Journal of Geosciences, Osaka City University,
Vol. 14, Art. 1, p. 1—18,
March, 1971

Notes on the Permian-Triassic boundary in Eastern Afghanistan

(with systematic descriptions of Lower Triassic ammonoids)*

Ken-ichi ISHII**, Jochen FISCHER*** and Yuji BANDO****

(With 2 Textfigures and 3 Plates)

Introduction

During the summer of 1969 ISHII and BANDO visited Afghanistan with the purpose to make geological observations in several localities with attention to the relationship between the lithology and fossil contents of the strata adjacent to and also probably crossing the Permian-Triassic boundary. The field survey was done in co-operation with German geologists through the courtesy of Prof. U. JUX, chief of the German Geological Mission of Kabul University. Thereafter, ISHII and BANDO visited Julfa, Iran to observe the boundary between the Permian Julfian strata and the Lower Triassic Scythian strata.

Before visiting Afghanistan for the purpose just mentioned, ISHII and BANDO investigated the lithological and faunal changes between the Permian and Triassic ages in Kashmir, India, with collaboration of the members of the scientific expedition of the Kyoto University (chief, K. NAKAZAWA) and staff members of the Geological Survey of India. The first report of this study in Kashmir was published under the title of "Preliminary Report on the Permian-Triassic of Kashmir" by NAKAZAWA and collaborators (1970).

From the observations and investigations on the stratigraphic and palaeontologic relationships between the Permian and Triassic in Kashmir, Julfa and Afghanistan, important information was obtained concerning the Permian-Triassic boundary.

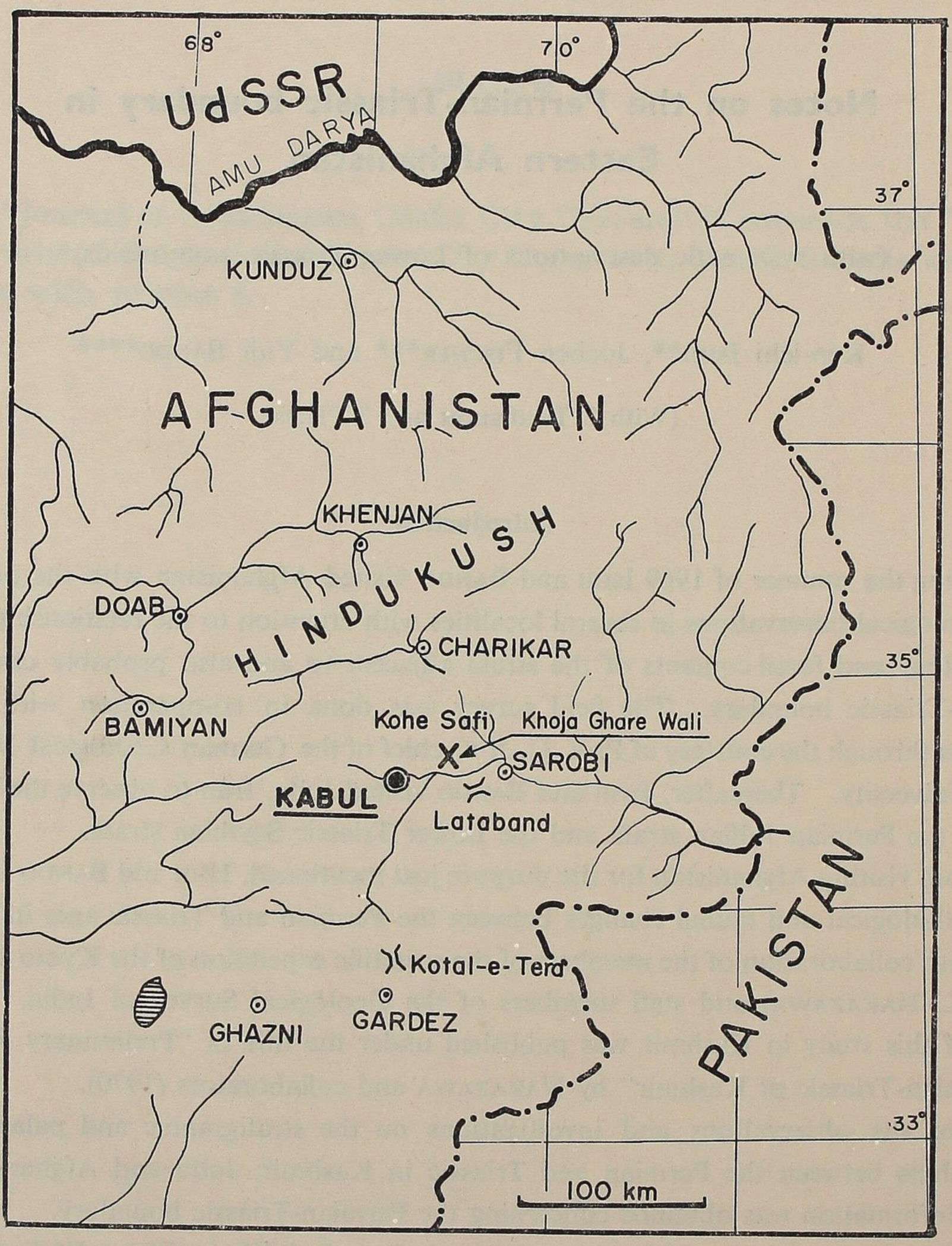
Field investigations in Afghanistan were conducted at Khoja Ghare Wali, Golagada and the Sinwaro Ghar area, all in the Kohe Safi district in Central Afghanistan and at Kotal-e-Tera in Southeast Afghanistan.

One of the writers (FISCHER) made geological observations in the Khoe Safi district including the locality of Khoja Ghare Wali for about one year, and the results of his work on the geology and stratigraphy will be published at another opportunity.

The Permian strata distributed in the areas mentioned above consist of conglomerate, sandstone, shale and limestone. Bellerophontids, productids, fusulinids and waagenophyllids occur abundantly from the argillaceous limestones. On the other hand, the Triassic

---

* Contribution from the Department of Geosciences, No. 223.
** Department of Geosciences, Faculty of Science, Osaka City University.
*** Geologisches Institut der Universität Köln.
**** Department of Geology, Faculty of Education, Kagawa University.



Textfigure 1. Index map showing location of Khoja Ghare Wali, Kohe Safi district.

strata in the same areas consist chiefly of alternation of thin bedded muddy limestones and limy mudstones; many ammonoids occurred from them. No distinct stratigraphic hiatus could be observed between the Permian and Triassic systems in the areas studied.

Several years ago, KUMMEL & ERBEN (1968) and KUMMEL (1968) described ammonoids from the Lower Triassic strata at Kotal-e-Tera Pass. These Lower Triassic ammonoids comprised the following species:

Pseudosageceras multilobatum NOETLING, *Subinyoites* cf. *kashmiricus* (DIENER), *S. welteri* SPATH, *Xenodiscoides* cf. *falcatum* (WAAGEN), *Flemingites* cf. *lidacensis* WELTER, *Dieneroceras knechti* (HYATT & SMITH), *D. caucasicum* POPOV, *Clypeoceras yudishthira* (DIENER), *Eoptychites* sp., *Owenites koeneni* HYATT & SMITH, *Paranannites aspenensis* HYATT & SMITH, *Juvenites* sp., *Anakashmirites angustecostatus* (WELTER), *Meekoceras gracilitatis*

WHITE, *Meekoceras* sp., *Arctoceras mushbachanum* (WHITE), *Hemiprionites hungari* KUMMEL & ERBEN, and *Anasibirites kingianus* (WAAGEN).

In addition the ammonoids of the *Subcolumbites* fauna (Scythian) from Afghanistan were described by KUMMEL (1968). They consist of: *Subvishnuites* sp., *S.* cf. *enveris* (ARTHABER), *Xenoceltites* sp., *Procarnites kokeni* (ARTHABER), *Juvenites* cf. *septentrionalis* SMITH, *Isculitoides* cf. *originis* (ARTHABER), *Subcolumbites perrinismithi* (ARTHABER), *Vickohlerites* cf. *sundaicus* (WELTER), *Meropella* cf. *plejanae* RENZ & RENZ, *Wyomingites aplanatus* (WHITE), *Albanites triadicus* (ARTHABER), *Hemiprionites typus* (WAAGEN), *Wasatchites* sp., *Keyserlingites* sp., and *Leiophyllites* sp.

In the present paper the writers report on the geological observations made in Afghanistan, and one of the writers (BANDO) will describe the Lower Triassic ammonoids of the *Gyronites* fauna from Khoja Ghare Wali.

