sp.

Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m,
4 Settembre 1954.

Cerastium thomsonii Hook. f.

Stak-la, sul passo, 12 Settembre 1953. Ho Bluk, ghiacciaio Biafo, 4035 m,
1 Settembre 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settem-
bre 1954.

Stellaria graminea L.

Urdukas (ghiacciaio Baltoro), c. 4000 m, 22 Agosto 1954. Ho Bluk, ghiac-
ciaio Biafo, 4035 m, 1 Settembre 1954.

TAMARICACEAE

Myricaria elegans Royle

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

GERANIACEAE

Geranium collinum var. *glandulosum* Ledeb.

Stak-la, sul passo, 12 Settembre 1953. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Geranium pratense L.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

LEGUMINOSAE

Astragalus strictus Grah.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Astragalus cicerifolius Royle

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

Astragalus dainellii Pampan.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Oxytropis lapponica Gaudin

Stak-la, sul passo, 12 Settembre 1953. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Cicer soongaricum Steph. ex DC.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

ROSACEAE

Spiraea hypericifolia L.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Potentilla fruticosa var. *pumila* Hook. f.

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954.

Potentilla gelida C. A. Meyer

Lato destro Valle Hispar a monte del ghiacciaio Khani Basa, 4500 m, 4 Settembre 1954.

Potentilla salesovii Steph. ex Willd.

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954.

Potentilla sericea L.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Potentilla sp.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Sibbaldia parviflora Willd.

Stak-la, sul passo, 12 Settembre 1953.

Rosa webbiana Wall. ex Royle

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

SAXIFRAGACEAE

Saxifraga flagellaris Willd.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Saxifraga pulvinaria H. Smith (*S. imbricata* Royle, non Lam.)

Baltoro, Campo Ovest-Sud-Ovest del Falchan Kangri (Broad Peak), 7 Agosto 1954.

Saxifraga jacquemontiana Decne.

Vallone Turmik, sotto Stak-la, sopra 4000 m, 12 Settembre 1953.

Saxifraga sibirica L.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

CRASSULACEAE

Orostachys thyrsiflora Fisch.

Presso il ghiacciaio Biafo, 3000-3050 m, 19 Settembre 1953.

Sedum ewersii Ledeb.

Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Sedum fastigiatum Hook. & Thoms.

Baltoro, pendici occidentali del Falchan Kangri (Broad Peak), rocce silicee, 4920 m, 23 Luglio 1954. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Sedum rosea (L.) Scop.

Stak-la, sul passo, 12 Settembre 1953. Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Sedum tibeticum var. *stracheyi* Hook. & Thoms.

Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

ONAGRACEAE

Epilobium latifolium L.

Stak-la, 4100 m, 12 Settembre 1953. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954. Haigatum (ghiacciaio Hispar), 4100 m, 5 Settembre 1954.

UMBELLIFERAE

Bupleurum falcatum var. *gracillimum* (Klotzsch) Wolff

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Pleurospermum govanianum Benth.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Heracleum pinnatum C. B. Clarke

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

COMPOSITAE

Aster flaccidus Bunge

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Erigeron cabulicus (Boiss.) Botsch.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

Erigeron aff. *bellidioides* Benth.

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953.

Erigeron aff. *multiradiatus* Benth.

Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Erigeron uniflorus L.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Erigeron sp.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, Agosto 1954.

Erigeron sp.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Leontopodium ochroleucum Beauverd

Sotto il Ganto-la, versante di Basha, sopra 4000 m, 14 Settembre 1953. Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Anaphalis nubigena DC.

Stak-la, sul passo, 12 Settembre 1953. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954.

Waldheimia nivea (Hook. & Thoms.) Regel

Presso Doksam, ghiacciaio Baltoro, 4250 m, 24 Settembre 1953. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Waldheimia stoliczkae (C. B. Clarke) Ostenf.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Waldheimia tomentosa (Decne.) Regel

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Waldheimia glabra (Decne.) Regel

Stak-la, sul passo, 12 Settembre 1953.

Chrysanthemum pyrethroides (Kar. & Kir.) Fedtsch.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Tanacetum senecionis (Jacq. ex Bess.) Gay

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Doronicum falconeri C. B. Clarke

Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Senecio chrysanthemoides var. *sisymbriiformis* (DC.) Hook. f.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

Saussurea gnaphalodes (Royle) Schultz Bip. ex Klatt

Baltoro, parete meridionale del K² presso il campo base, c. 5100 m, 6 Agosto 1954. Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Jurinea macrocephala (DC.) Benth. var.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Crepis flexuosa (Ledeb.) C. B. Clarke

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953.

Taraxacum stevenii (Spreng.) DC.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Taraxacum cf. *heteroloma* Hand.-Mazz.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Youngia tenuifolia var. *diversifolia* (Ledeb.) Bab. & Stebb.

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

PRIMULACEAE

Primula macrophylla var. *moorcroftiana* (Wall.) Pax

Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Primula schlagintweitiana Pax

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

GENTIANACEAE

Gentiana carinata Griseb.

Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, 4500 m, 4 Settembre 1954.

Gentiana tianshanica Rupr.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Gentianella falcata (Turcz.) H. Smith

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Urdukas (ghiacciaio Baltoro), c. 4000 m, 22 Agosto 1954. Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Lomatogonium carinthiacum (Wulf.) A. Braun

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Lomatogonium brachyantherum (C. B. Clarke) Fernald

Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

Lomatogonium caeruleum (Royle) H. Smith

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

BORRAGINACEAE

Eritrichium rupestre var. *pectinatum* (Pall.) Brand

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954. Urdukas (ghiacciaio Baltoro), c. 4000 m, 22 Agosto 1954.

Myosotis alpestris Schmidt

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro Valle Hispar, a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

Arnebia tibetana Kurz

Pendio sabbioso presso la pineta poco a valle del ghiacciaio Baltoro, 30 Settembre 1953.

SCROPHULARIACEAE

Pedicularis cheilanthifolia Schrenk

Urdukas (ghiacciaio Baltoro), c. 4000 m, 22 Agosto 1954.

Pedicularis pectinata Wall. ex Benth.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

LABIATAE

Nepeta discolor Royle

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

Nepeta longibracteata Benth.

Baltoro, pendici occidentali del Falchan Kangri (Broad Peak), 4920 m, rocce silicee, 23 Luglio 1954.

Nepeta nervosa Royle ex Benth.

Haigatum (ghiacciaio Hispar), c. 4100 m, 5 Settembre 1954.

Dracocephalum stamineum Kar. & Kir.

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954.

Thymus sp.

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953.

POLYGONACEAE

Polygonum affine D. Don

Stak-la, sul passo, 12 Settembre 1953.

Polygonum viviparum L.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Oxyria digyna (L.) Hill

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

LILIACEAE

Lloydia serotina (L.) Reichb.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954. Lato destro Valle Hispar a monte del ghiacciaio Khani Basa, c. 4500 m, 4 Settembre 1954.

AMARYLLIDACEAE

Allium carolinianum DC.

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

Allium przewalskianum Regel

Valletta glaciale sulla destra del Baltoro fra Biange e il ghiacciaio Young-husband, 4300 m, 14 Agosto 1954.

CYPERACEAE

Carex melanantha C. A. Meyer

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m, 8 Agosto 1954.

GRAMINEAE

Alopecurus himalaicus Hook. f.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Trisetum spicatum (L.) K. Richt.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Poa alpina L.

Ho Bluk, ghiacciaio Biafo, 4035 m, 1 Settembre 1954.

Poa attenuata Trin.

Baltoro, fianco meridionale del Falchan Kangri (Broad Peak), c. 4700 m,

8 Agosto 1954. Urdukas (ghiacciaio Baltoro), c. 4000 m, 11 Agosto 1954. Valletta glaciale sulla destra del Baltoro, fra Biange e il ghiacciaio Younghusband, 4300 m, 14 Agosto 1954.

Agropyron schrenkianum (Fisch. & Meyer) Drobov

Dintorni di Urdukas (Baltoro), 4000 m, 23 Settembre 1953. Presso Doksam, ghiacciaio Baltoro, 4250 m, 24 Settembre 1953. Chagaran (Val Mustagh), bacino Baltoro, 4450 m, 18 Agosto 1954.

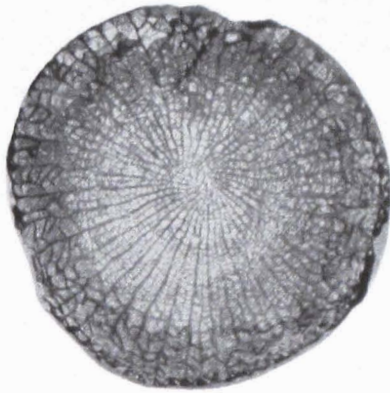
PLATES

TAFEL 1

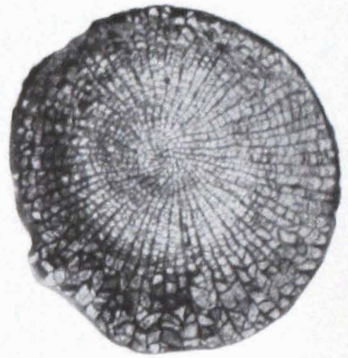
- Fig. 1. - *Grypophyllum (Leptoinophyllum) vermiculare* (Goldfuss). S. 17
 Ganzstück. 1751/1. $\times 0.5$.
- » 2. - *Grypophyllum (Leptoinophyllum) vermiculare* (Goldfuss).
 Querschnitt durch eine mittlere Mittellage. 1751/1. $\times 1.5$.
- » 3. - *Grypophyllum (Leptoinophyllum) vermiculare* (Goldfuss).
 Querschnitt durch eine höhere Mittellage. 1751/1. $\times 1.5$.
- » 4. - *Grypophyllum (Leptoinophyllum) vermiculare* (Goldfuss).
 Längsschnitt. 1751/1. $\times 1.5$.
- » 5. - *Disphyllum caespitosum tricyclium* n. ssp. S. 22
 Querschnitt durch ein Reifestadium. 1752/1; QS 1 (Holotyp). $\times 3$.
- » 6. - *Disphyllum caespitosum tricyclium* n. ssp.
 Längsschnitt. 1752/1; LS 1 (Holotyp). $\times 3$.
- » 7. - *Macgeea (Macgeea) desioi* n. sp. S. 32
 Kelch mit drei parricidalen Knospen. 1754/1 a (Holotyp). $\times 1$.
- » 8. - *Macgeea (Macgeea) desioi* n. sp.
 Querschnitt durch ein hohes Reifestadium mit Spross. 1754/1; QS 3 (Holotyp). $\times 3$.
- » 9. - *Macgeea (Macgeea) desioi* n. sp.
 Querschnitt durch ein mittleres Entwicklungsstadium. 1754/1; QS 1 (Holotyp).
 $\times 3.5$.
- » 10. - *Macgeea (Macgeea) desioi* n. sp.
 Längsschnitt. 1754/3. $\times 3$.
- » 11. - *Macgeea (Macgeea) desioi* n. sp.
 Querschnitt durch ein mittleres Entwicklungsstadium. 1754/2. $\times 3.5$.
- » 12. - *Macgeea (Macgeea) desioi* n. sp.
 Längsschnitt. 1754/1; LS 1 (Holotyp). $\times 3$.
- » 13. - *Macgeea (Macgeea) desioi* n. sp.
 Längsschnitt. 1754/2. $\times 3$.



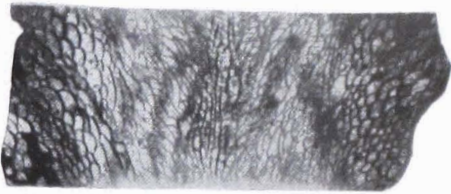
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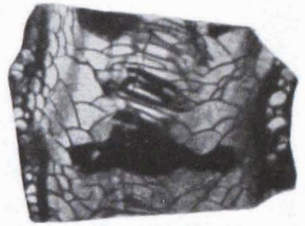
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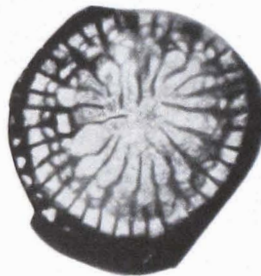
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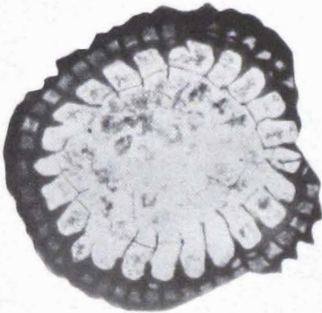
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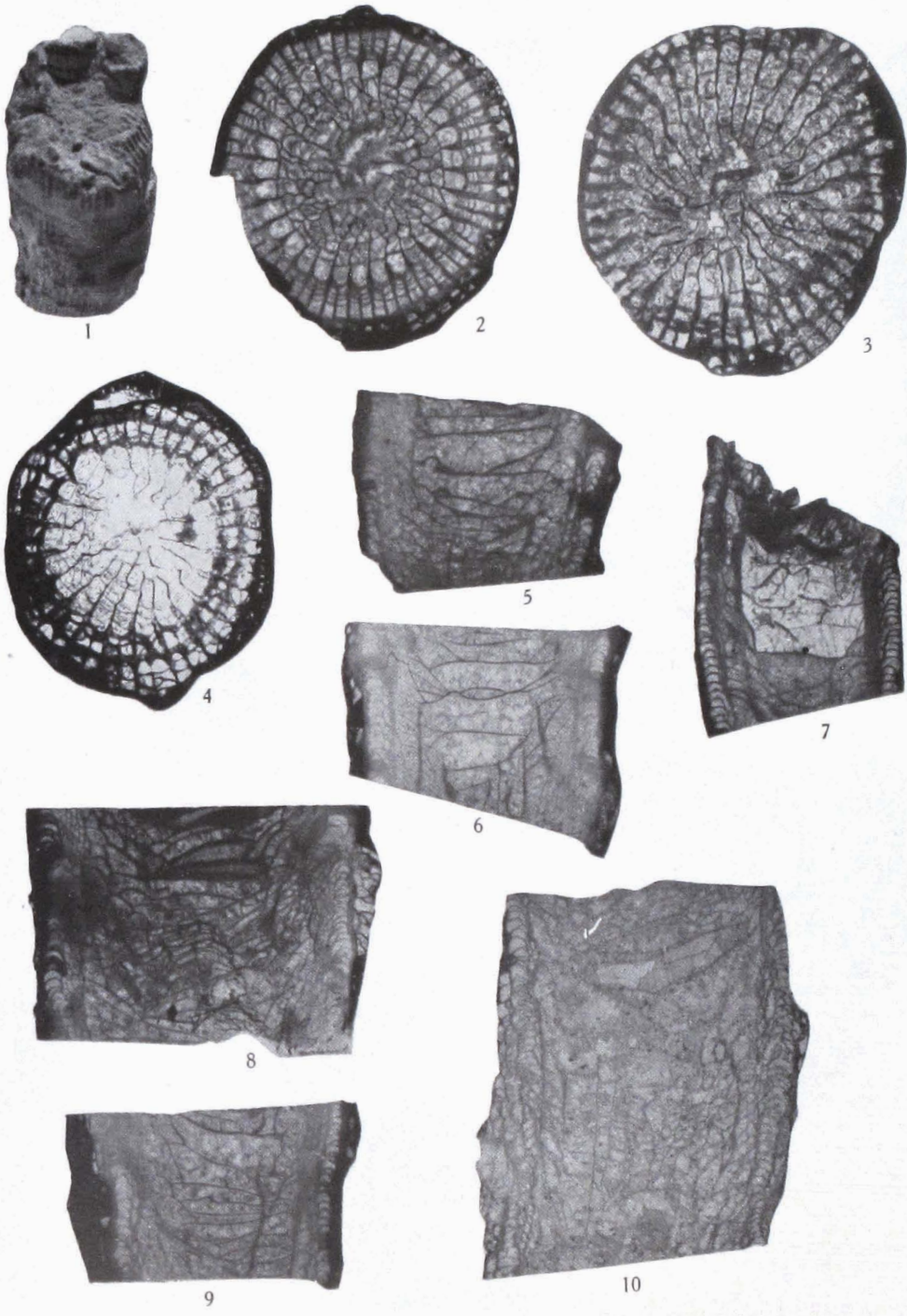
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TAFEL 2

- Fig. 1. - *Macgeea (Macgeea) multizonata* (Reed). S. 27
 Bruchstück mit Kelchsprossen. 1753/2. $\times 1$.
- » 2. - *Macgeea (Macgeea) multizonata* (Reed).
 Querschnitt durch ein Reifestadium. 1753/1. $\times 2,4$.
- » 3. - *Macgeea (Macgeea) multizonata* (Reed).
 Querschnitt durch ein mittleres Entwicklungsstadium. 1753/1. $\times 3$.
- » 4. - *Macgeea (Macgeea) multizonata* (Reed).
 Querschnitt durch ein mittleres Entwicklungsstadium. 1753/2. $\times 2,7$.
- » 5. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/3. $\times 2,3$.
- » 6. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/3. $\times 3$.
- » 7. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/5. $\times 3$.
- » 8. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/1. $\times 2,7$.
- » 9. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/4. $\times 3$.
- » 10. - *Macgeea (Macgeea) multizonata* (Reed).
 Längsschnitt. 1753/6. $\times 2,5$.