The Permian and Triassic sequence at Khoja Ghare Wali and other localities

Khoja Ghare Wali is situated at about 30 km east of Kabul and near the road from Kabul to the village of Djallalabad (Textfig. 1). Most of the ammonoid specimens described in this paper were collected from the Lower Triassic strata cropping out in the eastern part of Khoja Ghare Wali. In this area the basement rocks consist of gneissose rocks and mica-schists, which are well exposed at Tangi Gharu, the pass between Khoja Ghare Wali and Djallalabad. The absolute age by the K–A method of the basement rocks is about 550 $\times 10^6$ years. The green schists and phyllites cropping out at the western slope belong to the older Paleozoic. These basement rocks are overlain with unconformity by the basal conglomerate of the Permian strata. The Permian strata are approximately 300-350 m in thickness, and the general strike changes from north-south to north north west-south south east and their dips are 30–40 degrees eastwards (pl. I, fig. 1). The Permian sequence in this area can be classified into three formations, among which, in the Kotal-e-Tera, the middle and upper formations consist mainly of calcareous facies.

The lower formation consists of basal conglomerate succeeded upwards with alternations of pelitic and psammitic rocks. The middle formation is characterized by its calcareous and pelitic rocks and the upper formation consists of a thick limestone. Owing to that the limestone texture is microcrystaline sparite by recrystalization it is difficult to identify the fusulinid fossils.

In the middle formation there are three limestones (thickness of each limestone bed; about 2–3 m). The lower and middle limestones yielded schwagerinid fossils such as *Polydiexodina*? sp. and *Parafusulina*? sp. etc. and the upper limestone *Neoschwagerina*? sp. and *Nankinella* sp. Therefore, based upon the fusulinid fossils, the age of the middle formation is lower and middle Middle Permian (the zone of *Parafusulina* and *Neoschwagerina*).

The upper formation consists of limestones (thickness about 200 m). The lower part

of this limestone bed yielded *Waagenophyllum* cf. *indicum*, but no fusulinids*. This limestone bed lies with conformity on the middle formation which is the zone of *Neoschwagerina*. Therefore the lower part of this limestone is upper Middle or lower Upper Permian in age (the zone of *Yabeina*). From the middle and upper part FISCHER collected abundant fossils, especially of bellerophontids and pseudopunctat brachiopods like *Waagenites*, *Derbyia*, *Productus indicus* (=*Costiferina indica*) and lyttonids. The middle and upper part of the upper formation can be correlated with the Zewan series in Kashmir and the upper *Productus* limestone (Chideruan, Upper Permian) of the Salt Range (KUMMEL & TEICHERT, 1966).

The difference in the lithofacies and biofacies are considerably distinct between the Lower Triassic yellowish brown limestones and the Upper Permian black muddy limestone.

The base of the Lower Triassic strata is characterized by the coquina bed made of crowded fragmental shells, and its basal plane is characterized by the abundant traces of straight vertical burrows, which extend downwards into the subjacent Upper Permian muddy limestone. These vertical burrows are represented by small cylindrical pipes which are about 5–10 cm in length; their mode of occurrence is shown in pl. II, fig. 4.

About 1m above the basal plane of the Triassic strata there is developed an *Ophiceras*? bed about 0.75–1 m in thickness and composed of black or grayish brown bedded limestone. The ophiceratid specimens are oriented parallel to the bedding plane. Because the ophiceratid shells are highly recrystalized, they break into fragments in collecting. But judging from the shell profiles and surface features the ammonoids may belong to the *Ophiceras* or *Glyptophiceras* group. It is unfortunate that identifiable specimens could not be collected from this horizon. Above the *Ophiceras*? bed there is developed a rhythmical alternation of muddy and limy beds, about 18 m in total thickness. From the lower part of this rhythmical alternation FISCHER collected *Bellerophon*?, pectinid and ophiceratids.

Reddish, bedded limestones become predominate above the alternations just mentioned and therefrom some important specimens of the Lower Triassic ammonoids were collected. They are as follows:

Kymatites cf. *typus* WAAGEN, *Gyronites fischeri* BANDO, n. sp., *Gyronites* sp. indet., and *Parakymatites* sp. indet.

Although the preservation of the ammonoid specimens is not so good they still retain the whorl character and sutures and thus permit identification. *Gyronites* is a well known genus of the Gyronitan stage of the Lower Triassic. Up to date, the Gyronitan ammonoids have been described only from the Lower Triassic of the Salt Range (WAAGEN, 1895; SPATH, 1934) and from the Primorye Region of East Siberia (KIPARISOVA, 1961). From the foregoing, the writers consider that the ammonoid fauna from Khoja Ghare Wali can be correlated with the zone of *Prionolobus rotundatus* (KUMMEL, 1957, p. 124) of the Gyronitan stage (Lower Scythian or Lower Eo-Trias) and belongs to a horizon higher than the zones of *Vishnuites decipiens* and *Proptychites rosenkrantzi*. Originally, the genera *Gyronites*, *Prion-*

---

* The Upper Permian formation of the Kotal-e-Tera area is characterized by many specimens of the coral fauna and foraminifera such as *Codonofusiella*, *Lantschichites*, *Reichelina*, cf. *Nankinella* and cf. *Colaniella* (SIEHL, 1967).

olobus and *Ambites* resemble each other in the general feature of the shell, and stratigraphically they occur from the same horizon. It is interesting that the strata bearing those gyronitid ammonoids make distinct cliffs in the Khoja Ghare Wali area just as in the upper part of the strata with proptychitid ammonoids at Kashmir.

From the argillaceous limestone stratigraphically high above the gyronitid ammonoid one of writers (FISCHER) discovered many specimens of the *Meekoceras* and *Pseudosageceras* fauna. These are considered to have the same faunal character as those reported by KUMMEL & ERBEN (1968) and KUMMEL (1968) from Kotal-e-Tera.

KUMMEL (1967, 1968) stressed on the significance of the *Owenites* and *Subcolumbites* faunas from the Kotal-e-Tera region. At that locality the writers were fortunate in being able to observe KUMMEL's *Owenites* limestone bed which is intercalated between the brown calcareous sandstone and the gray massive limestone. In the *Owenites* limestone bed three ammonite horizons were recognized as follows in descending order:

	Ammonoid zone	Thickness
	(3) *Anasibirites kingianus* zone	2m
Owenites Bed	(2) *Dieneroceras, Owenites* & *Meekoceras* zone	2m
	(1) *Pseudosageceras multilobatum* zone	1.5m

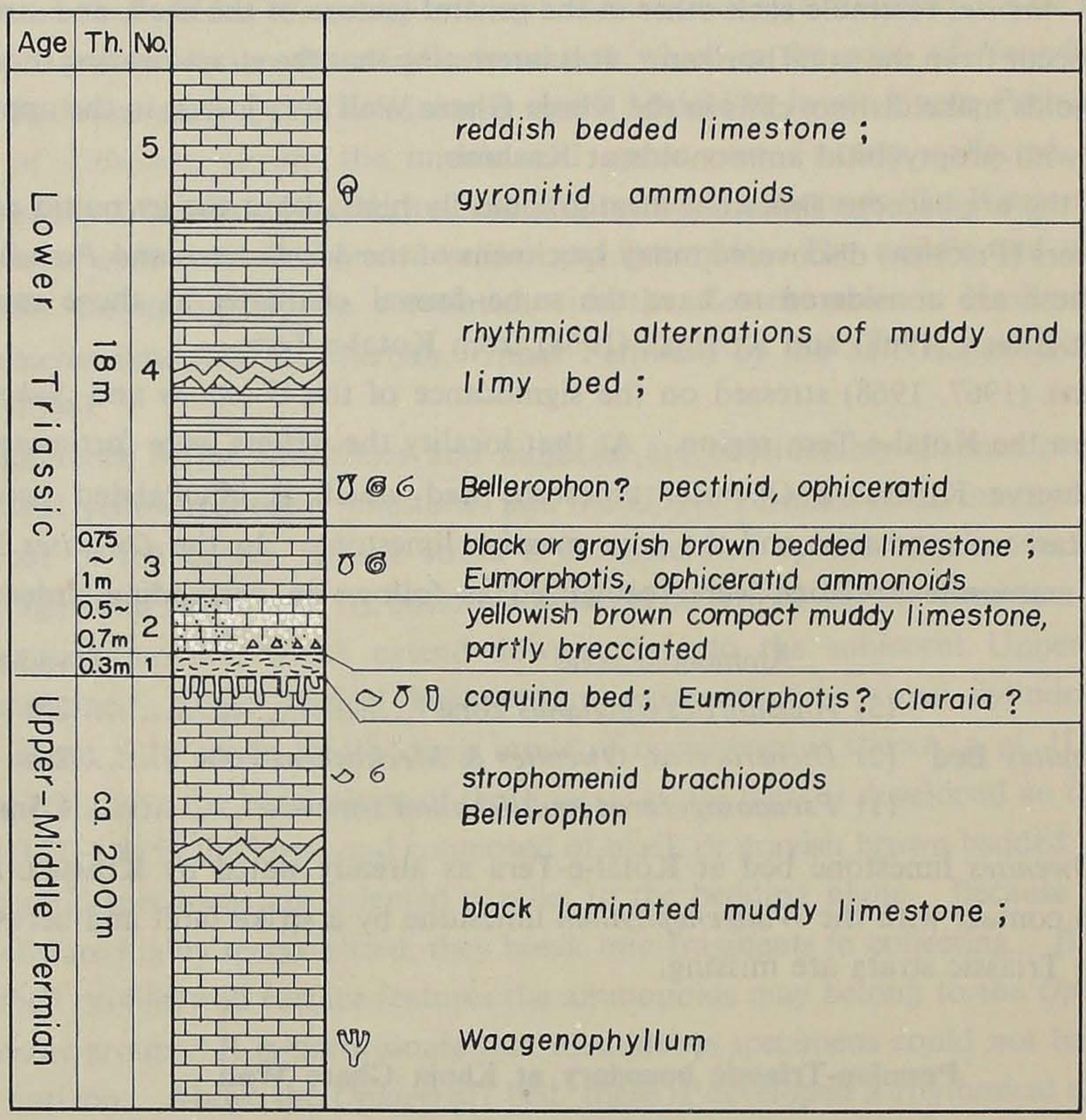
The *Owenites* limestone bed at Kotal-e-Tera as already stated by KUMMEL & ERBEN (1968) is in contact with the *Waagenophyllum* limestone by a strike fault and between them the Lowest Triassic strata are missing.