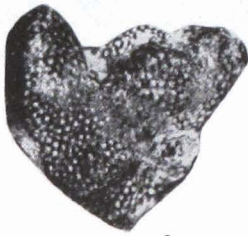


TAFEL 3

- Fig. 1. - *Thamnopora reticulata* (De Blainville).
 Astende. 1755/2. $\times 1,2$.
- » 2. - *Thamnopora reticulata* (De Blainville).
 Bruchstück eines Stockes. 1755/3. $\times 1$.
- » 3. - *Thamnopora reticulata* (De Blainville).
 Querschnitt. 1755/1. $\times 3$.
- » 4. - *Thamnopora reticulata* (De Blainville).
 Längsschnitt. 1755/1. $\times 3$.
- » 5. - *Thamnopora boloniensis* (Gosselet).
 Bruchstück eines Stockes. 1756/3. $\times 1$.
- » 6. - *Thamnopora boloniensis* (Gosselet).
 Bruchstück eines Astes. 1756/4. $\times 1$.
- » 7. - *Thamnopora boloniensis* (Gosselet).
 Querschnitt. 1756/1. $\times 3$.
- » 8. - *Thamnopora boloniensis* (Gosselet).
 Längsschnitt. 1756/1. $\times 3$.
- » 9. - *Thamnopora boloniensis* (Gosselet).
 Querschnitt. 1756/2. $\times 3$.
- » 10. - *Alveolites hudlestoni* (Reed)
 Stock. 1757/2. $\times 1$.
- » 11. - *Alveolites hudlestoni* (Reed).
 Querschnitt. 1757/1. $\times 3$.



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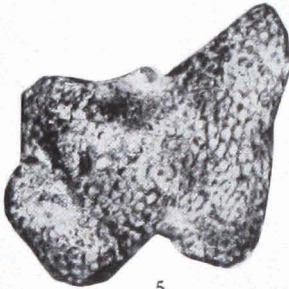
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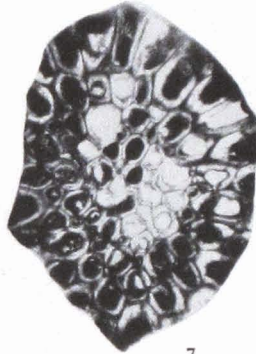
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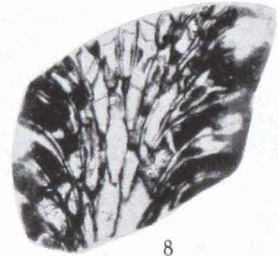
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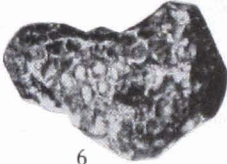
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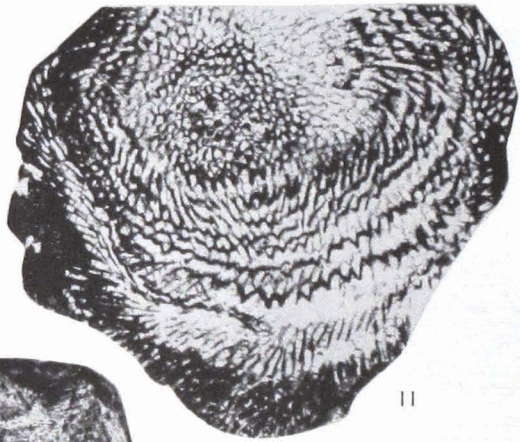
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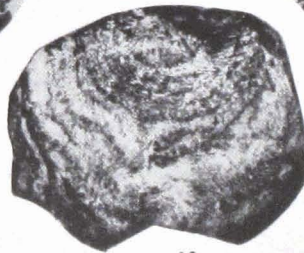
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PLANCHE 4

Cyphoterorhynchus koraghensis (Reed, F.R.C., 1922) (p. 55)

Fig. 1a-e. - Spécimen n. 1773 (localité 55 PD - 77).

Vues ventrale, dorsale, apicale, frontale et latérale. Formule des plis: $\frac{7}{6} \frac{1-1}{1-1}$; ?.

Grossissement: $\times 1$.

» 2a-e. - Spécimen n. 1777 (localité 55 PD - ?).

Vues ventrale, dorsale, apicale, frontale et latérale. Formule des plis: $\frac{6}{5} \frac{1-1}{1-1} \frac{15}{?}$.

Grossissement: $\times 1$.

» 3a-e. - Spécimen n. 1770 (localité 55 PD - 77).

Vues ventrale, dorsale, apicale, frontale et latérale. Formule des plis: $\frac{6}{5} \frac{1-1}{1-1} \frac{13}{14}$.

Grossissement: $\times 1$.

» 4a-e. - Spécimen n. 1771 (localité 55 PD - 77).

Vues ventrale, dorsale, apicale, frontale et latérale. Formule des plis: $\frac{6}{5} \frac{1-1}{1-1} \frac{14}{15}$.

Grossissement: $\times 1$.

» 5a-e. - Spécimen n. 1769 (localité 55 PD - 78).

Vues ventrale, dorsale, apicale, frontale et latérale. Formule des plis: $\frac{4}{3} \frac{2-2}{2-2}$; 10.

La fig. 5a montre le champ musculaire ventral au grossissement: $\times 2$. Grossissement des fig. 5b-e: $\times 1$.

» 6. - Spécimen n. 1778 (localité 55 PD - 77).

Vue dorsale d'un spécimen large. Grossissement: $\times 1$.

» 7. - Spécimen n. 1775 (localité 55 PD - 77).

Vue ventrale d'un spécimen large. Grossissement: $\times 1$.

» 8. - Même spécimen que celui des fig. 3a-e., incliné de façon à montrer le champ musculaire dorsal. Grossissement: $\times 2$.



1 a



1 b



1 c



1 d



1 e



2 a



2 b



2 c



2 d



2 e



3 a



3 b



3 c



3 d



3 e



4 a



4 b



4 c



4 d



4 e



5 a



5 b



5 d



6



7



5 c



5 e



8

PLANCHE 5

Cyphoterorhynchus koraghensis (Reed, F.R.C., 1922) (p. 55)

Sections s eri ees transverses dessin ees   l'aide de la chambre claire; les distances, en millim etres, sont mesur ees depuis le sommet de l'umbo ventral.

A. - Sp ecimen n. 1772 (localit e 55 PD - 77).

B. - Sp ecimen n. 1776 (localit e 55 PD - 78).

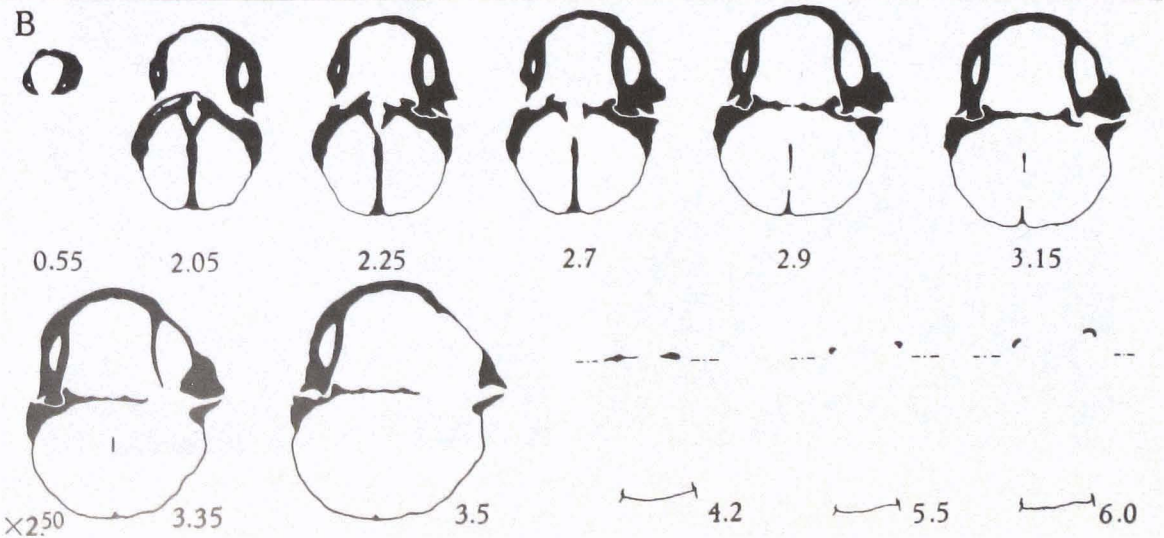
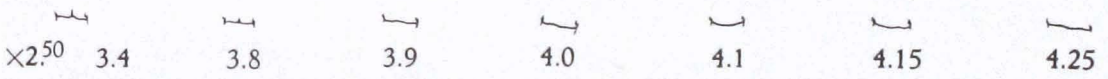
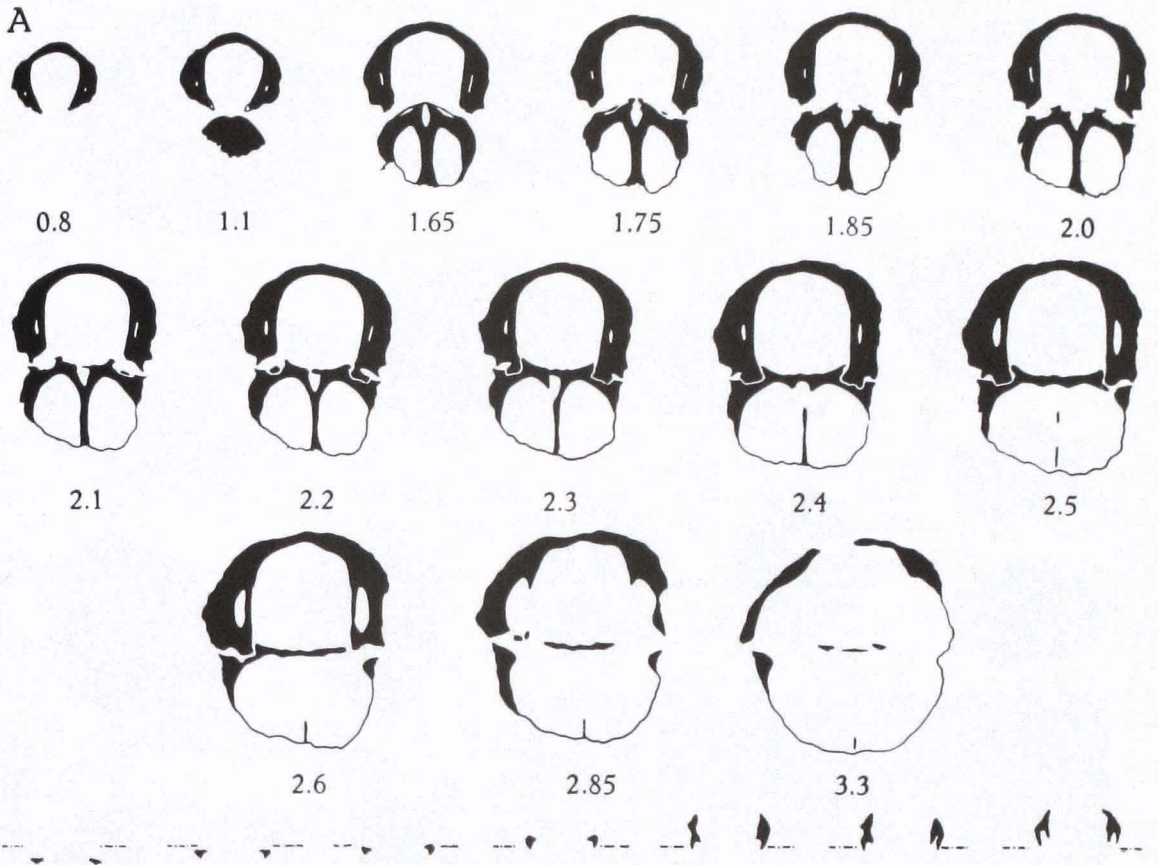


PLANCHE 6

Fig. 1-21. - *Cyrtospirifer pamiricus* (C. Reed, 1922) . . . p. 69

Localité: Kuragh 55 PD-77.

Position stratigraphique: Dévonien supérieur (Frasnien supérieur?).

Fig. 1-18. - Série ontogénique de spécimens de la Forme I. $\times 1$.

- » 1- 3. - Spécimen n. 1751.
1. Valve dorsale presque entièrement décortiquée avec bourrelet peu élevé large, de section arrondie. Il paraît lisse en moule interne mais les traces des côtes sont marquées au bord marginal; 2. Valve ventrale avec un peu de coquille conservée près du crochet. Le sinus est large et peu profond; 3. Profil montrant un début de mucronation.
- » 4- 6. - Spécimen n. 1752.
4. Valve dorsale avec bourrelet peu apparent; 5. Valve ventrale avec test conservé mais ayant déjà subi une certaine exfoliation; 6. Profil montrant le développement de l'aréa ventrale.
- » 7- 9. - Spécimen n. 1753.
7. Valve dorsale fortement corrodée avec bourrelet nettement limité par des sillons bordiers; 8. Valve ventrale avec traces de test. Le moule interne porte l'empreinte des côtes radiales; 9. Profil.
- » 10-12. - Spécimen n. 1754.
10. Valve dorsale; 11. Valve ventrale décortiquée avec traces du myoglyphe dans le moule interne; 12. Profil.
- » 13-15. - Spécimen n. 1755.
13. Valve dorsale décortiquée, avec un peu de test conservé près du crochet; 14. Valve ventrale entièrement décortiquée, montrant l'empreinte du myoglyphe dans le moule interne; 15. Profil.
- » 16-18. - Spécimen n. 1756.
16. Valve ventrale; 17. Valve dorsale légèrement défoncée; 18. Profil.
- » 19. - Microsculpture microépineuse conservée dans le spécimen n. 1767 (Forme II). $\times 7$.
- » 20. - Section polie perpendiculaire au plan de symétrie bilatérale dans le crochet dorsal du spécimen n. 1764, montrant le processus cardinal bifide et en surplomb dans le notothyrium. $\times 3,5$.
- » 21. - Aréa ventrale et sa microsculpture, spécimen n. 1752. $\times 3,5$.