Permian-Triassic boundary at Khoja Ghare Wali

As mentioned already, the Upper Permian consists of black laminated muddy limestone, in which fasciculate corals such as *Waagenophyllum* occur in the lower part and strophomenid brachiopods such as *Waagenites, Derbyia, Productus indicus* (=*Costiferina indica*) and lyttoniidae appear in the middle and upper parts.

At the base of the Triassic strata adjacent to the Permian-Triassic boundary there developed many vertical burrows. These burrows extend down vertically into the subjacent black muddy limestone of the Upper Permian. The burrows are filled with yellowish gray precipitated calcium carbonate sediments of the Lower Triassic which differ distinctly from the lithofacies of the Upper Permian black muddy limestone. The Lower Triassic sequence at Khoja Ghare Wali is as follows in ascending order (pl. II, figs. 1–4; textfig. 2):

1. Coquina bed; yellowish gray or black muddy limestone; 0.3 m thick; contains abundant fragmental bivalve shells, FISCHER collected *Eumorphotis* and *Claraia*?.
2. Yellowish brown muddy limestone; partly brecciated; 0.5–0.7m thick; unfossiliferous.
3. Black or grayish brown bedded limestone; 0.75–1m thick; contains ophiceratid ammonoids and *Eumorphotis*. Ophiceratid ammonoids are common throughout the bed, and are oriented parallel to the bedding plane.
4. Rhythmical alternations of muddy and limy beds; 18 m thick; muddy bed black in colour and limy bed yellowish gray in colour; thickness of bed 5–20 cm; fos-



Textfigure 2. Geological column near the Permian-Triassic boundary at Khoja Ghare Wali.

sils are rare; *Bellerophon*?, pectinid and ophiceratid ammonoids were collected by Fischer from the lower part.

5. Reddish bedded limestone and arenaceous calcarenite containing gyronitid ammonoids.

This reddish bedded limestone continues upward to the *Proptychites-Meekoceras* bed.

In short, the Upper Permian black laminated muddy limestones were deposited under a shallow water subtidal environment as suggested by the fascicultate coral as waagenophyllid and free-lying strophomenid brachiopods. At the beginning of the Triassic age, the Upper Permian calcium carbonate sediments were exposed to subaerial denudation and quickly dried under the intertidal environment. At this time, the surface of this tidal flat was

penetrated by vertical burrows thought to have been made by some suspension feeders*. This phenomenon may indicate the maximum of the regressive phase during the Upper Permian-the Lower Triassic in this area. Further, bivalve shells were transported and destroyed by water currents and breaking waves and thus a coquina bed was developed on the tidal flat. Thereafter the Lower Triassic marginal sea area again changed into a subtidal environment which favored the thriving of pteroid mollusca and ophiceratid ammonoids. In this area the rhythmical alternations of muddy and limy sediments were deposited as the result of repeated oscillative fluctuations of the sea.

Acknowledgements

The writers wish to express their sincere thanks to Professor Ulrich JUX of Kabul University, a member of the German Geological Mission to Afghanistan, for his useful suggestions and kindness and to Mr. Rudolf DIETMAR also a member of the German Geological Mission of Kabul University, for his kind help to our field survey. Thanks are due to Professor Keiji NAKAZAWA, Kyoto University, for his kind guidance and encouragement. We also acknowledge appreciation to Professors Kotora HATAI of the Tohoku University and Koichiro ICHIKAWA of the Osaka City University for their suggestions for improvement of the manuscript. Appreciation is also due to Dr. Yuji OKIMURA, Hiroshima University, for his kind advice during our stay in Afghanistan in the summer in 1969. It is a pleasure to acknowledge the support of the Ministry of Education of the Japanese Government with respect to the research grant.

Systematic description of Lower Triassic Ammonoids from Khoja Ghare Wali, Afghanistan

Yuji BANDO

The Lower Triassic ammonoids collected from the Lower Triassic strata at Khoja Ghare Wali, east of Kabul, Afghanistan, include some characteristic Lower Eo-Triassic ammonoid genera such as *Gyronites*, *Kymatites* and *Parakymatites*?. These gyronitid ammonoids were first discovered in Afghanistan and are rare in the Lower Eo-Triassic of the world. Moreover, they have a restricted distribution up to date and most species have been described from the Lower Triassic of the Salt Range (WAAGEN, 1880). SPATH (1930, 1934) proposed the *Gyronites* bed of the Salt Range to be the representative horizon of an ammonoid stage (Gyronitan) between the Otoceratan and Flemingitan stages. The same Gyronitan stage ammonoids as those from Afghanistan have also been recorded from the

* "burrowers in intertidal regions are forced to borrow more deeply in the sediment to avoid the ecologic stress associated with intermittent subaerial exposure (heating or chilling, salinity changes, desiccation)" (WALKER & LAPORTE, 1970).

Hymalayas (KRAFFT & DIENER, 1909, *Prionolobus* fauna), Timor (WELTER, 1922, *Prionolobus* and *Gyrophiceras* fauna) and Madagascar (WHITE, 1929, *Prionolobus* fauna). Accordingly, this *Gyronites* fauna clearly belongs to the Tethyan fauna and have a distribution more restricted than the *Ophiceras* and *Meekoceras* faunas of the Lower Triassic.

Stratigraphically the species of *Gyronites*, *Prionolobus*, *Kymatites* and *Parakymatites* may belong to almost the same horizon as those of *Vishnuites* and *Proptychites*, but no positive evidence has been found from the localities of the Lower Triassic in the world except for the case of the Salt Range in west Pakistan. NAKAZAWA and his collaborators (1970) reported on the Permian-Triassic boundary of the Guryul Ravine district near Srinagar, but no *Gyronites* fauna could be found from the horizon of *Vishnuites* and *Proptychites*.

Description of Ammonoids

Superfamily Meekoceratida WAAGEN, 1895

Family Gyronitidae WAAGEN, 1895

Genus *Gyronites* WAAGEN, 1895

Gyronites fischeri BANDO, new species

Pl. III, Figs. 1a–c, 3a–c

Description: Shell evolute, laterally compressed, with narrowly tabulated venter and slightly convex sides. Umbilical wall rounded and umbilical shoulders sharply rounded. Diameter of umbilicus a little narrower than 1/3 diameter of shell and width of outer whorl about 1/2 of height. Shell surface smooth, without ribs or striations. Width of venter about 1/8 of height. Ventral margin distinctly carinated. Sutures subgoniatitic, without any serrations on secondary lateral and umbilical lobes, but with faint serrations on first lateral lobe. Ventral lobe simply divided into narrow lobes by shallow rounded saddle on siphonal portion.