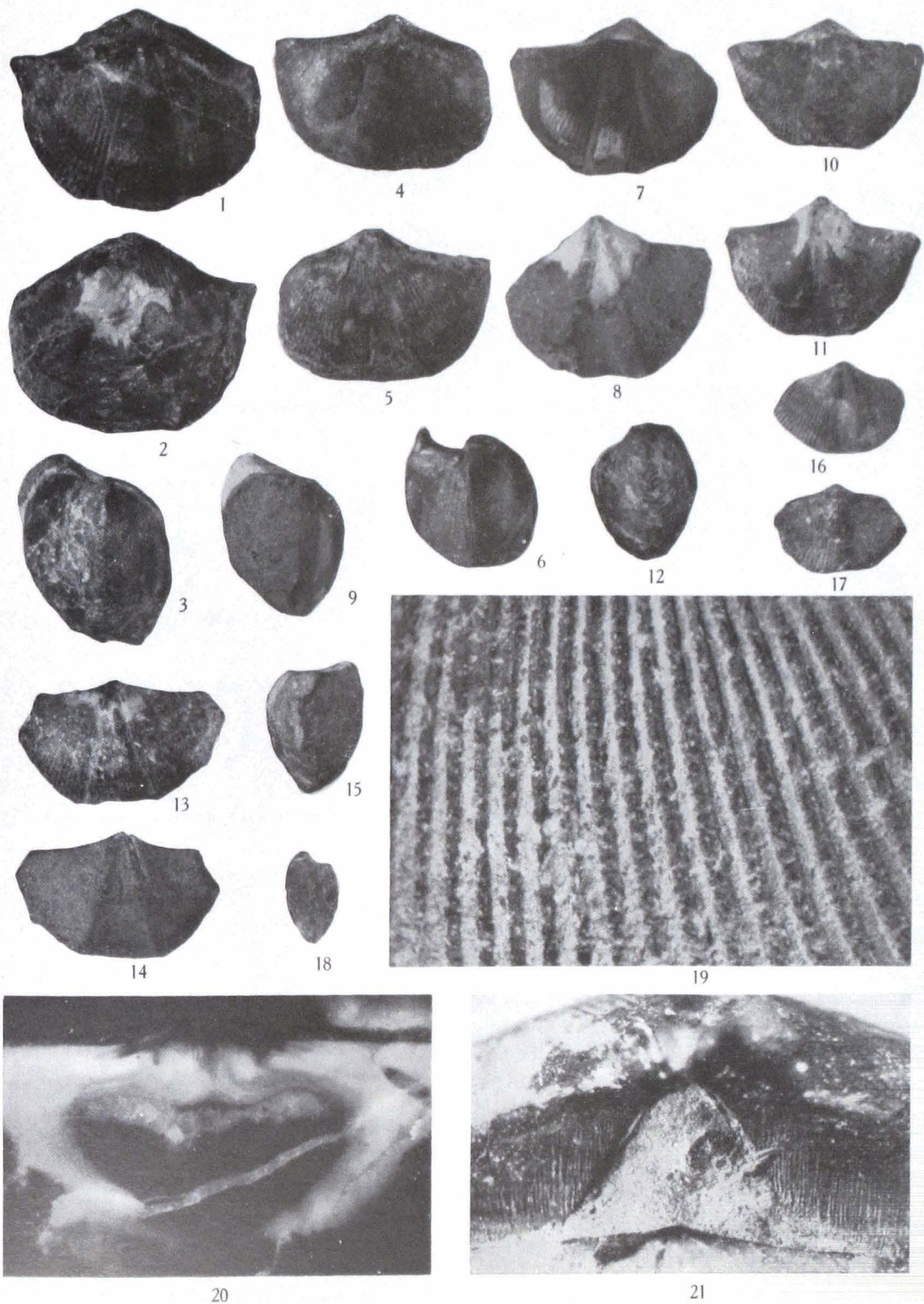


PLANCHE 7

Fig. 1-18. - *Cyrtospirifer pamiricus* (C. Reed, 1922) . . . p. 69

Localité: Kuragh 55 PD - 77.

Position stratigraphique: Dévonien supérieur (Frasnien supérieur?).

Fig. 1-18. - Série ontogénique de spécimens de la Forme II. $\times 1$.

» 1- 3. - Spécimen n. 1757.

1. Valve dorsale encroûtée; 2. Valve ventrale avec sinus large et peu profond;
3. Profil montrant la forte courbure de l'aréa ventrale.

» 4- 6. - Spécimen n. 1758.

4. Valve dorsale décortiquée; 5. Valve ventrale avec traces du myoglyphe
dans le moule interne; 6. Profil.

» 7- 9. - Spécimen n. 1759, un peu déformé.

7. Valve dorsale décortiquée; 8. Valve ventrale décortiquée avec traces du myo-
glyphe dans le moule interne; 9. Profil.

» 10-12. - Spécimen n. 1760.

10. Valve dorsale avec bourrelet obsolète; 11. Valve ventrale avec ébauche de
mucronation cardinale; 12. Profil.

» 13-15. - Spécimen n. 1761.

13. Valve dorsale décortiquée avec bourrelet obsolète; 14. Valve ventrale en
moule interne; 15. Profil.

» 16-18. - Spécimen n. 1762.

16. Valve dorsale avec bourrelet obsolète; 17. Valve ventrale avec aréa en-
croûtée; 18. Profil.

Fig. 19-21. - *Cyrtospirifer mastujensis* (C. Reed, 1922) . . . p. 75

Spécimens n. 1763.

Localité: Shogran 55 PD-71.

Position stratigraphique: Dévonien supérieur (Frasnien supérieur?).

Fig. 19. - Valve dorsale avec microsculpture conservée. $\times 1$.

» 20. - Valve ventrale avec microsculpture. $\times 1$.

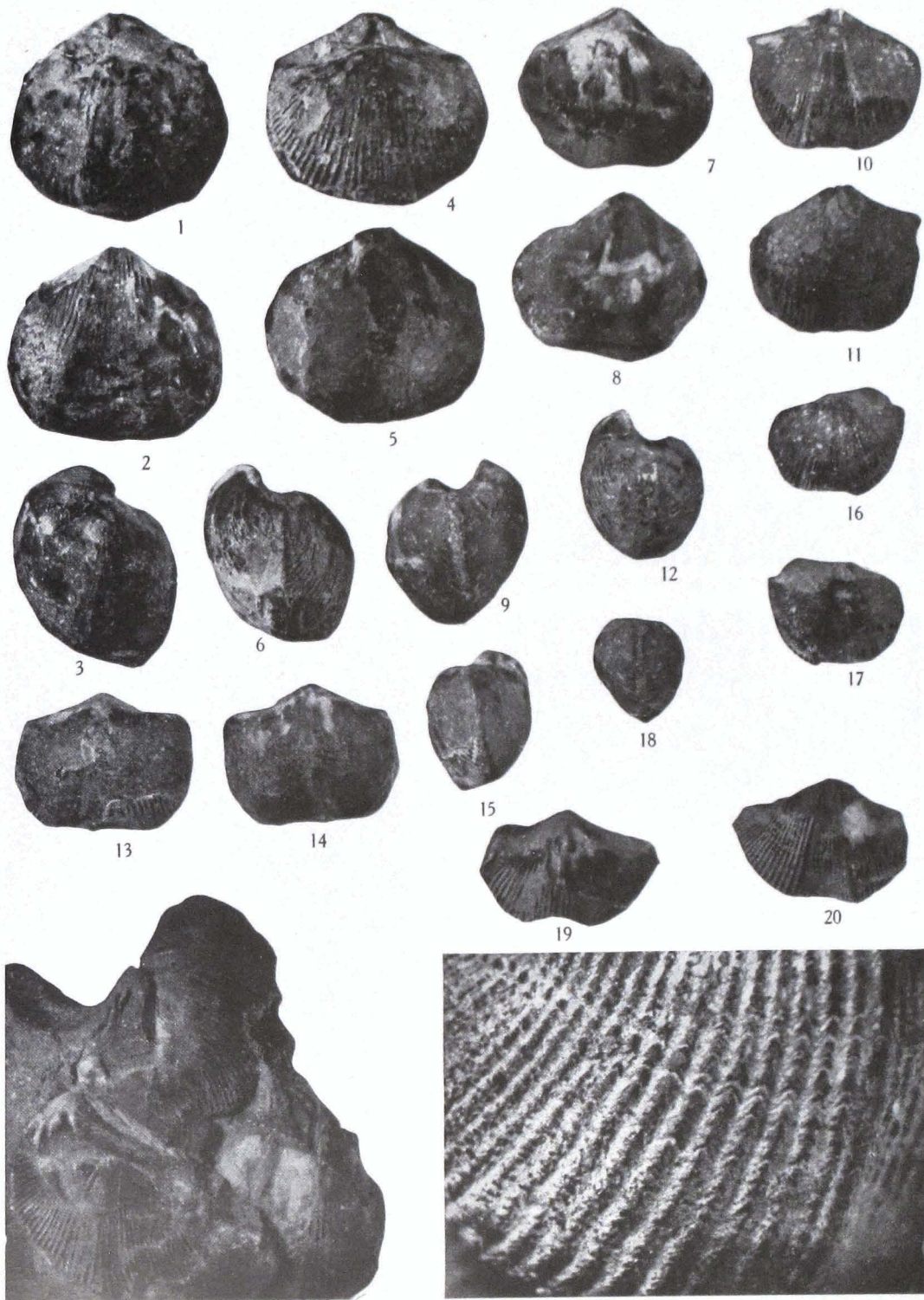
» 21. - Microsculpture microépineuse de la valve ventrale. $\times 5$.

Fig. 22. - *Cyrtospirifer* cf. *verneuili* (R. I. Murchison, 1840) p. 75

Bloc avec quelques spécimens engagés dans la roche, n. 1768. $\times 1$.

Localité: Kuragh 55 PD-76.

Position stratigraphique: Dévonien supérieur (Frasnien supérieur?).



22

21

PLATE 8

Epimastopora hunzaensis sp.n. (p. 84)
(longitudinal sections)

- Fig. 1. - It can be noted the cylindrical form of branches and their disposition in only one series. Sl. M44/1; $\times 45$.
- » 2. - Oblique section showing an irregular disposition of the pores, having here, according to the orientation of the section, a lengthened irregular form. Sl. M44/7; $\times 30$.
 - » 3. - The branches, at first disposed in one only series, acquire afterwards a biseriate disposition. Sl. M44/6; $\times 43$.
 - » 4. - The branches, disposed in one only series, have cylindrical or slightly conical form, this probably owing to ricrystallization. Sl. M44/16; $\times 46$.
 - » 5. - The specimen is showing a branch, at first cylindrical, afterwards bifurcating itself. Sl. M44/9a; $\times 45$.
 - » 6. - Cylindrical form of the branches and strictly monoseriate disposition. Thallus slightly bendind. Sl. M46/4; $\times 30$. (Holotype).

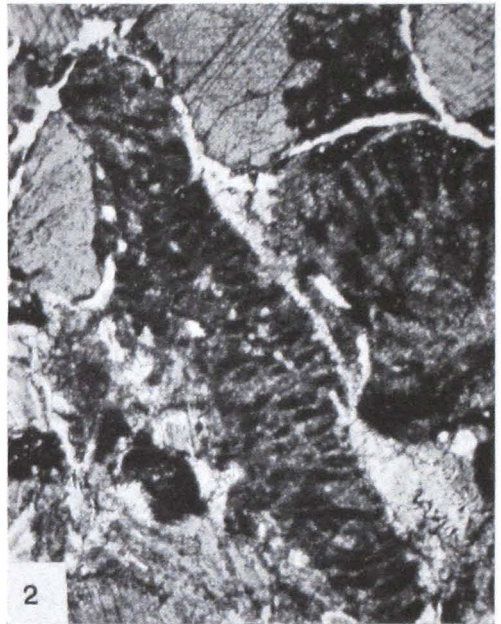


PLATE 9

Epimastopora hunzaensis sp.n. (p. 84)

(cross sections)

- Fig. 1. - The thallus is showing the circular form of the pores which are presenting a roughly alternate disposition. Sl. M43/13; $\times 43$.
- » 2. - Slightly oblique cross section, as the lengthened pores are showing, with an irregularly alternate disposition, Sl. M44/12; $\times 70$.
 - » 3. - The size of pores' diameter is slightly inferior than the one seen in other specimens. Sl. M46/9; $\times 44$.
 - » 4. - Thallus having undetermined contour line and circular pores. Sl. M44/6; $\times 41$.
 - » 5. - Thallus with circular or slightly elliptical pores, in roughly alternate disposition Sl. M44/10; $\times 44$.
 - » 6. - Cross and partly oblique section. Thallus is here showing a remarkable length Sl. M44/11a; $\times 33$.

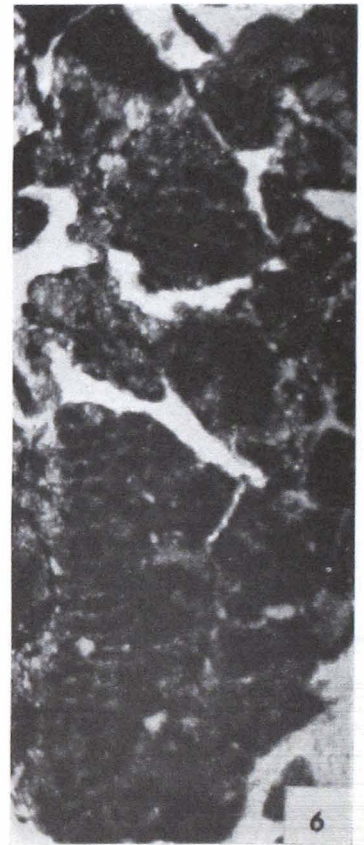
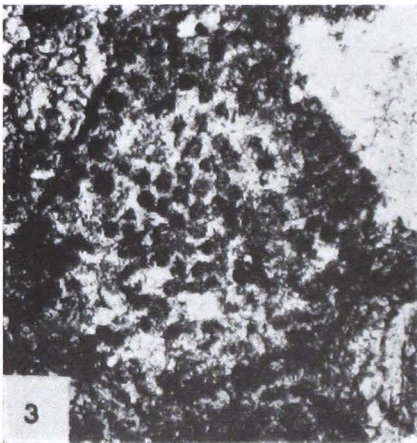
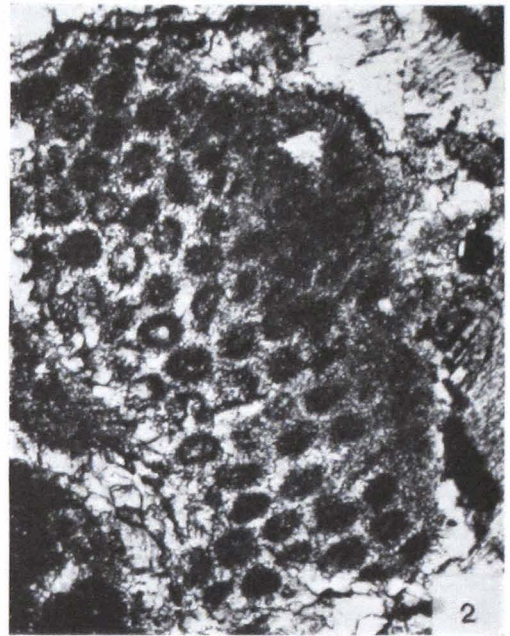
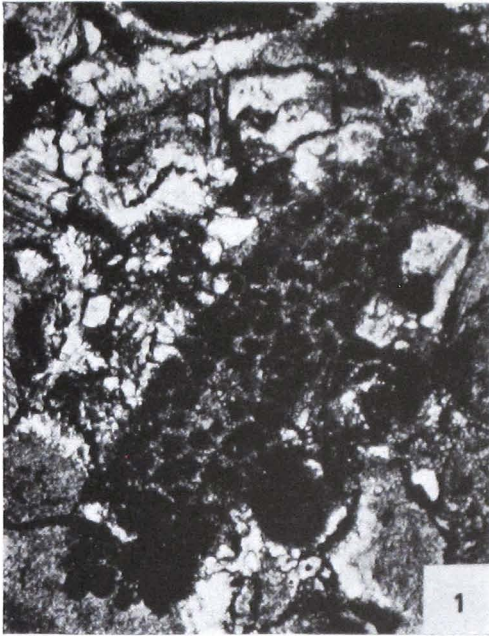


PLATE 10

- Fig. 1. - Bryozoan dolomitic biosparite. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 10.
c = *Climacamina* sp. 2, section almost parallel with the axis. p. 107
m = *Monodiezodina* ? sp., oblique axial section. p. 106
n = *Nankinella* aff. *quasihunanensis* Sheng, oblique transversal section. p. 96
- » 2. - Fusulinid dolomitic biosparite. Hajashitk, Chapursan Valley, S. 62 PM-46; \times 10.
p. 93