Measurements (in mm):

	D	H	W	U	H/D	W/H	U/D
AFG–4	34.6	13.8	7 8	10.7	0.38	0.57	0.31
AFG–6	39.7	17.0	8.5	11.8	0.43	0.41	0.29

Remarks: The present specimen is similar to *Gyronites planissimus* SPATH (SPATH, 1934, p. 92, pl. 8, figs. 4a–b) from the Lower Ceratite Limestone (Zone of *Prionolobus rotundatus*) of Virgal, Salt Range, in the sutures and lateral characters of the shell, but in the whorl section the present material has the whorls slightly more depressed than those of *G. planissimus*. *Gyronites frequens* WAAGEN (WAAGEN, 1895, p. 292, pl. 37, figs. 1–41–4; DIENER, 1915, p. 196; SPATH, 1934, p. 91, fig. 19) from the *Gyronites* bed of the Lower Ceratite Limestone of the Salt Range has more evolute whorls than those of the present new species. The genus *Gyrolecanites* (SPATH, 1943, p. 95, genotype: *Lecanites impressus* WAAGEN) resemble

Gyronites s. str. in the whorl shape and umbilicus, but *Gyrolecanites* has a more sharply rounded umbilical wall and depressed whorls than those of *Gyronites*. The present new species also resemble *Gyronites separatus* KIPARISOVA (1961, p. 62, pl. 11, figs. 2 a–b.) from the *Proptychites* bed of the Induan stage in the Primorye region of Siberia, but the present species has more compressed whorls than those of the Russian species. Some species of *Gyronites* from the Lower Ceratite Limestone of WAAGEN (1895), *Gyronites rotula* WAAGEN (pl. 38, figs. 3–5), *G. radians* WAAGEN (pl. 38, figs. 6–8) and *G. plicosus* WAAGEN (pl. 38, fig. 11), may be included into the genus *Protophiceras* HYATT (1900), because these "gyronitid" ammonoids have closer resemblance with the glyptophiceratid ammonoid, *Protophiceras*, than those of *Gyronites* in the character of the shell form nad sutures. The proposed new species name after Dr. Jochen FISCHER, Köln University, West Germany, who cooperated with us during the geological survey in Afghanistan in 1969.

Occurrence and geological horizon: Gyronitan or Late Induan stages of the Lower Eo-Triassic in the eastern part of Khoja Ghare Wali, Afghanistan. Reg. No. AFG–4 and AFG–6. Coll. K. ISHII, J. FISCHER, R. DIETMAR and Y. BANDO, 1969.

Gyronites sp.

Pl. III, Fig. 4

Description: Shell laterally compressed, discoidal, subevolute, with narrowly tabulated venter and flattened sides. Height of shell increasing gradually. Diameter of umbilicus about 1/3 total diameter of shell. Umbilical shoulders sharply rounded. Shell surface almost smooth, without any lobes or strigations. Suture unknown.

Measurements (in mm):

	D	H	W	U	H/D	W/H	U/D
AFG–5	39.0	16.7	–	10.7	0.51	–	0.27

Remarks: The present material belongs to the genus *Gyronites* from the general character of the shell. Unfortunately the suture is not preserved in the present material. Judging from the characteristics of the shell the material may be identified with *Gyronites planissimus* KOKEN & SPATH (1934, p. 92, pl. 8, figs. 4a–b) from the Lower Ceratite Limestone in the Salt Range, West Pakistan, but accurate identification is not possible owing to the poor preservation of the present material. In the form of volution the present specimen is also similar to *Gyronites separatus* KIPARISOVA (1961, p. 62, pl. 11, figs. 2a–b) from tne *Proptychites* zone of the Induan stage in the Primorye region of east Siberia, but the Russian species less compressed whorls.

Occurrence and geological horizon: Gyronitan or Late Induan stage of the Lower Eo-Triassic at eastern part of Khoja Ghare Wali, Afghanistan. Reg. No. AFG–5. Coll. K. ISHII, J. FISCHER, R. DIETMAR and Y. BANDO, 1969.

Genus *Kymatites* WAAGEN, 1895

Kymatites sp. cf. *Kymatites typus* WAAGEN

Pl. III, Figs. 2a–b

Compare:

1895. *Kymatites typus* WAAGEN, p. 221, pl. 27, figs. 1a–c.
1934. *Kymatites typus,* SPATH, p. 105, fig. 25.

Description: Shell involute, laterally compressed, with narrowly tabulated venter and small umbilicus. Sides of shell almost flattened and shell form generally dicoidal. No sculpture on shell surface. Sutures rather goniatitic, consist of entirely rounded lateral saddle and smooth lateral lobes. Umbilical lobe simple as in *Gyronites*. Ventral lobe considerable narrow and divided by shallow peripheral saddle into nonserrated ventral lobes.

Measurements (in mm):

	D	H	W	U	H/D	W/H	U/D
AFG–7	31.8(22.0)	15.8	5.9	5.2	0.39	0.37	0.16

Remarks: The present specimen is very similar to *Kymatites typus* WAAGEN from the Salt Range (WAAGEN, 1985). The umbilicus and sutures both resemble the specimens from the Salt Range, but the cross section of the outer whorl differs slightly from the present specimen. That is to say, the present material has a more compressed whorl at the umbilical sides of flank compared with the Salt Range species just mentioned.

The genus *Kymatites* which has been known only from the Ceratite Limestone of the Salt Range, is asigned by SPATH (1934, p. 105) to the Upper Gyronitan age. In the suture lines, both *Kymatites* and *Ambites* (WAAGEN, 1895, p. 151) show strong resemblance with each other, there being only a slight difference in the umbilical sutures. The genotype of *Ambites*, *A. discus* WAAGEN (WAAGEN, 1895, p. 155, pl. 7a, fig. 10; SPATH, 1934, p. 103, fig. 23), has a wider umbilicus than that of *Kymatites*. Another species, *Kymatites posterus* WAAGEN (1895, p. 212, pl. 26, fig. 3a–c), is wider than the present specimen.

Occurrence and geological horizon: Gyronitan or Late Induan stages of the Lower Eo-Triassic at Khoja Ghare Wali, eastern part of Afghanistan. Reg. No. AFG–7. Coll. K. ISHII, J. FISCHER, R. DIETMAR and Y. BANDO, 1969.

Genus *Parakymatites* WAAGEN, 1895

Parakymatites? sp.

Pl. III, Fig. 5

Description: Shell involute, laterally compressed, with narrow umbilicus, gentle convex sides and sharply rounded umbilical shoulders. Ventral part missing. Suture consists

of lateral and umbilical series, and lateral ones of entirely rounded saddles and serrated lobes. Umbilical series consist of narrow saddles and non-serrated lobes. Ventral part of suture missing.

Remarks: It is unfortunate that the present material is poorly preserved and the ventral part of the shell is missing. Judging from the form of the umbilicus, sutures on the side of the flank and from the umbilical margin the present specimen may belong to *Parakymatites* WAAGEN (1895, p. 213; DIENER, 1915, p. 216; SPATH, 1934, p. 106; genotype: *Parakymatites discoides* WAAGEN) from the Ceratite sandstone in the Salt Range of Pakistan, but precise identification is difficult because of the poor preservation of the present material.

Occurrence and geological horizon: Gyronitan or Late Induan stages at Khoja Ghare Wali, East of Kabul, Afghanistan. Reg. No. AFG–2. Coll. K. ISHII, J. FISCHER, R. DIETMAR and Y. BANDO, 1969.

Actual date of publication May 10, 1971.

References

DIENER, C. (1915): Fossilium Catalogus. 1, Pt. 8, Cephalopoda triadica, pp. 1–369, Berlin.

HYATT, A. (1900): Cephalopoda in ZITTEL, Textbook of Paleontology (trans. and edit. by C.R. EASTMAN). London, vol. 1, pp. 502–604.

KIPARISOVA, L.D. (1961): Paleontological base for the stratigraphy of the Triassic deposits of the Primorye Region. *All Soviet Union Geol. Inst. Transact.*, N.S., no. 48, pp. 1–198, pls. 1–38 (Russian).

KRAFFT, A. & C. DIENER, (1909): Himalayan Fossils, Lower Triassic Cephalopoda from Spiti, Malla Johar and Byans. *Pal. Indica,* 15th ser. 6, pp. 1–189, pls. 1–31.

KUMMEL, B. (1957): in "Treatise on Invertebrate Paleontology", Part L. Mollusca 4, Cephalopoda, Ammonoidea. *Geol. Soc. Amer.* and *Univ. Kansas Press,* pp. 1–490.

——— (1967): The Lower Triassic history of Afghanistan. *Science, Fac. Sci., Kabul Univ.,* vol. 3, no. 4, pp. 1–8.

——— (1968): Additional Scythian ammonoids from Afghanistan. *Bull. Mus. Comp. Zool., Harvard Univ.*, vol. 136, no. 13, pp. 483–503, pls. 1–3.

——— & C. TEICHERT, (1966): Relations between the Permian and Triassic formations in the Salt Range and Trans-Indus ranges, West Pakistan. *N. Jb. Geol. Paläont.*, Abh., Bd. 125, pp. 297–333, pls. 27–28.

——— & H.K. ERBEN, (1968): Lower and Middle Triassic Cephalopods from Afghanistan. *Palaeontogr.*, Bd. 129, pp. 95–148, pls. 19–24.