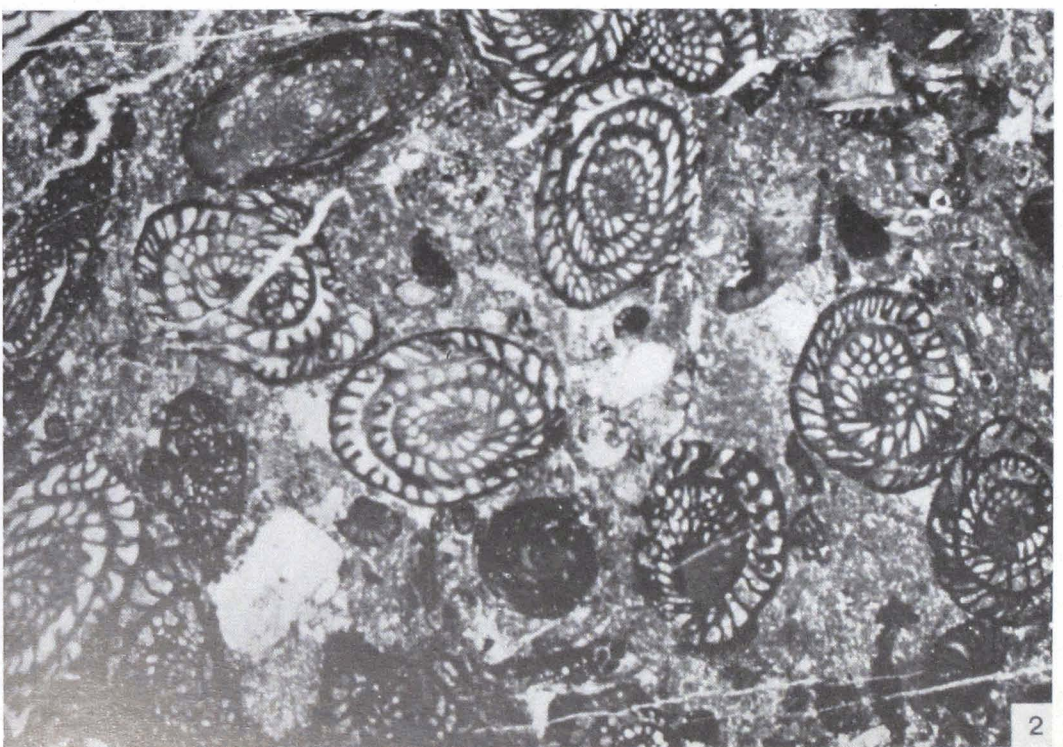
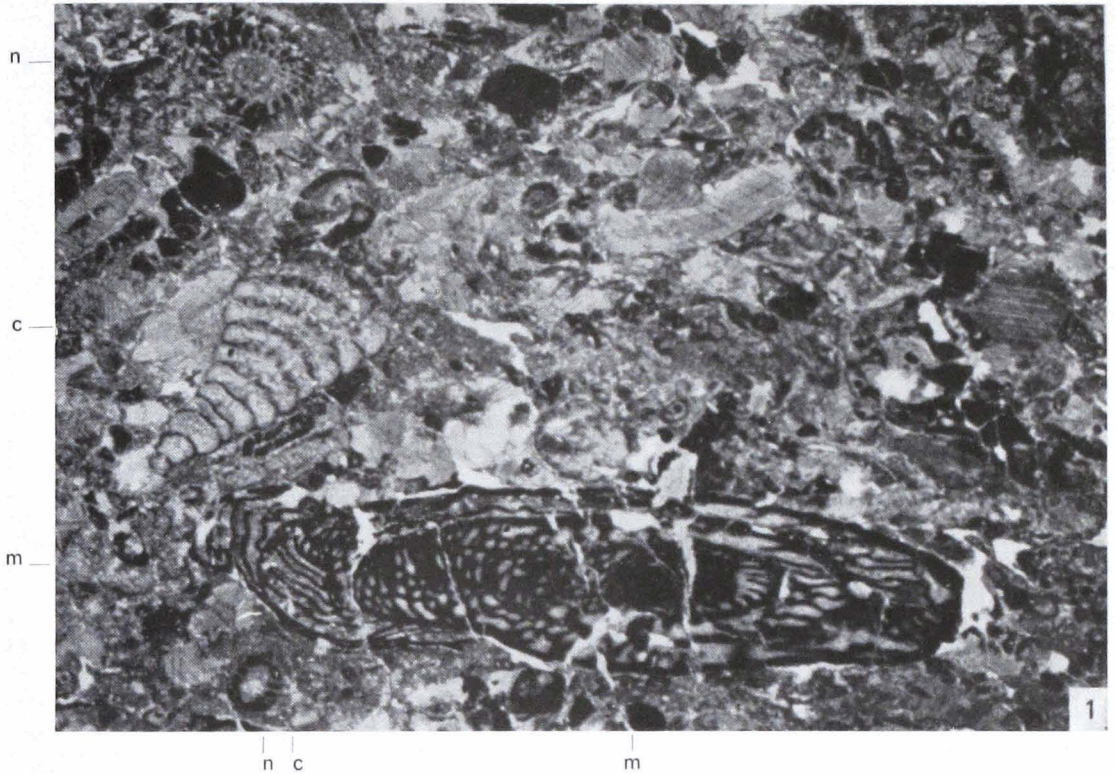


PLATE 11

- Fig. 1. - *Pseudofusulina* cf. *buranchini* Rauser-Chernousova. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 23. p. 101
- » 2. - *Pseudofusulina* sp. 3. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 23. p. 105
- » 3. - Fusulinid dolomitic biosparite. Hajashitk, Chapursan Valley, S. 62 PM-46; \times 10. p. 93

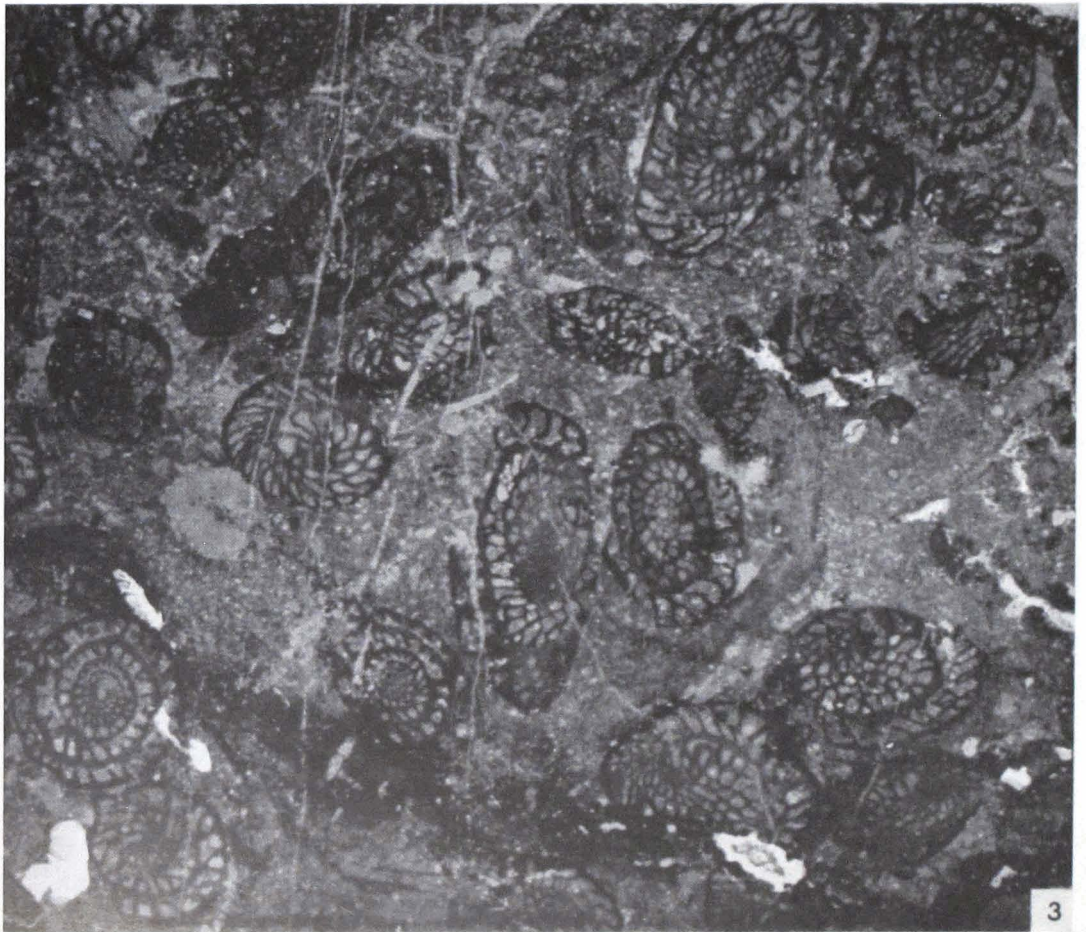
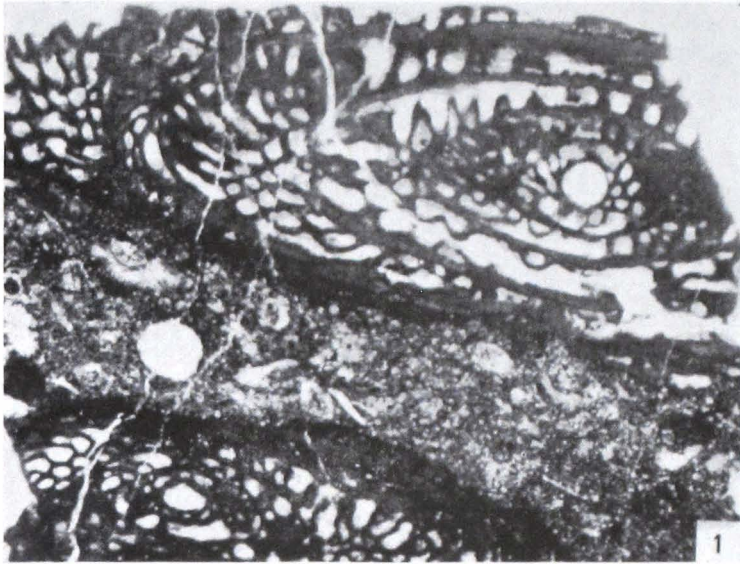


PLATE 12

- Fig. 1. - *Nankinella* sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique transversal section; \times 50. p. 97
- » 2. - *Nankinella* aff. *quasihunanensis* Sheng. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique transversal section; \times 35. p. 96
- » 3. - *Nankinella* aff. *quasihunanensis* Sheng. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 30. p. 96
- » 4. - *Nankinella* sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique axial section; \times 70. p. 97
- » 5. - *Nankinella* aff. *quasihunanensis* Sheng. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique axial section; \times 35. p. 96
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- » 7. - *Schubertella* ? sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique axial section; \times 140.
- » 8. - First whorls of a Foraminifer belonging to the *Schubertellidae* (?). Hajashitk, Chapursan Valley, S. 62 PM-44; \times 145.
- » 9. - *Millerella* ? sp. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 70. p. 99
- » 10. - *Eostaffella* sp. 2. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 145. p. 99
- » 11. - *Eostaffella* sp. 1. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 200. p. 98

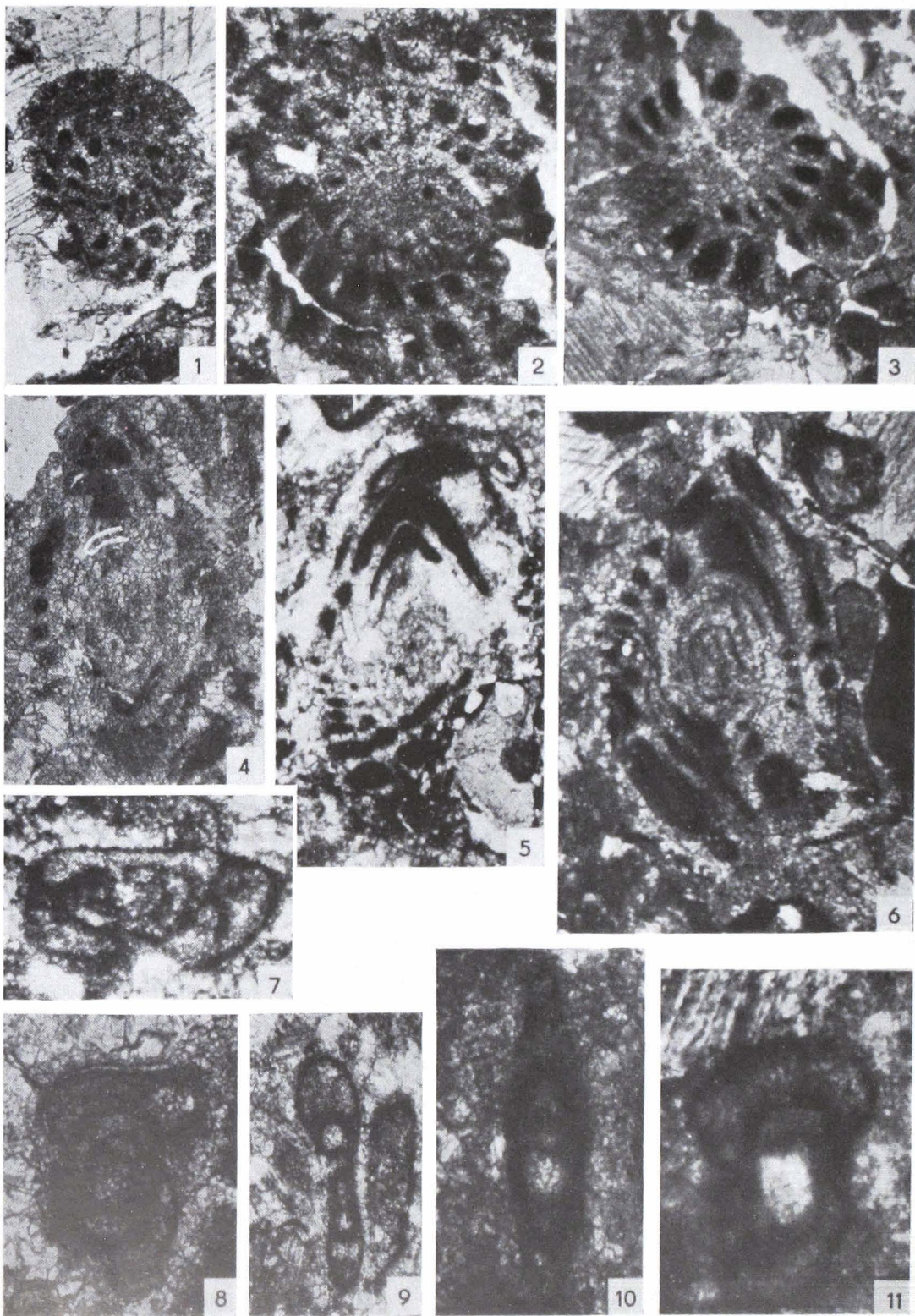


PLATE 13

- Fig. 1. - *Pseudofusulina* cf. *tschernyschewi* v. *ellipsoidalis* Chen. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; $\times 20$ p. 103
- » 2. - *Pseudofusulina* sp. Hajashitk, Chapursan Valley, S. 62 PM-46. Tangential section: tunnel and cuniculi are visible; $\times 12$ p. 105
- » 3. - *Pseudofusulina* sp. 2. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section not centered; $\times 14$ p. 104
- » 4. - First volutions of a Fusulinid (?). Hajashitk, Chapursan Valley, S. 62 PM-46; $\times 125$.
- » 5. - *Pseudofusulina* sp. 1. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; $\times 20$ p. 104
- » 6. - *Pseudofusulina* sp. Hajashitk, Chapursan Valley, S. 62 PM-46. Oblique axial section; $\times 12$.
- » 7. - *Pseudofusulina* cf. *paraconfusa* Rauser-Chernousova. Hajashitk, Chapursan Valley, S. 62 PM-44. Axial section; $\times 20$ p. 102
- » 8. - *Eostaffella* sp. Hajashitk, Chapursan Valley. S. 62 PM-46. Oblique axial section; $\times 80$.

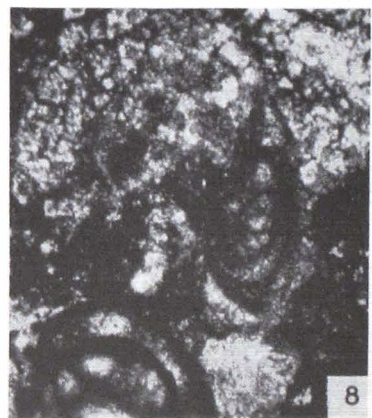
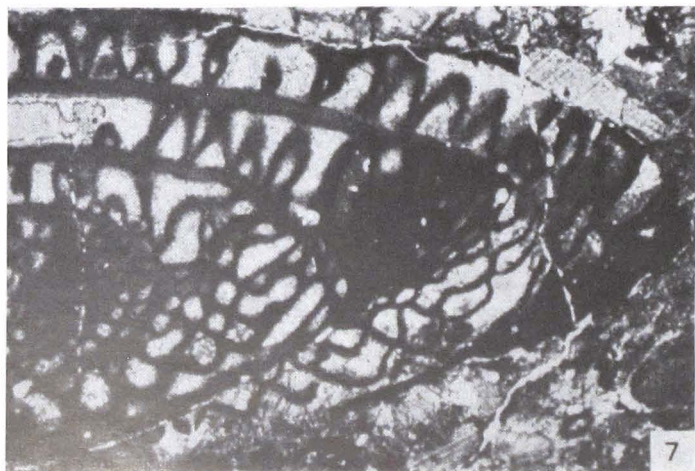
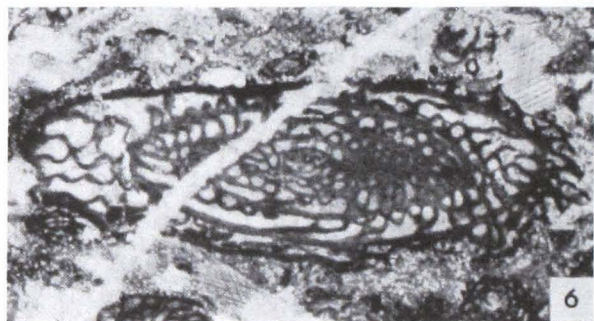
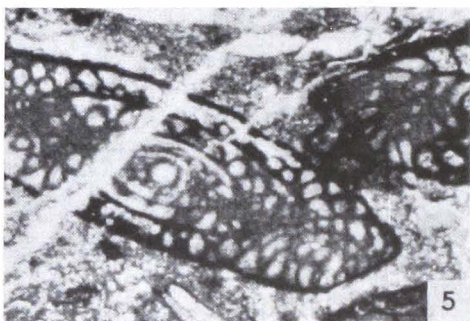
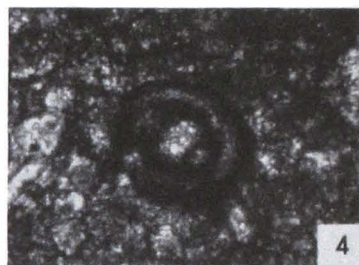
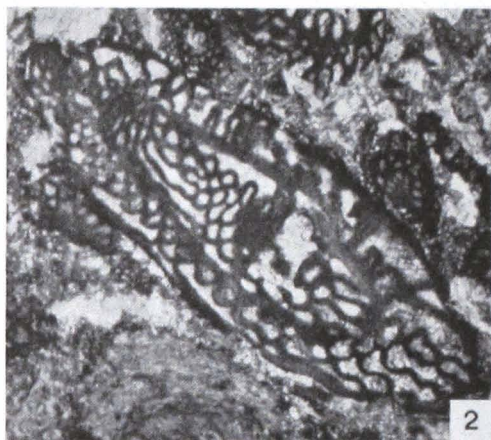
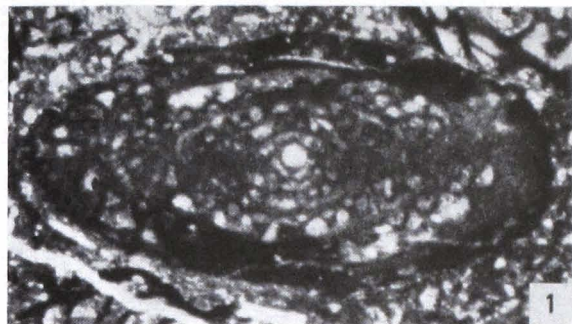


PLATE 14

- Fig. 1. - *Globivalvulina* sp. 1. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 130. p. 112
- » 2. - *Globivalvulina bulloides* (Brady). Hajashitk, Chapursan Valley, S. 62 PM-46; \times 70.
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- » 3. - *Globivalvulina graeca* Reichel. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 38.
p. 111
- » 4. - *Globivalvulina bulloides* (Brady). Hajashitk, Chapursan Valley, S. 62 PM-46; \times 55.
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- » 5. - *Globivalvulina bulloides* (Brady). Hajashitk, Chapursan Valley, S. 62 PM-46; \times 100.
p. 110
- » 6. - *Globivalvulina biserialis* Cushman & Waters. Hajashitk, Chapursan Valley, S. 62
PM-44; \times 70. p. 111
- » 7. - *Globivalvulina* sp. Hajashitk, Chapursan Valley, S. 62 PM-46; \times 70.
- » 8. - *Globivalvulina biserialis* Cushman & Waters. Hajashitk, Chapursan Valley, S. 62
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- » 9. - *Globivalvulina bulloides* (Brady) Hajashitk, Chapursan Valley, S. 62 PM-44; \times 85.
p. 110
- » 10. - *Globivalvulina vonderschnitti* ? Reichel. Hajashitk, Chapursan Valley, S. 62 PM-44;
 \times 30.

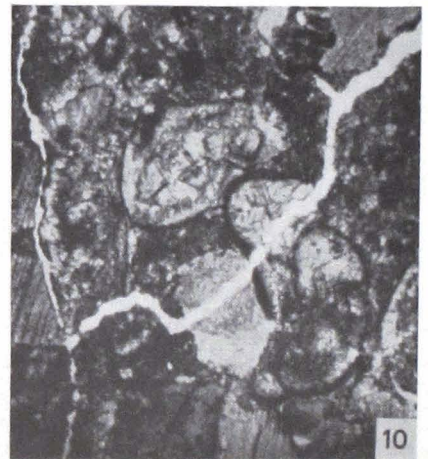
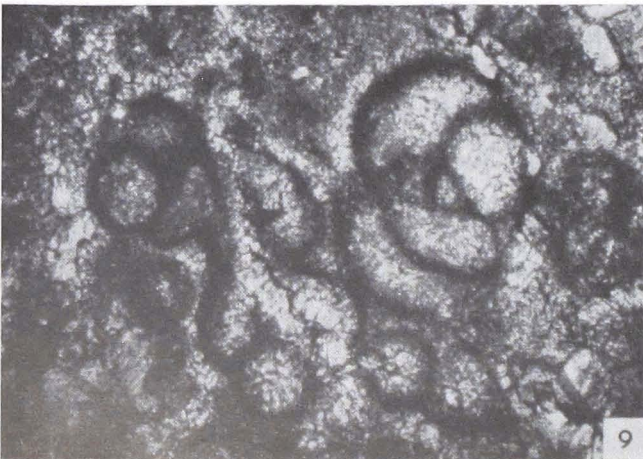
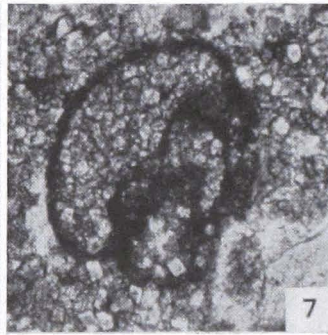
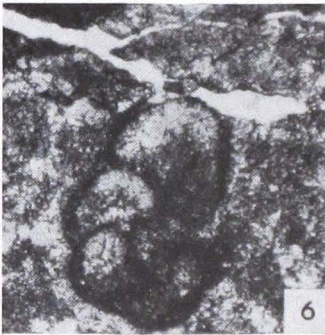
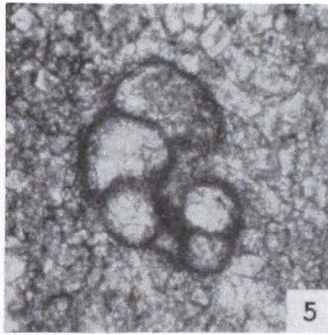
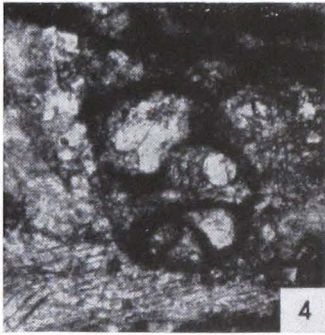
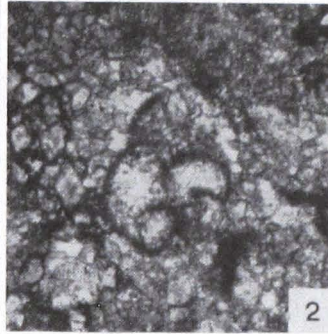
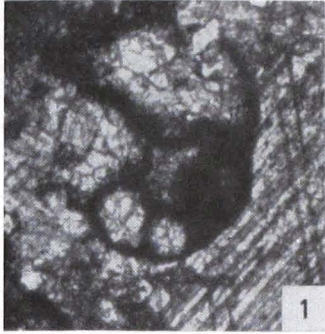


PLATE 15

- Figs. 1-5. - *Globivalvulina bulloides* (Brady). Hajashitk, Chapursan Valley. Figs. 1-4, S. 62 PM-44; fig. 5, S. 62 PM-46. p. 110
- » 6-11, 14, 15. - *Globivalvulina biserialis* Cushman & Waters. Hajashitk, Chapursan Valley. Fig. 6-10, 14, 15, S. 62 PM-44; fig. 11, S. 62 PM 46. p. 111
- » 12-13. - *Globivalvulina* sp. Hajashitk, Chapursan Valley. S. 62 PM-44.
- » 16-19. - *Globivalvulina graeca* Reichel. Hajashitk, Chapursan Valley. Fig. 16, 17, 19, S. 62 PM-44; fig. 18, S. 62 PM-46. p. 111
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PLATE 16

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- » 2. - *Textularia* sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Incomplete axial section; \times 60. p. 108
- » 3. - *Climacammina* sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Oblique section; \times 50.
- » 4. - *Tetrataxis conica* Ehrenberg. Hajashitk, Chapursan Valley, S. 62 PM-44. Axial section; \times 30. p. 108
- » 5. - *Tetrataxis conica* v. *lata* Spandel. Hajashitk, Chapursan Valley, S. 62 PM-44. Axial section; \times 145. p. 109
- » 6. - *Tetrataxis* sp. Hajashitk, Chapursan Valley, S. 62 PM-44. Subaxial section; \times 80.
- » 7. - *Nodosaria* sp. Hajashitk. Chapursan Valley, S. 62 PM-46; \times 70.
- » 8. - *Lagenidae*. Hajashitk, Chapursan Valley, S. 62 PM-46; \times 125.
- » 9. - *Geinitzina* sp. Hajashitk, Chapursan Valley, S. 62 PM 44; \times 70.
- » 10. - *Lagenidae* ? Hajashitk. Chapursan Valley, S. 62 PM-44; \times 70.

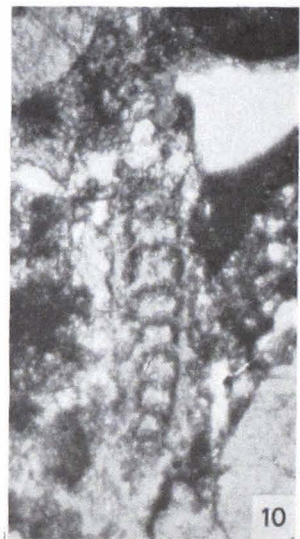
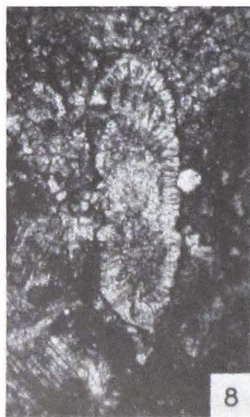
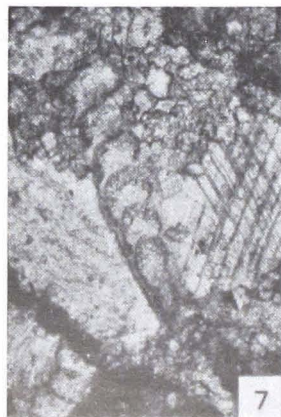
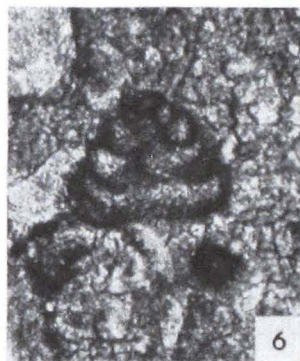
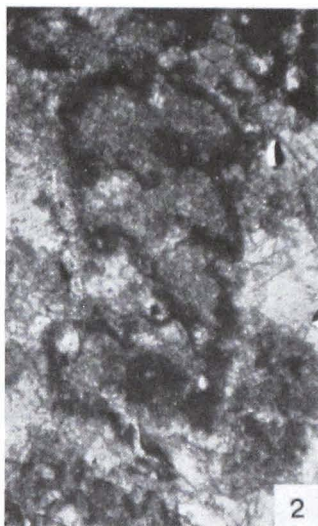


PLATE 17

- Fig. 1. - *Hemigordius ? pakistanus* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44. Holotype. Axial slightly oblique section; $\times 75$ p. 112
- » 2. - *Hemigordius ? pakistanus* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44. Paratype. Axial slightly oblique section; $\times 75$.
- » 3. - *Hemigordius ? pakistanus* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44. Paratype. Axial slightly oblique section; $\times 75$.
- » 4. - *Hemigordius ?* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44. Holotype. Axial slightly oblique section; $\times 70$ p. 114
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- » 6. - Probably oblique transversal section of *Hemigordius ?* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44; $\times 65$ p. 114
- » 7. - *Hemigordius ?* cf. *pakistanus* sp.n. Hajashitk, Chapursan Valley, S. 62 PM-44. Incomplete transversal section; $\times 70$ p. 112
- » 8. - *Lasiodiscus* sp.1. Hajashitk, Chapursan Valley, S. 62 PM 44. Axial slightly oblique section; $\times 70$.

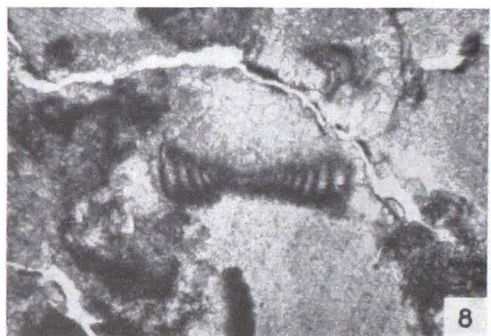
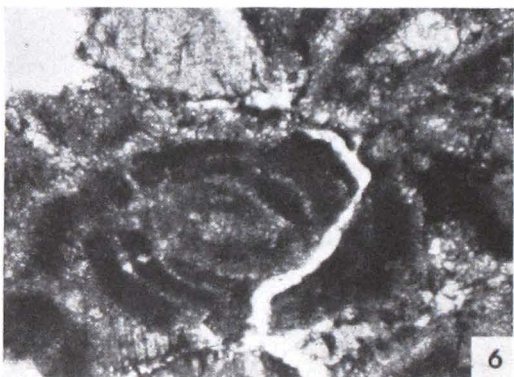
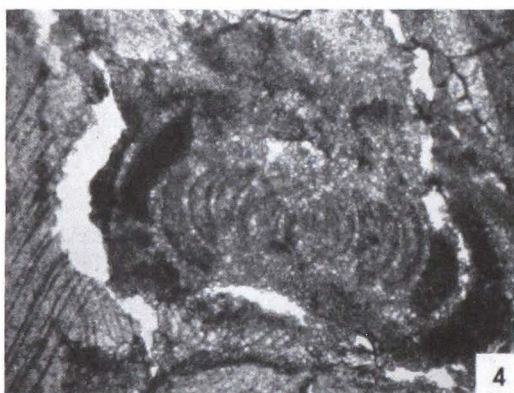
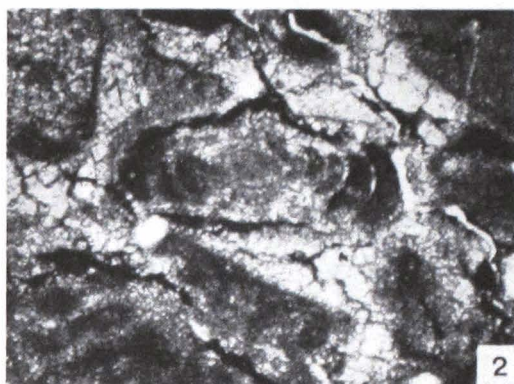
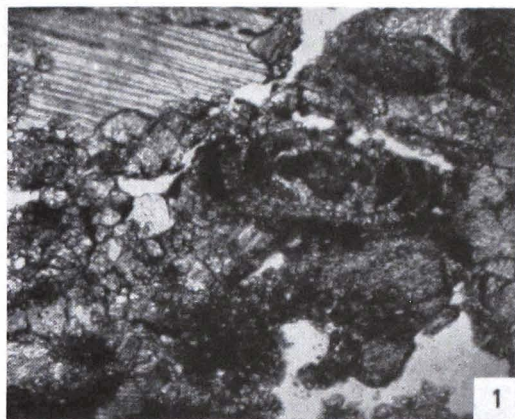


PLATE 18

- Fig. 1. - *Lasiodiscus* sp.1. Hajashitk, Chapursan Valley, S. 62 PM-46. Axial section; \times 175.
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- » 2. - *Lasiodiscus* sp. Hajashitk. Chapursan Valley. S. 62 PM-46. Oblique section; \times 105.
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- » 4. - *Lasiodiscus* sp. Hajashitk, Chapursan Valley, S. 62 PM-46; \times 130.
- » 5. - *Lasiodiscus* cf. *planus* M.-Maclay. Hajashitk, Chapursan Valley, S. 62 PM-44. Axial
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- » 7. - *Hemigordius* ? sp. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 125.
- » 8. - *Hemigordius* ? sp. Hajashitk, Chapursan Valley, S. 62 PM-44; \times 120.