NAKAZAWA, K., et al. (1970): Preliminary Report on the Permo-Trias of Kashmir. *Mem. Fac. Sci., Kyoto Univ., Ser. Geol. & Min.*, vol. 37, no. 2, pp. 163–172, pls. 28–29.

SIEHL, A. (1967): Zur Stratigraphie und Paläoegeographie des Perm in Afghanistan. *Geol. Rundsch.* Bd. 56, S. 795–812.

SPATH, L.F. (1930): The Eo-triassic Invertebrate Fauna of East Greenland. *Med. om. Grønland,* 83, pp. 1–90, pls. 1–12.

——— (1934): Catalogue of Fossil Cephalopoda in the British Museum (Natural History), Part 4, the Ammonoidea of the Trias (1). *Brit. Museum.* pp. 1–521, pls. 1–18.

WALKER, K.R. & L.F. LAPORTE, (1970): Congruent Fossil Communities from Ordovician and Devonian Carbonates of New York. *Jour. Paleont.*, vol. 44, no. 5, pp. 928–944.

WELTER, O.A. (1922): Die Ammoniten der unteren Trias von Timor. *Paläont. von Timor,* 11, pp. 83–154, pls. 155–171.

Plate I

Explanation of Plate I

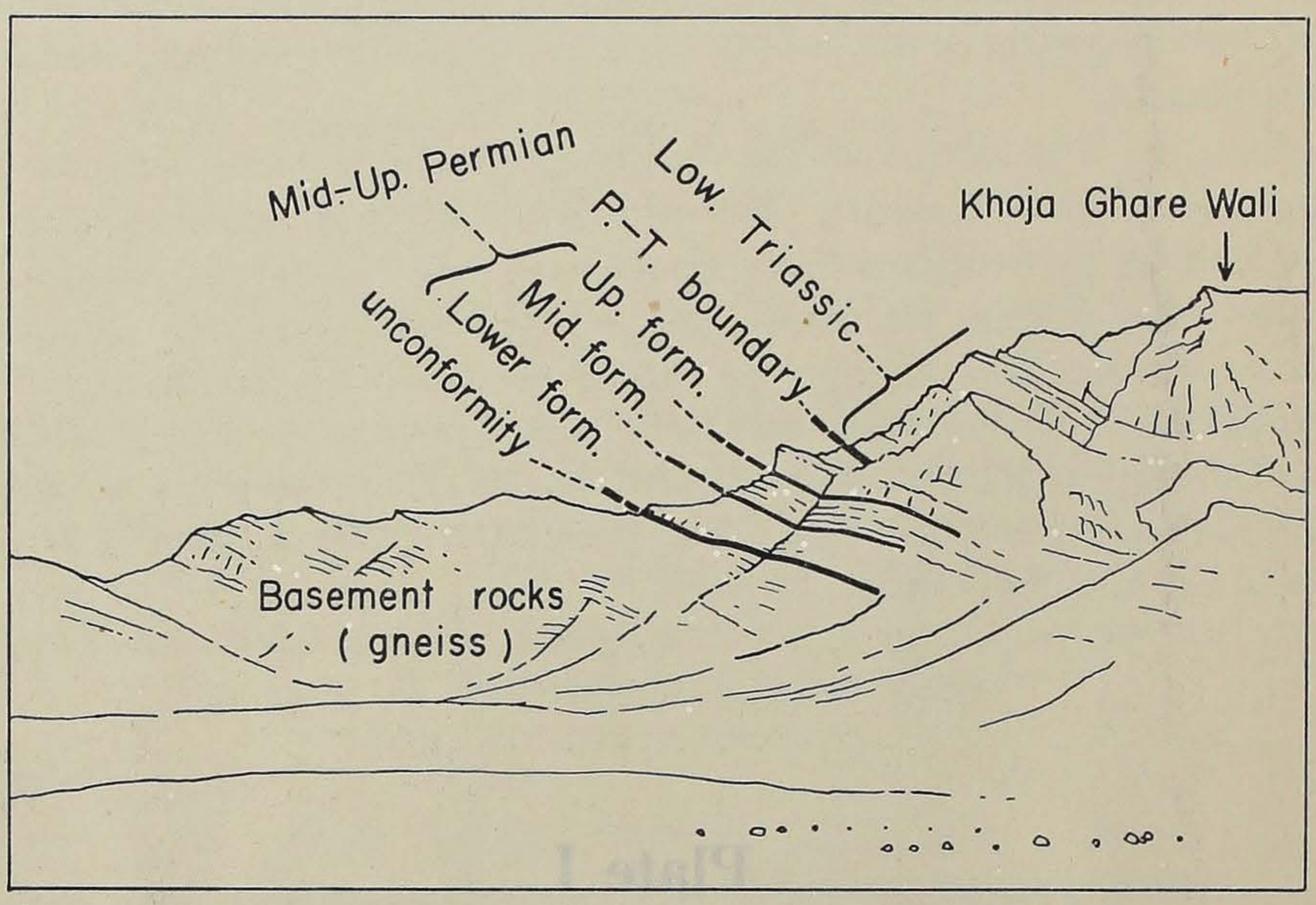


Fig. 1. Photograph of the Kohe Safi district in Central Afghanistan, showing characteristic topographic expression of the Paleozoic-Triassic sequence.