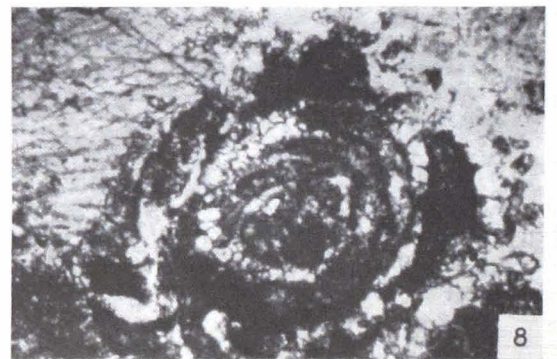
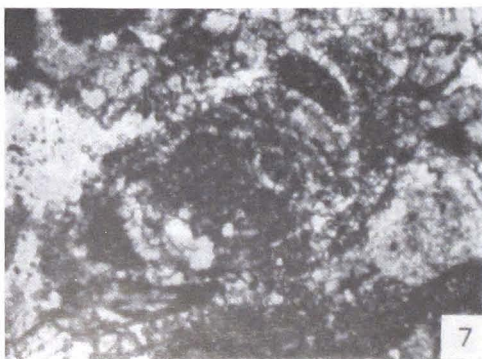
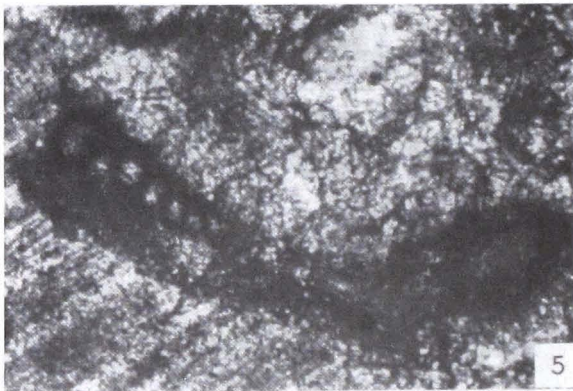
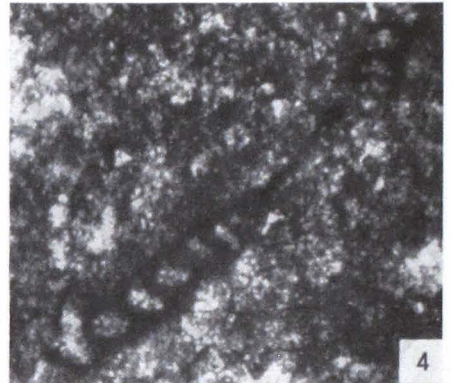
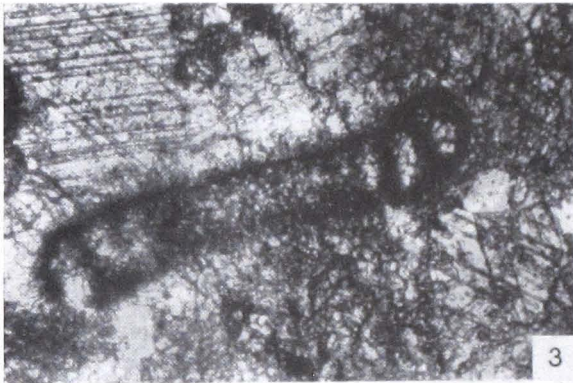
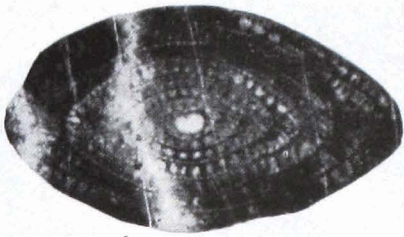
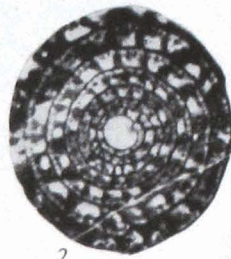


PLANCHE 19

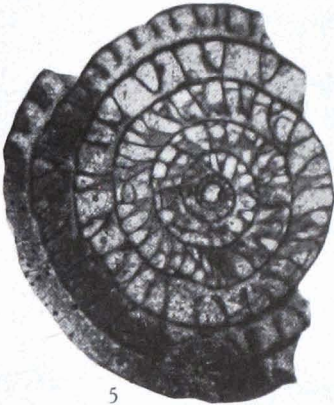
- Fig. 1. - *Afghanella schencki* Thompson. Gorges de la Bulola. Coupe axiale. $\times 20$ p. 129
- » 2. - Même espèce. Coupe équatoriale. $\times 20$.
- » 3. - *Verbeekina verbeeki* (Geinitz). Gorges de la Bulola. Coupe axiale montrant les variations d'épaisseur de la spirothèque. $\times 15$ p. 130
- » 4. - *Yangchienia haydeni* Thompson. Gorges de la Bulola. Coupe axiale légèrement oblique. $\times 20$ p. 129
- » 5. - *Paraschwagerina* sp. Glacier Staghar. Coupe équatoriale. $\times 10$ p. 131
- » 6. - Même espèce. Coupe axiale, pratiquée dans le plus grand spécimen de la fig. 7. $\times 20$.
- » 7. - Même espèce. Vue externe de trois spécimens, montrant le passage de la forme globuleuse d'un individu jeune à celle, fusiforme, des stades ultérieurs. $\times 5$.
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- » 10. - *Hemigordiopsis renzi* Reichel. Camp V Concordia - Glacier du Baltoro. Coupe axiale. $\times 15$ p. 131



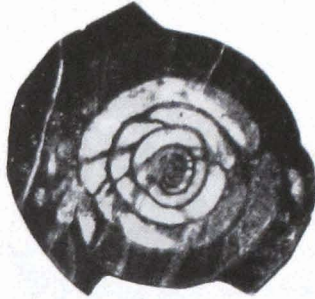
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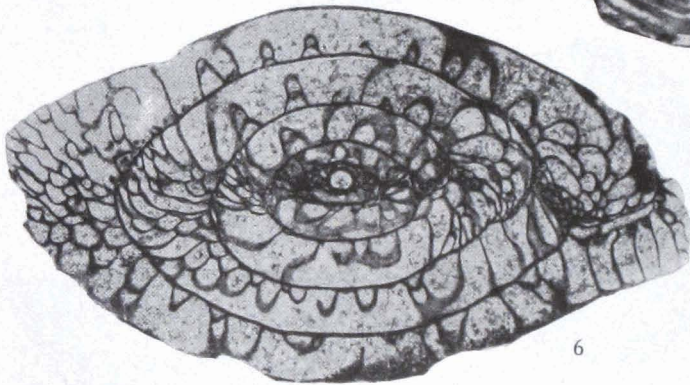
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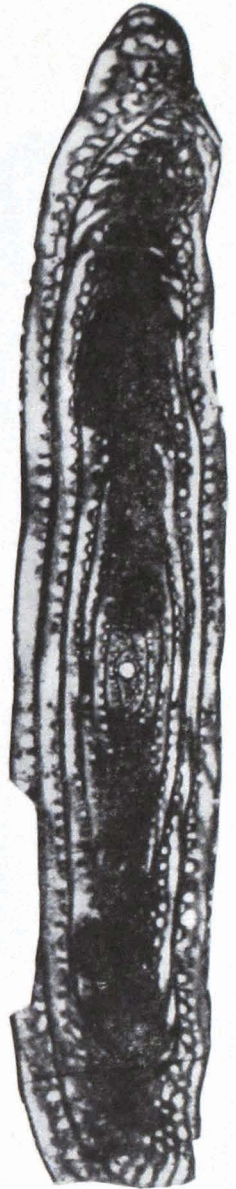
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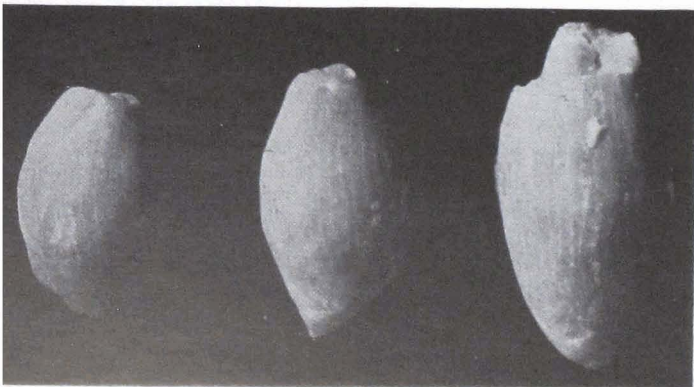
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PLATE 20

- Fig. 1. - *Neospirifer fasciger nitiensis* (Diener). Abgarch Valley. Pedicle valve; $\times 1.5$. p. 141
- » 2-3. - *Elivina tibetana* (Diener). Abgarch Valley. Respectively side and ventral views of the pedicle valve of a medium-sized specimen; $\times 1.5$ p. 142
- » 4-5. - *Elivina tibetana* (Diener). Abgarch Valley. Respectively side and ventral views of the pedicle valve of a small specimen; $\times 2$ p. 142
- » 6-7. - *Linoproductus lineatus* (Waagen). Abgarch Valley. Respectively ventral and side views of the pedicle valve; $\times 2$ p. 140
- » 8. - *Cancrinella cancriniformis* (Tschernyschew). Abgarch Valley. Lateral view of the pedicle valve; $\times 2$ p. 141
- » 9-10. - *Parallelodon desioi* sp.n. Abgarch Valley. Holotype. Respectively lateral and dorsal views of the left valve; $\times 2$ p. 144
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- » 13. - *Ditomopyge* ? *middlemissi* (Diener). Abgarch Valley. Pygidium; $\times 2$. p. 146

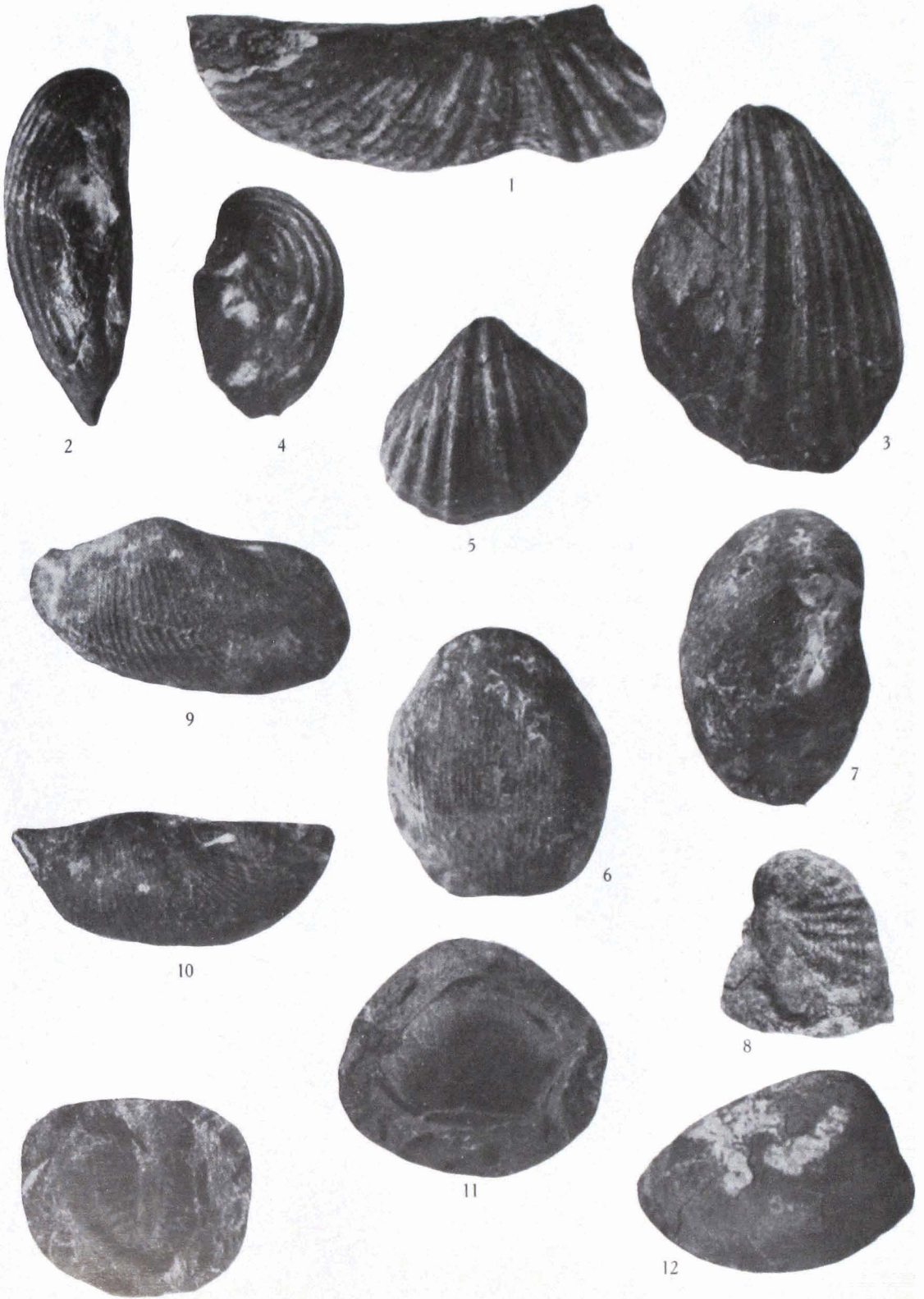


PLATE 21

- Fig. 1-3. - *Amplexocarinia* sp. Gasherbrum Gilga. Transversal section, side and longitudinal sections. $\times 1$ p. 169
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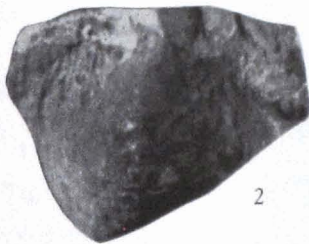
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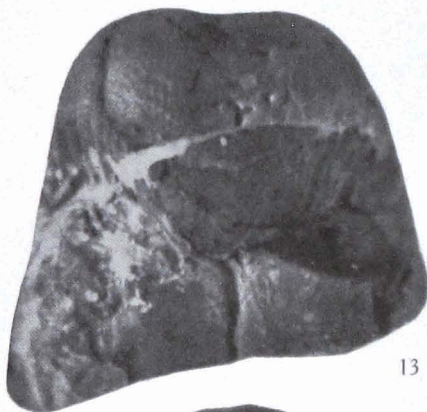
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PLATE 23