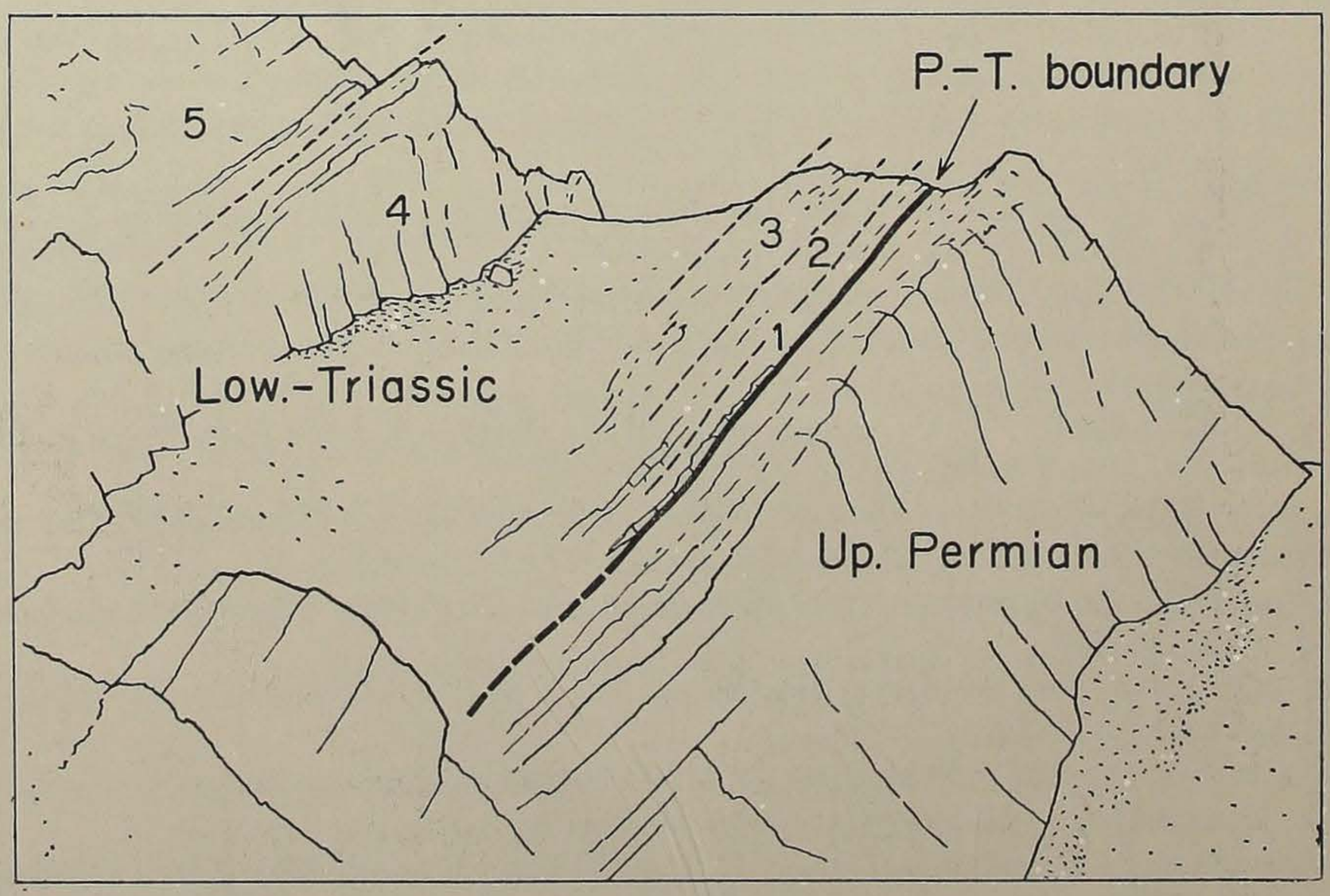
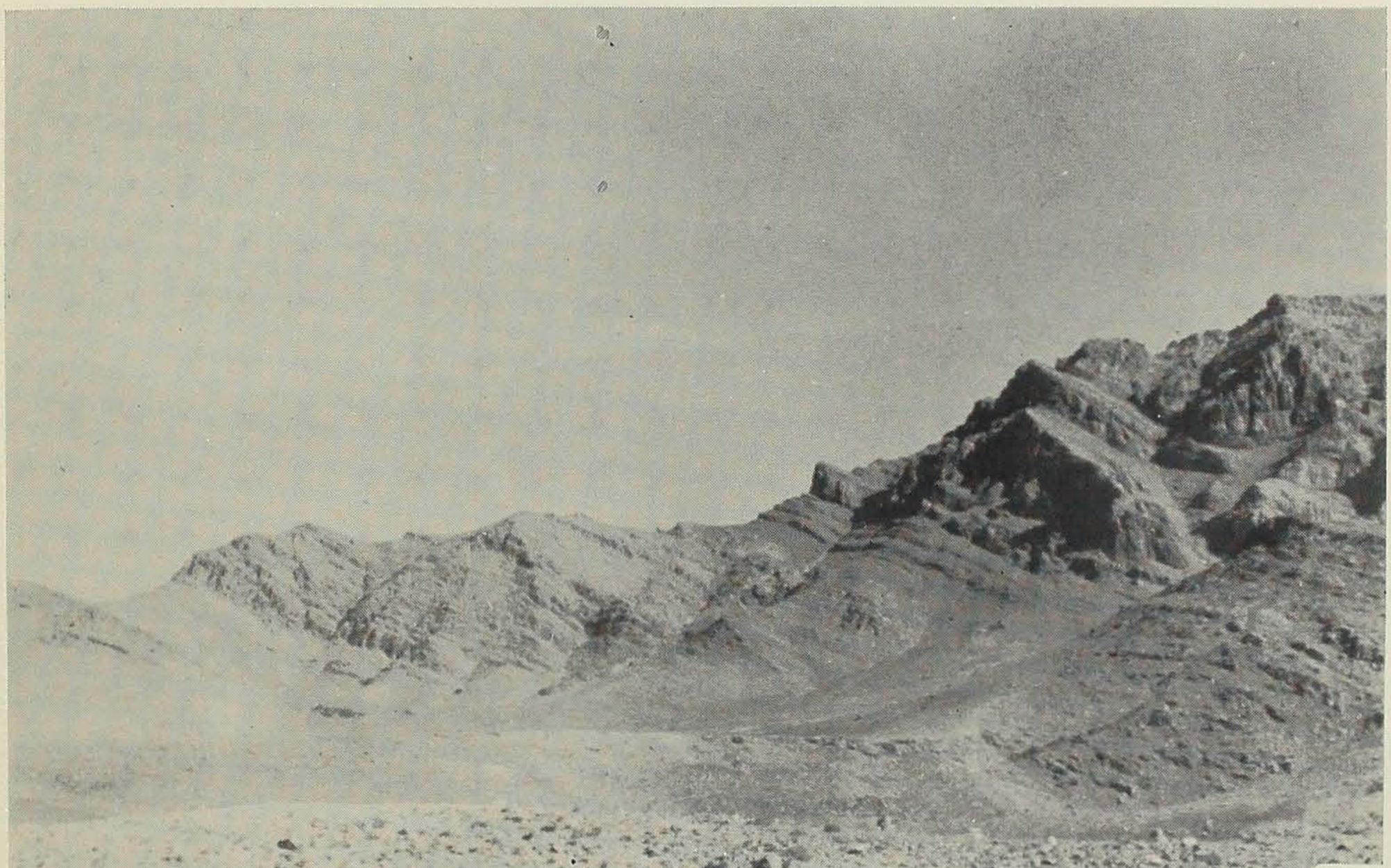
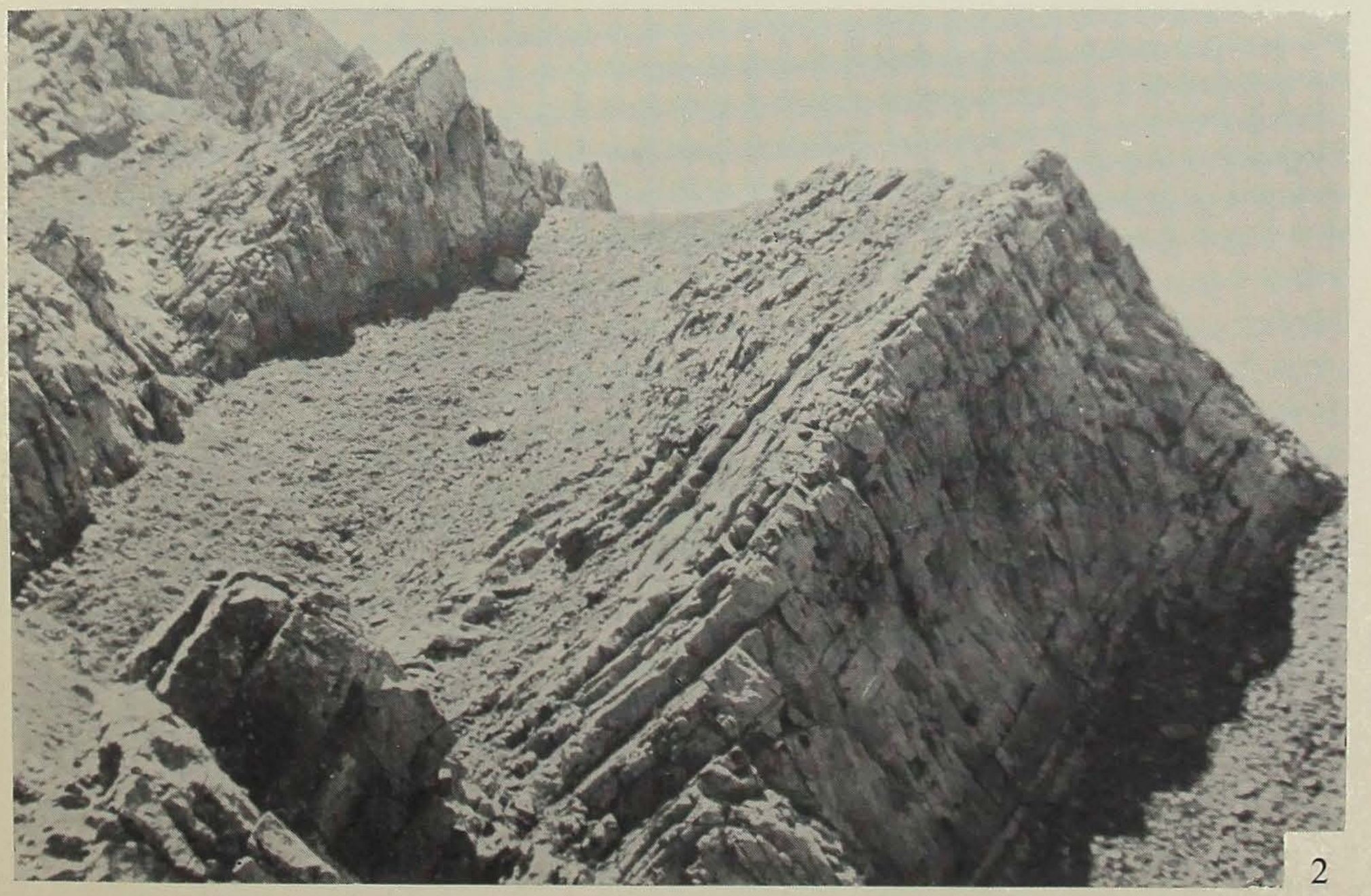


Fig. 2. Distant view of the Permian-Triassic boundary at Khoja Ghare Wali of the Kohe Safi district,

Plate I



1



2

Plate II

Explanation of Plate II

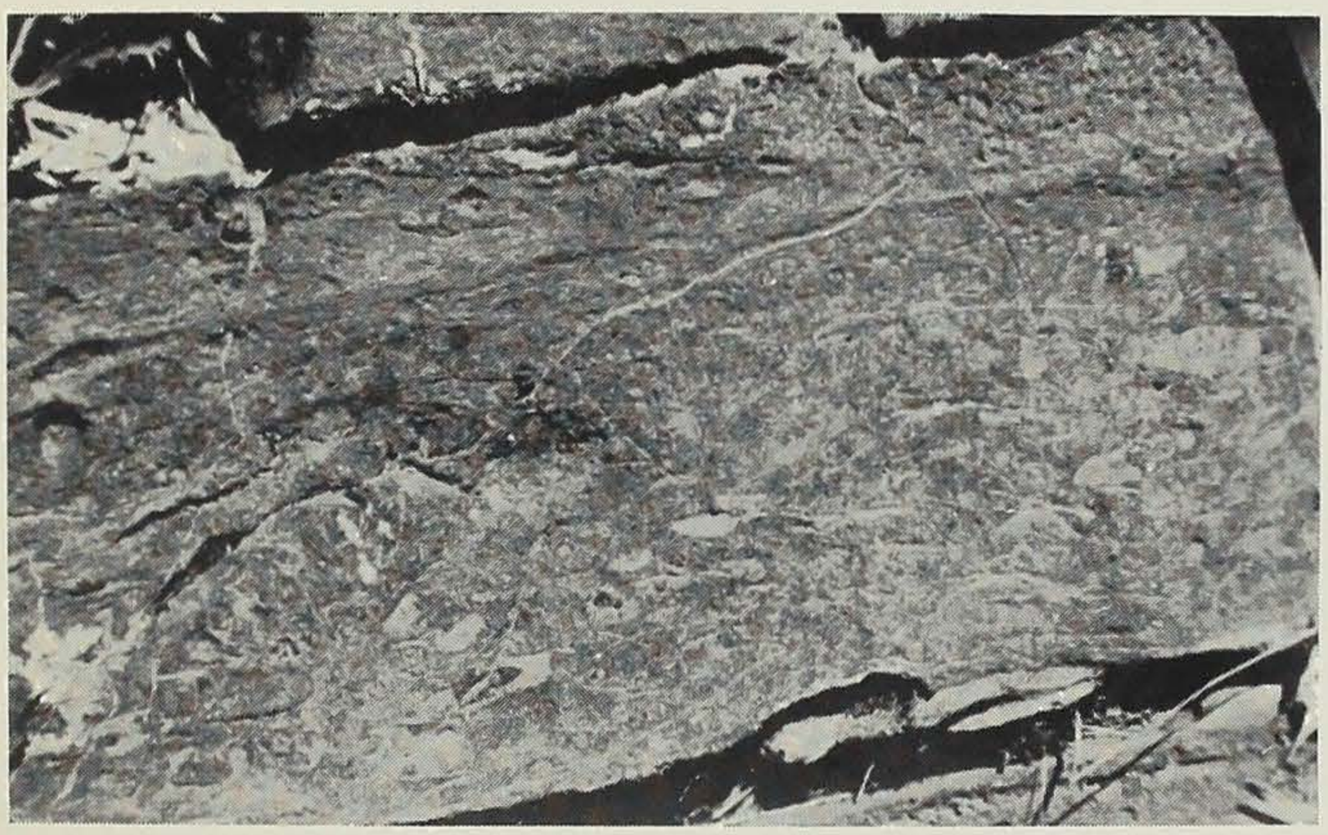
Fig. 1. Reddish bedded limestone and arenaceous calacrenite containing gyronitid ammonoids.

Fig. 2. Rhythmical alternations of muddy and limy bed, containing rare specimens of *Bellerophon*?, pectinid and ophiceratid ammonoids.

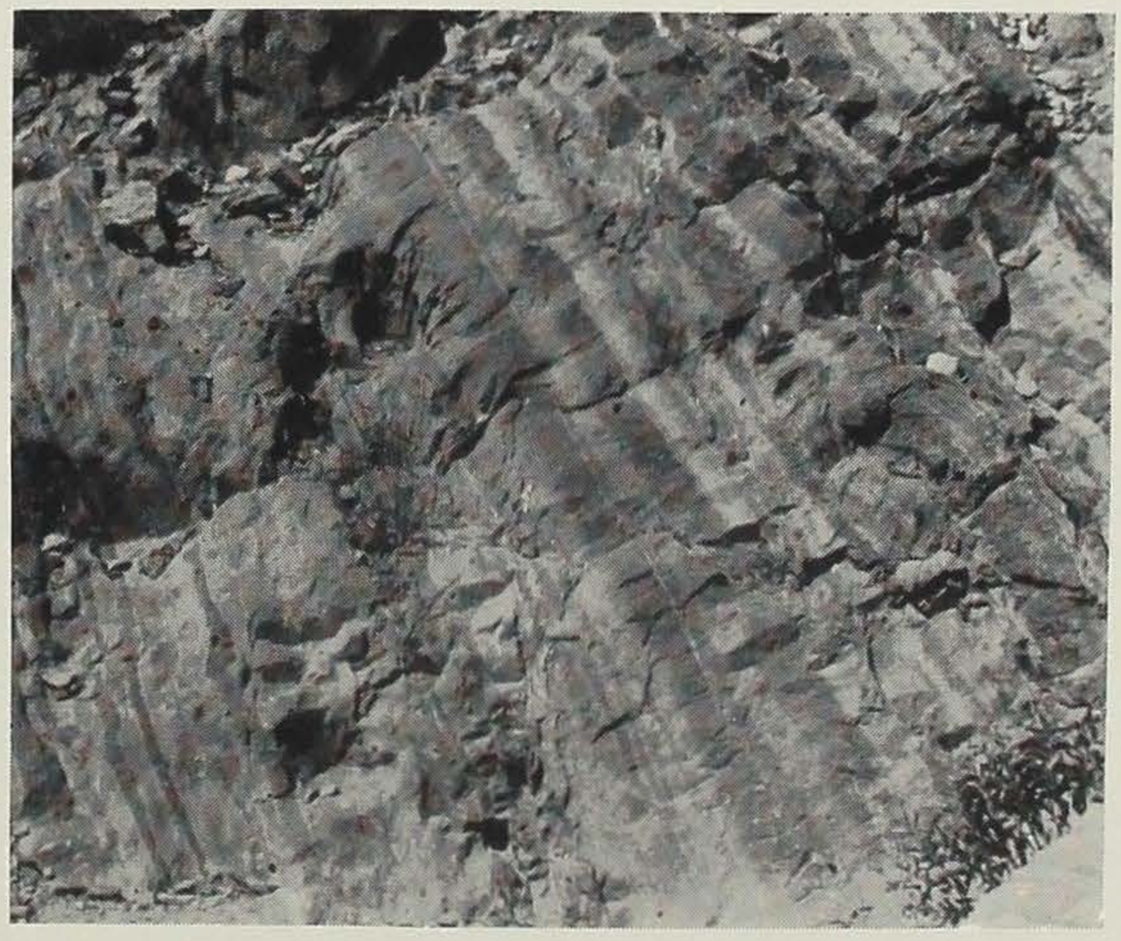
Fig. 3. Photograph near the Permian-Triassic boundary; UP, Upper Permian black laminated muddy limestone; 1, coquina bed of the basal part of the Lower Triassic sequence; 2, yellowish brown muddy limestone; 3, black or grayish brown bedded limestone containing ophiceratid ammonoids and *Eumorphotis*.

Fig. 4. Enlargement of the Permian-Triassic boundary (Fig. 3). At the base of the Triassic strata there developed many vertical burrows. These burrows extend down into the subjacent Upper Permian limestone.