- Fig. 1. - *Chonetinella ? latesinuata* (Schellwien). Gasherbrum Gilga. Ventral view. $\times 1,5$. p. 191
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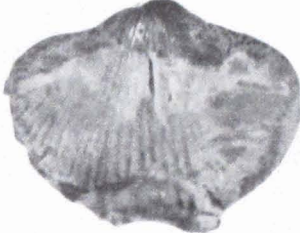
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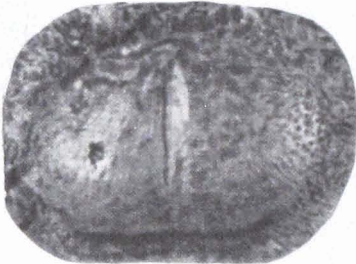
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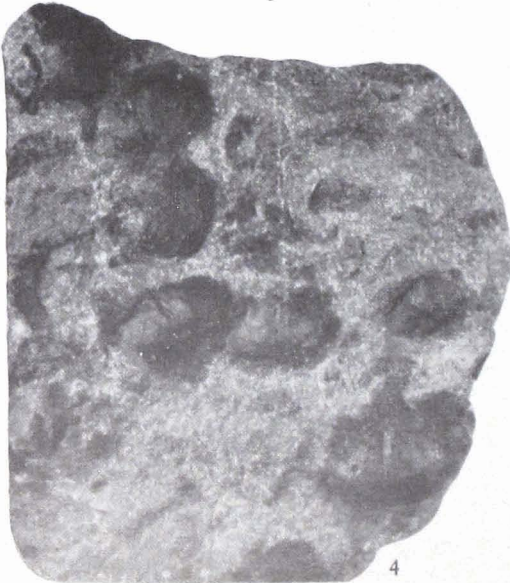
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PLATE 24

- Fig. 1-4. - *Neophricondothyris asiatica* (Chao). Staghar Glacier. Ventral, dorsal, posterior and side views. $\times 1$ p. 197
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- » 18. - *Gastrioceras* ? sp. ind. Staghar Glacier. $\times 1,5$ p. 210



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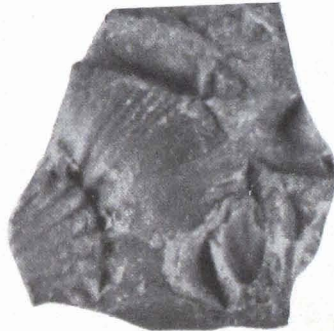
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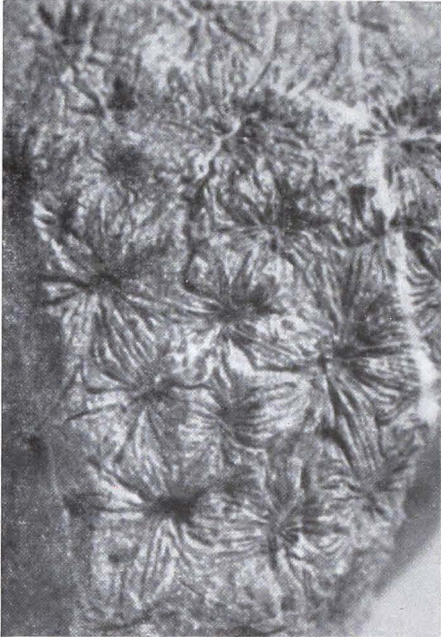
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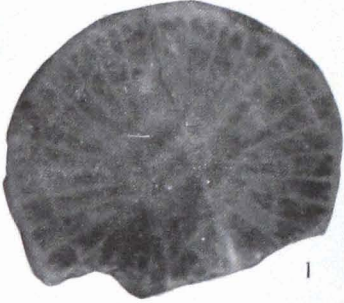
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PLATE 25

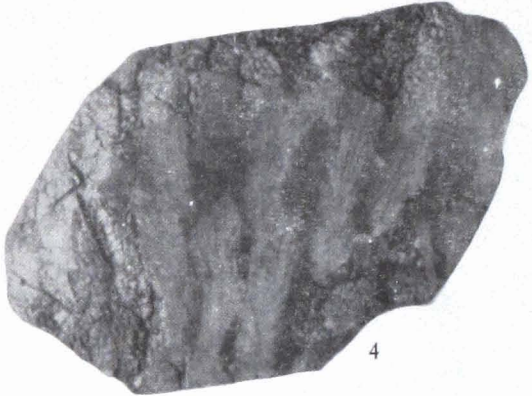
- Fig. 1. - *Macgeopsis* cf. *subcylindrata* Alloiteau. Confluence of the Sarpo Laggo Valley with the Shaksgam Valley. Transversal section. $\times 2.2$ p. 221
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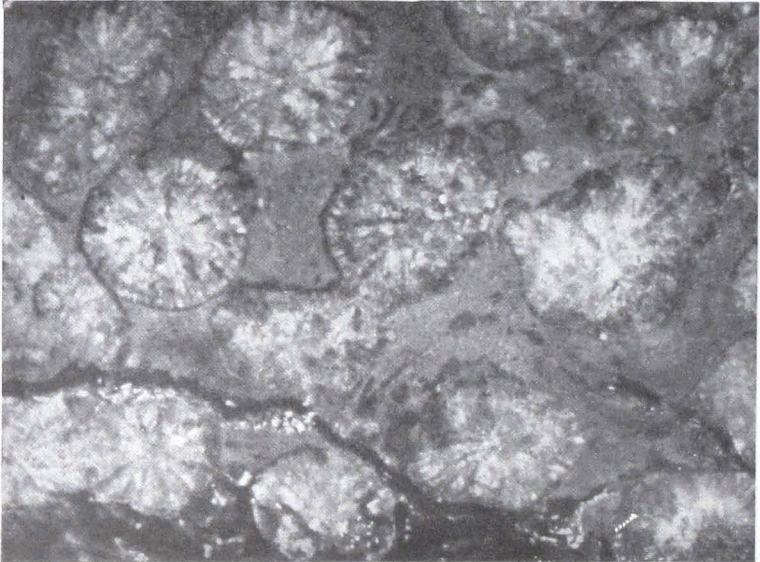
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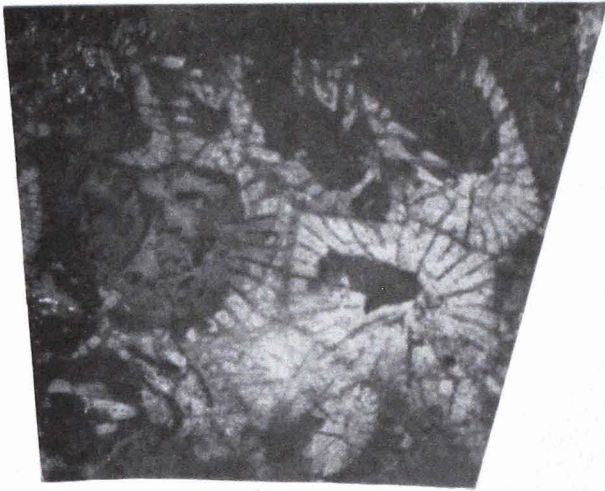
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PLATE 26

- Fig. 1. - *Thamnoseris froteana* Thurmann & Etallon. Confluence of the Sarpo Laggo Valley with the Shaksgam Valley. Transversal section. $\times 2$ p. 225
- » 2-3. - *Thecosmilia magna* Thurmann & Etallon. Confluence of the Sarpo Laggo Valley with the Shaksgam Valley. Respectively side and transversal section. $\times 0,7$ and $\times 1,5$ p. 224
- » 4-5. - *Dermosmilia* sp. Confluence of the Sarpo Laggo Valley with the Shaksgam Valley. Respectively transversal section and side. $\times 2$ p. 225



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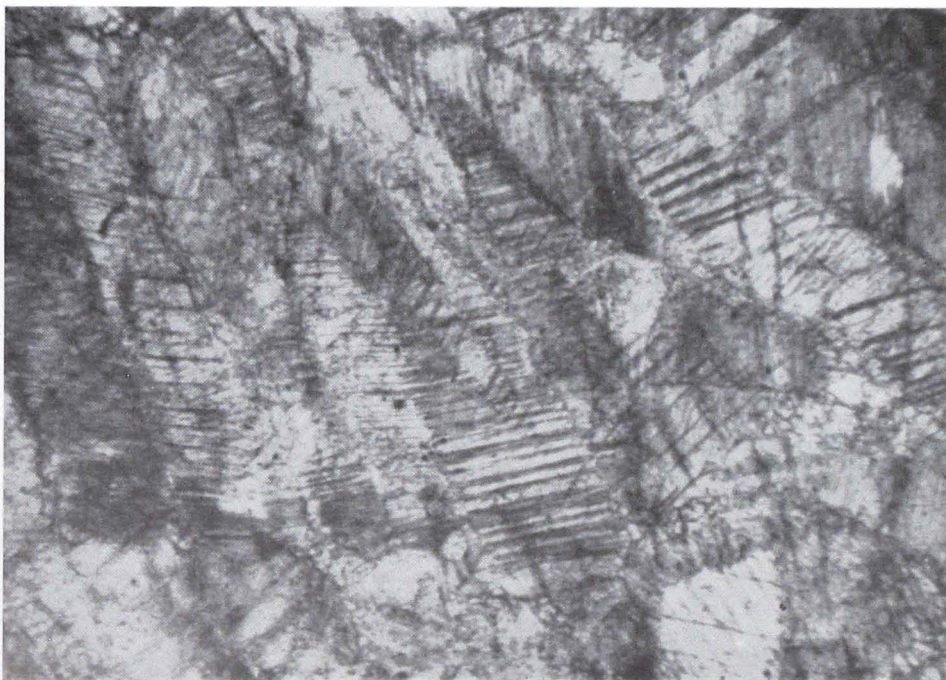
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TAVOLA 27

- Fig. 1. - Sezione trasversale del guscio di valva sinistra di *Horiopleura haydeni* Douvillé. Essa mostra la suddivisione del guscio in 3 strati; a partire dall'alto si riconosce: uno strato esterno fibroso, in cui sono visibili le tracce delle linee di accrescimento; uno strato intermedio anch'esso fibroso; uno strato interno molto più spesso dei precedenti, che mostra localmente (a destra, in alto, nella figura) struttura prismatica. (Luce polarizzata. $\times 15$) p. 235
- » 2. - Particolare della fig. 1. Strato interno a struttura prismatica. (Luce polarizzata. $\times 120$). p. 235



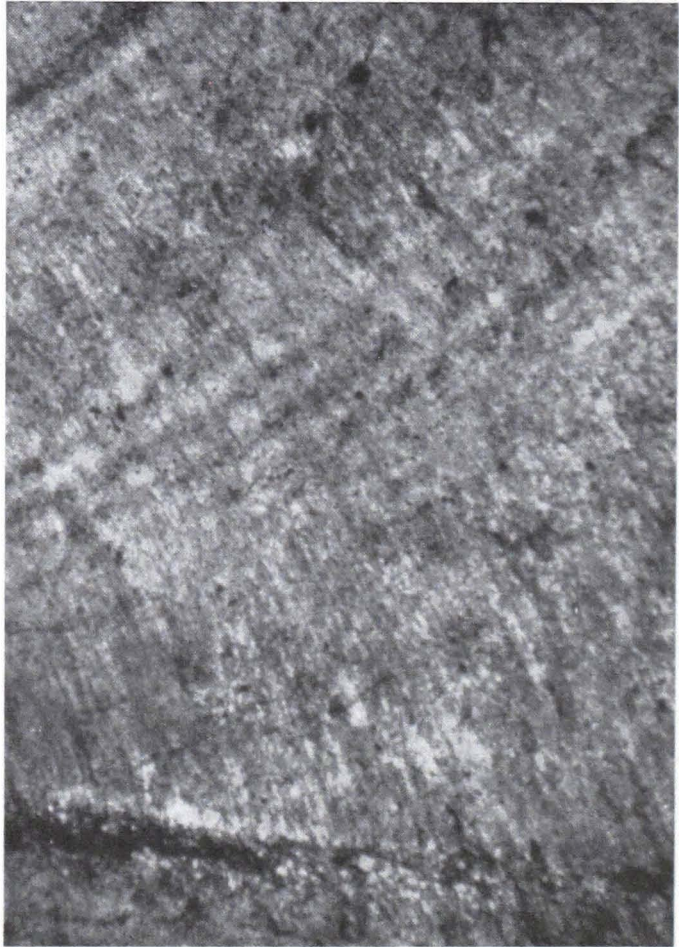
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TAVOLA 28

- Fig. 1. - Sezione trasversale del guscio di valva sinistra di *Horiopleura haydeni* Douvillé, analoga a quella della fig. 1 della Tav. 27. (Luce polarizzata, $\times 24$) p. 235
- » 2. - Particolare della fig. 1. Strato esterno fibroso: si notino le strutture a fibre e l'allungamento di queste in direzione perpendicolare alle linee di accrescimento. (Luce polarizzata, $\times 120$) p. 235



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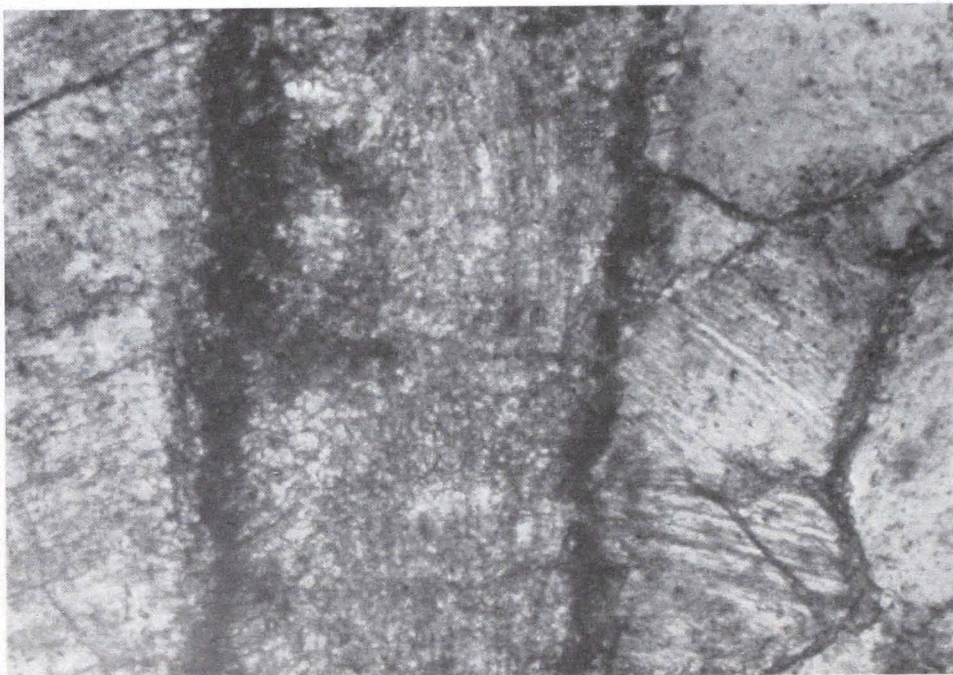
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TAVOLA 29

- Fig. 1. - Particolare della fig. 1 della Tav. 28. Strato intermedio: la struttura è a fibre incrociate (si noti l'andamento leggermente divergente dei diversi fasci di fibre) e l'allungamento delle fibre è trasversale rispetto a quello dello strato esterno (in alto nella figura. (Luce polarizzata, $\times 120$) p. 235
- » 2. - Particolare della fig. 1 della Tav. 27. Strato interno a struttura prismatica. (Luce polarizzata, $\times 120$) p. 235



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TAVOLA 30

- Fig. 1. - *Horiopleura desioi* n.sp. Olotipo visto dal lato postero-dorsale; è visibile il solco legamentare. p. 239
- » 2. - *Horiopleura desioi* n.sp. Olotipo visto dal lato ventrale; è visibile presso l'apice l'accenno di una fascia sifonale.
- » 3. - *Horiopleura desioi* n.sp. Paratipo: sezione trasversale di valva sinistra; sono visibili gli elementi cardinali, la lamina miofora posteriore, la superficie d'inserzione del muscolo anteriore, la cavità principale e la cavità accessoria posteriore.

Tutte le figure sono in grandezza naturale.



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TAVOLA 31

Fig. 1. - *Horiopleura desioi* n.sp. Olotipo: visto dal lato dorsale, con solco legamentare. p. 239

- » 2. - *Horiopleura desioi* n.sp. Olotipo: sezione trasversale della valva destra; sono visibili gli elementi mio-cardinali, la cavità principale e la cavità legamentare.
- » 3. - *Horiopleura desioi* n.sp. Olotipo: sezione trasversale della valva sinistra: sono visibili gli elementi mio-cardinali e le cavità principale e accessoria posteriore. All'estremità anteriore è incorporata una porzione della valva destra.

Tutte le figure sono in grandezza naturale.

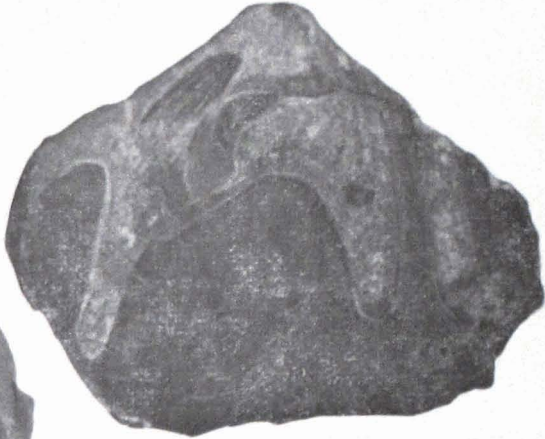


TAVOLA 32

- Fig. 1. - *Horiopleura desioi* n.sp. Sezione longitudinale di un paratipo bivalve eseguita presso il margine ventrale; sono visibili le lamine miofore posteriori delle due valve destra e sinistra. p. 239
- » 2. - *Horiopleura desioi* n.sp. Sezione longitudinale di un paratipo bivalve eseguita presso il margine dorsale; sono visibili le sezioni dei denti e delle lamine miofore posteriori delle due valve.
- » 3. - *Horiopleura desioi* n.sp. Sezione trasversale della valva sinistra di un paratipo; sono riconoscibili gli elementi mio-cardinali, la cavità principale e la cavità accessoria posteriore.

Tutte le figure sono in grandezza naturale.



TAVOLA 33

Fig. 1. - *Horiopleura desioi* n.sp. Paratipo bivalve I, visto dal lato ventrale; sono visibili le due fasce sifonali separate dall'interbanda. p. 239

» 2. - *Horiopleura desioi* n.sp. Paratipo bivalve I, visto dal lato posteriore.

Tutte le figure sono in grandezza naturale.

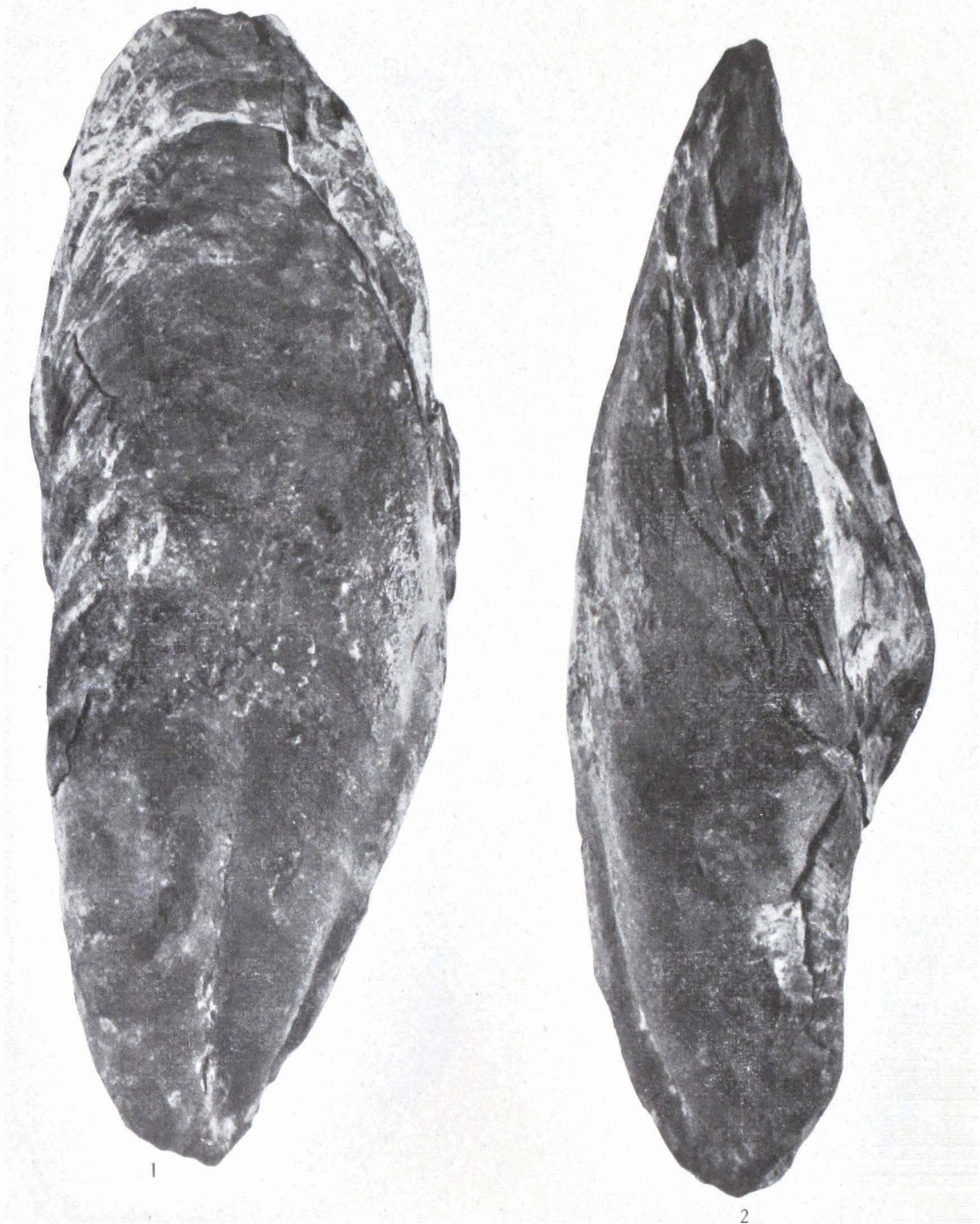


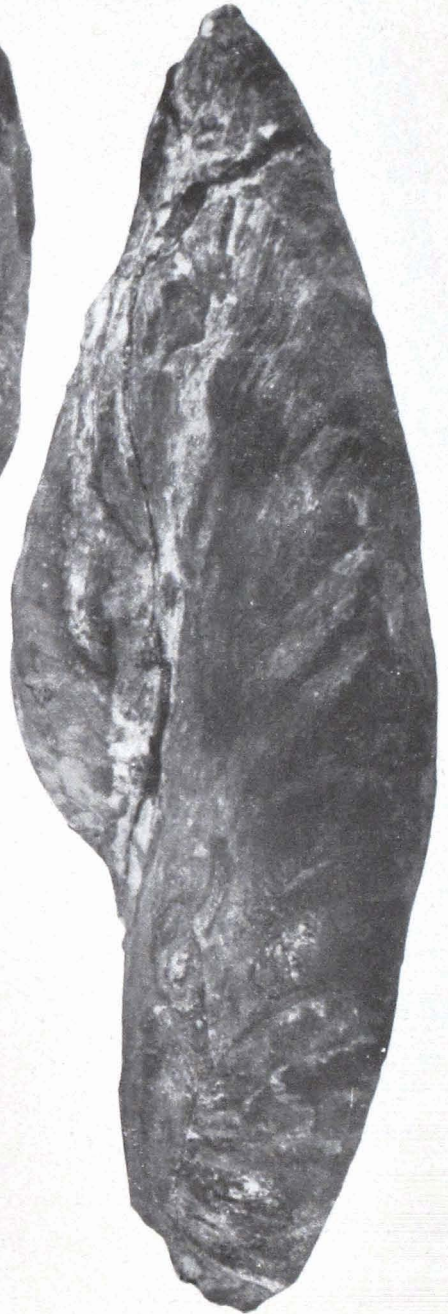
TAVOLA 34

- Fig. 1. - *Horiopleura desioi* n.sp. Paratipo bivalve I, visto dal lato anteriore. . . . p. 239
- » 2. - *Horiopleura desioi* n.sp. Paratipo bivalve II, visto dal lato dorsale; sono visibili il solco legamentare e le coste longitudinali granulose.

Tutte le figure sono in grandezza naturale.



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TAVOLA 35

Fig. 1. - *Horiopleura desioi* n.sp. Paratipo bivalve I, visto dal lato dorsale; è visibile il solco legamentare. p. 239

» 2. - *Horiopleura desioi* n.sp. Paratipo bivalve II, visto dal lato antero-dorsale.

Tutte le figure sono in grandezza naturale.



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TAVOLA 36

- Fig. 1. - *Horiopleura haydeni* Douvillé. Esemplare bivalve visto dal lato ventrale, parzialmente decorticato. p. 246
- » 2. - *Horiopleura haydeni* Douvillé. Lo stesso esemplare visto dal lato dorsale, con il solco legamentare.
- » 3. - *Horiopleura haydeni* Douvillé. Lo stesso esemplare visto dal lato posteriore.
- Tutte le figure sono in grandezza naturale.



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TAVOLA 37

- Fig. 1. - *Horiopleura haydeni* Douvillé. Esemplare bivalve visto dal lato dorsale, con tracce del solco legamentare. p. 246
- » 2. - *Horiopleura haydeni* Douvillé. Sezione trasversale di valva sinistra; sono evidenti gli elementi mio-cardinali, la cavità principale e la cavità accessoria posteriore.

Tutte le figure sono in grandezza naturale.



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TAVOLA 38

Fig. 1. - *Horiopleura haydeni* Douvillé. Sezione longitudinale di un esemplare bivalve tagliata presso il margine ventrale. Sono evidenti le apofisi miofore posteriori delle due valve.
p. 246

» 2. - *Horiopleura haydeni* Douvillé. Sezione longitudinale di un esemplare bivalve tagliata presso il margine dorsale. Sono riconoscibili gli elementi cardinali, la cavità principale, la cavità accessoria posteriore della valva sinistra e la cavità legamentare.

Tutte le figure sono in grandezza naturale.



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TAVOLA 39

- Fig. 1. - *Eoradiolites ? gilgitensis* (Douvillé). Valva destra. p. 251
- » 2. - *Eoradiolites ? gilgitensis* (Douvillé). Sezione trasversale della valva destra: sono riconoscibili la cresta legamentare e il dente 2 della valva destra, oltre alle sezioni dei denti 1 e 3 e delle apofisi miofore della valva sinistra.
- » 3. - *Cossmannea (Eunerinea) vogtiana* (de Mortillet). p. 253
- » 4. - *Cossmannea (Eunerinea) vogtiana* (de Mortillet). Sezione assiale dello stesso esemplare.
- » 5. - *Adiozoptysis coquandiana* (d'Orbigny). Esemplare identificabile con *A. renauxiana* (d'Orbigny) p. 255

Tutte le figure sono in grandezza naturale.



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TAVOLA 40

- Fig. 1. - *Adiozoptyx coquandiana* (d'Orbigny). p. 255
- » 2. - *Adiozoptyx coquandiana* (d'Orbigny). Sezione assiale dello stesso esemplare.
 - » 3. - *Adiozoptyx coquandiana* (d'Orbigny). Sezione assiale dell'esemplare identificabile con *A. renauxiana* (d'Orbigny) (v. Tav. 39, fig. 5).
 - » 4. - *Plesioptyx yasinensis* n.sp. Paratipo visto dal lato orale. p. 266
 - » 5. - *Plesioptyx yasinensis* n.sp. Lo stesso paratipo visto dal lato aborale.

Tutte le figure sono in grandezza naturale.



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TAVOLA 41

- Fig. 1. - *Plesioptyxis yasinensis* n.sp. Olotipo visto dal lato aborale. p. 266
- » 2. - *Plesioptyxis yasinensis* n.sp. Olotipo visto dal lato orale.
- » 3. - *Plesioptyxis yasinensis* n.sp. Paratipo I visto dal lato aborale.
- » 4. - *Plesioptyxis yasinensis* n.sp. Paratipo I visto dal lato orale.
- » 5. - *Plesioptyxis desioi* (Farioli Mirelli). Paratipo. p. 262
- » 6. - *Plesioptyxis desioi* (Farioli Mirelli). Paratipo I.
- » 7. - *Plesioptyxis desioi* (Farioli Mirelli). Olotipo visto dal lato aborale.
- » 8. - *Plesioptyxis desioi* (Farioli Mirelli). Porzione di olotipo vista dal lato orale.
- » 9. - *Plesioptyxis yasinensis* n.sp. Paratipo frammentario. p. 266

Tutte le figure sono in grandezza naturale.



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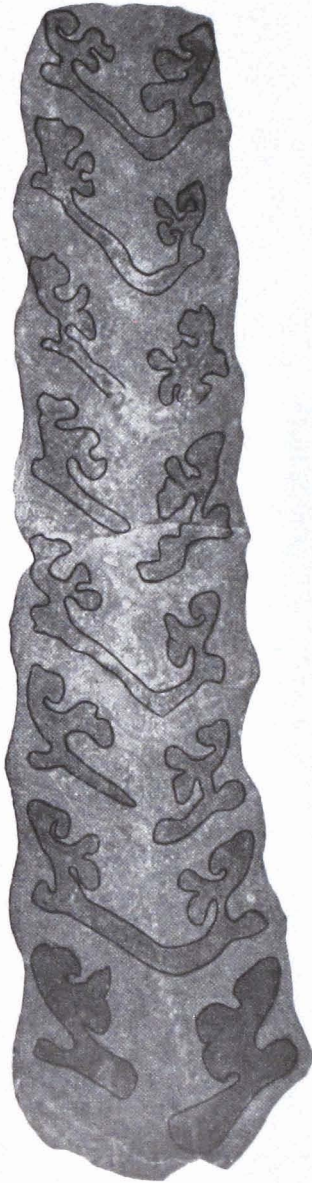
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TAVOLA 42

- Fig. 1. - *Plesioptyxis desioi* (Farioli Mirelli). Sezione assiale dell'olotipo figurato nella fig. 7 della Tav. 41. $\times 1,5$ p. 262
- » 2. - *Plesioptyxis desioi* (Farioli Mirelli). Sezione assiale di un paratipo. $\times 1,5$.
- » 3. - *Plesioptyxis desioi* (Farioli Mirelli). Sezione assiale della porzione abapicale del paratipo illustrato nella fig. 5 della Tav. 41. $\times 1,5$.
- » 4. - *Plesioptyxis yasinensis* n.sp. Sezione assiale di un paratipo. $\times 1,5$ p. 266
- » 5. - *Plesioptyxis yasinensis* n.sp. Sezione assiale della porzione adapicale dell'olotipo (v. Tav. 41, fig. 2). $\times 1,5$.
- » 6. - *Plesioptyxis yasinensis* n.sp. Sezione assiale della porzione adapicale dell'olotipo (v. Tav. 41, fig. 1). $\times 1,5$.



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TAVOLA 43

- Figg. 1-2. - *Plesioptyxis yasinensis* n.sp. Sezioni assiali di un paratipo. $\times 1,5$ p. 266
- Fig. 3. - *Plesioptyxis yasinensis* n.sp. Sezione assiale di un paratipo. $\times 1,5$.
- Figg. 4-5. - *Plesioptyxis yasinensis* n.sp. Sezioni assiali di un paratipo. $\times 1,5$.
- Fig. 6. - *Plesioptyxis yasinensis* n.sp. Sezione assiale del paratipo figurato nella fig. 4 della Tav. 40. $\times 1,5$.
- » 7. - *Plesioptyxis yasinensis* n.sp. Sezione assiale di un paratipo. $\times 1,5$.
- » 8. - *Plesioptyxis yasinensis* n.sp. Sezione assiale del paratipo figurato nella fig. 3 della Tav. 41. $\times 1,5$.



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