Plate II

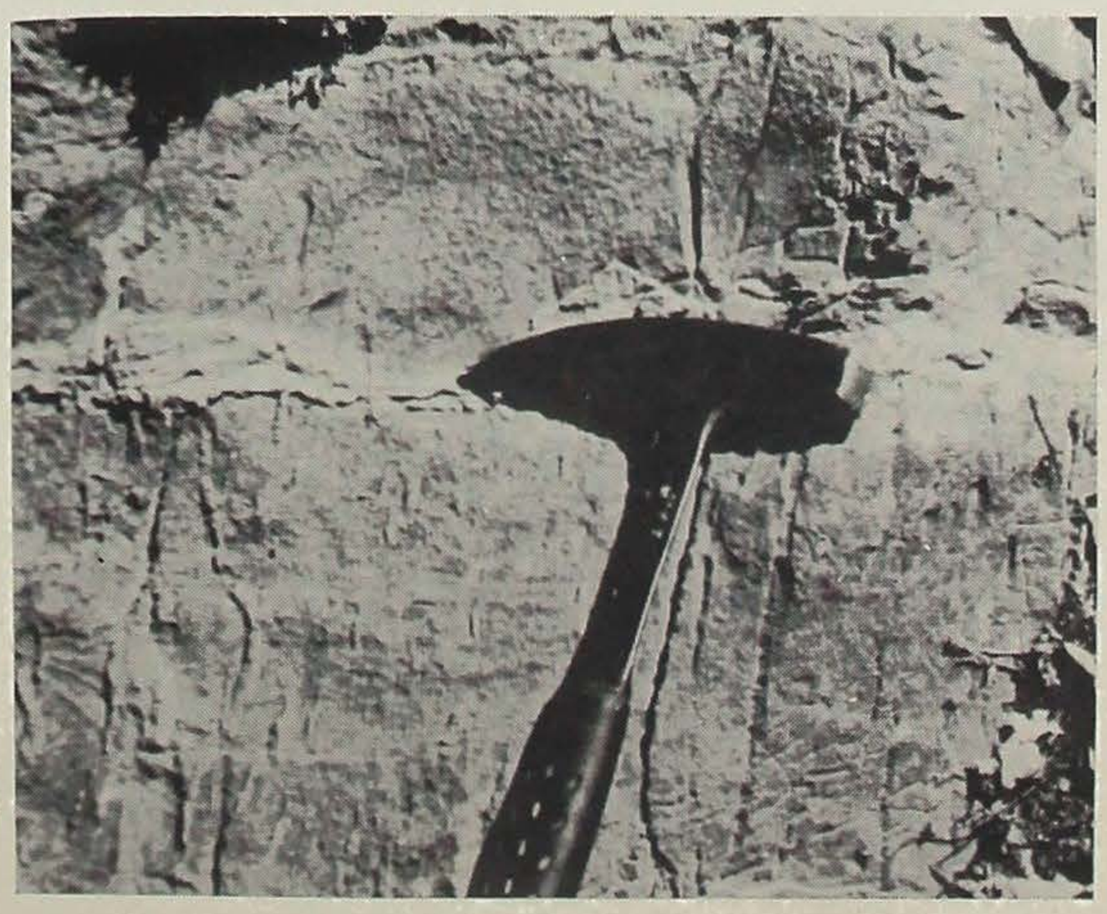


1



2

3



4

Plate III

Explanation of Plate III

Figs. 1a–c, 3a–c. *Gyronites fischeri* BANDO, n. sp., AFG–4 (Holotype) and AFG–6, ×ca. 1

Figs. 2a–b. *Kymatites* sp. cf. *Kymatites typus* WAAGEN, AFG–7, ×ca. 1.

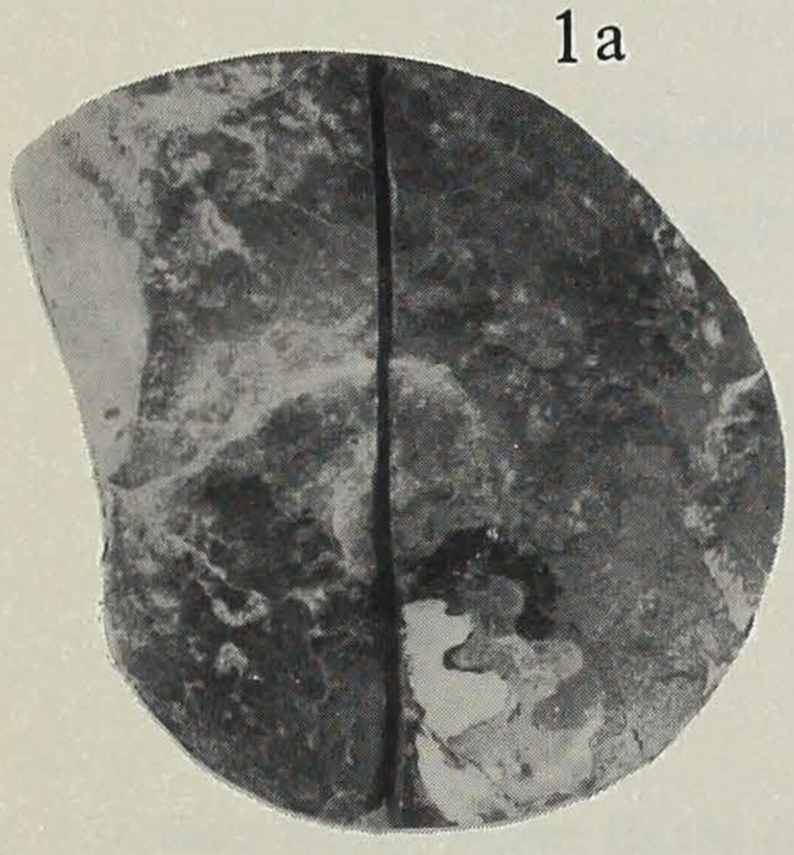
Fig. 4. *Gyronites* sp. indet., AFG–5, ×ca. 1.

Fig. 5. *Parakymatites*? sp. indet., AFG–2, ×ca. 1.

All illustrated specimens here were collected from the dark gray arenaceous limestone at Khoja Ghare Wali, eastern Afghanistan. Gyronitan or Late Induan stages of the Lower Triassic. Coll. K. ISHII, J. FISCHER, R. DIETMAR and Y. BANDO, 1969. All specimens are preserved in the Department of Geology, Faculty of Education, University of Kagawa, Takamatsu, Japan.

Plate III

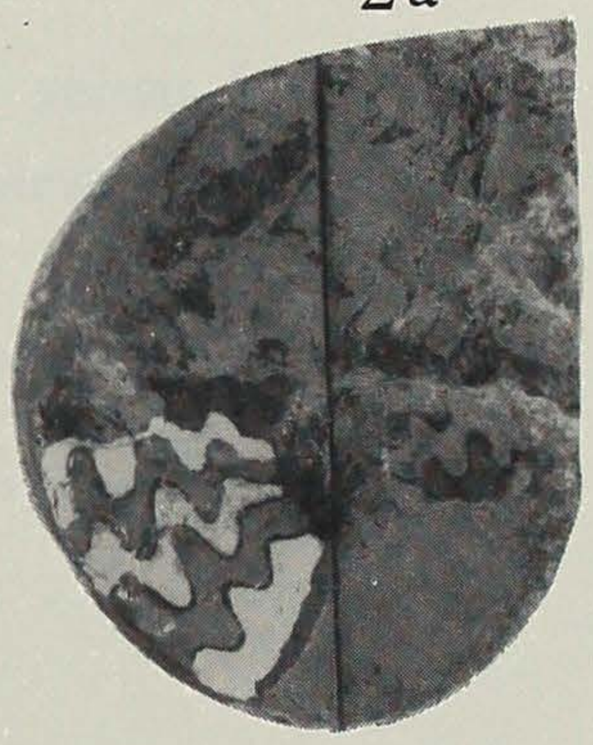
1a



1b

2b

2a

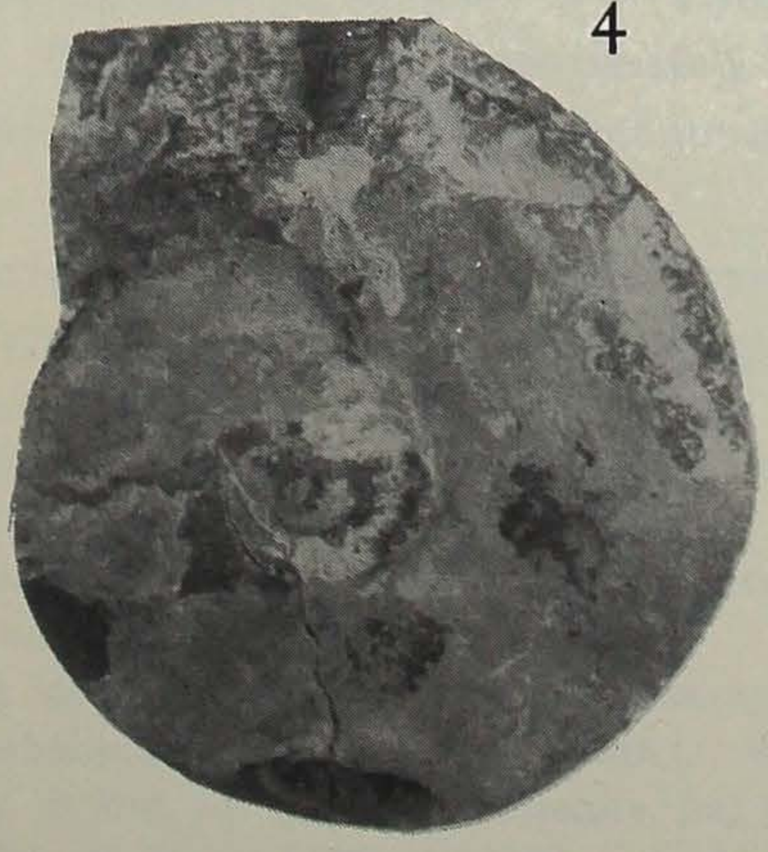


3a

3b

3c

4



1c

5