

Some Cretaceous Pelecypods from Afghanistan

by
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Abstract

Pelecypods, echinoid, ammonite, brachiopod and tetra-coral from Afghanistan were sent to the Geological Survey of Japan through Dr. H. Sawata by the request of the Geological Survey of Afghanistan, Royal Afghan Ministry of Mines and Industries.

Concerning the Pelecypods only, the writer determined their genera and specific names as follows :

Neithea quinquecostata (SOWERBY)

Inoceramus aff. *balticus* BOEHM

Pterotrigonia (?) sp. indet.

"*Pecten*" sp. indet.

Limidae or *Cardiidae* gen. et sp. indet.

All of them obviously indicate the late Cretaceous period, except the illustrated specimens under a name of *Pterotrigonia* (?) sp.. If just-mentioned specimens represent actually the genus *Pterotrigonia*, this genus has a great probability represented the lower horizon than the upper Cretaceous.

Introduction and Acknowledgements

The distribution of Cretaceous strata in the northern realm of Afghanistan has been hitherto known, though its detail has been scarcely reported. Fortunately, the Afghan fossils belonging to pelecypod, echinoid, ammonite, brachiopod and tetra-coral collected by the Geological Survey of Afghanistan, Royal Afghan Ministry of Mines and Industries, were sent to the Geological Survey of Japan through Dr. H. Sawata who is carrying on the geological reconnaissance in Afghanistan by the request of the Afghan Government, in order to serve those for determination of the geological age.

In this paper, the writer deals with only the pelecypods representing the upper Cretaceous period, in consideration of the geologic age of these fossils for an aid of studying the pelecypod-fauna of Tethys sea.

At last, the writer wishes to express his sincere thanks to the Geological Survey of Afghanistan, Royal Afghan Ministry of Mines and Industries for its kind favours sending these fossils and offering an opportunity of this study to the writer.

Notes on Paleontology and Geology

Of the pelecypod fossils examined, the following two specific names were identified, but those of other six specimens could not be determined owing to ill-preservation.

Among the determined species, *Inoceramus balticus*, *Neithea quinquecostata*, and their allied species are world-widely distributed in the upper Cretaceous period, and are very effective for the age determination. The geologic range of the first is thought to be shorter than that of the second. *Inoceramus balticus* and its allied species are yielded from the Senonian (s.s.)

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Name	Locality
<i>Neithea quinquecostata</i> (SOWERBY)	N. 34.86°, E. 67.28°, N. 34.86°, E. 67.81°, N. 34.87°, E. 67.18°
<i>Inoceramus</i> aff. <i>balticus</i> BOEHM	N. 34.87°, E. 67.18°
<i>Lopha</i> sp.	N. 34.86°, E. 67.28°
<i>Pterotrigonia</i> (?) sp. indet. (including two specimens)	N. 34.82°, E. 67.54°
" <i>Pecten</i> " sp. indet. (including two specimens)	N. 34.87°, E. 67.18°, N. 34.86°, E. 67.28°
<i>Limidae</i> or <i>Cardiidae</i> gen. et sp. indet.	N. 34.86°, E. 67.28°

to Maestrichtian of Southern India, Europe, Japan, etc. *Neithea quinquecostata* and its allied species have been repeatedly reported throughout the upper Cretaceous deposits of Southern India, Southern Africa and various countries of Europe. In this sense, these species seem to play an important role in the faunal relationship of the upper Cretaceous period among Europe, Southern Africa and Asia.

The report on geology of Afghanistan in detail has been hitherto scarcely published. According to the compiled geological map of Eurasian continent published in U.S.S.R. (1956), recently discovered localities of these fossils are kept as a blank territory in this compiled map. Fortunately, the writer has an opportunity to read the article on the stratigraphical outline of Afghanistan lately reported by S. POPOL and S. W. TROMP (1954). According to them, the Cretaceous system is widely developed from the northeastern to the southwestern realms of Afghanistan. Among the Cretaceous, the Senonian (s.l.) represents the narrowest distribution. Regarding the Senonian strata, they say as follows:

Senonian and Lower Eocene beds seem to be absent in Afghanistan except in the section north of the massive Turonian limestone at Tashkurgan and below the Argane pass (20 km W. of Kunduz, in the northeastern plain). Both micro- and macro-fossil studies confirmed our assumption in the field that the marly sections above the massive Turonian limestone represent a Senonian section, near Tashkurgan gradually changing into L. Eocene gypsiferous marls. This so-called "Tashkurgan series" is composed of a 270 m thick grey (in the sun grey) marl section near the base composed of white weathering greenish marls. About 80 m above the base a thin section of black oil shales occurs. In the Ishpushta region, in the Central Hindu Kush, the Turonian massive limestone are covered by brownish grey (green in sun) marl, with sandstone and limestone intercalations, which also may represent a Senonian or L. Eocene section.

As shown in Fig. 1, recently discovered fossil localities are situated at the northern and northwestern parts of Bamian in the Central Hindu Kush range, and the matrix of each fossil is composed of various colored sandstone. Therefore the approximate horizon of these fossils may be in sandstone intercalation within brownish grey marls which are assumed by them to be the Senonian or the lower Eocene. Meanwhile, when the geological age is inferred from these fossils, the conclusion will be deduced as follows: It cannot be said from the past studies of many authors that *Neithea quinquecostata* ranges only in the Senonian. However, the geologic horizon of locality ① (Fig. 1) is thought at least to be correlated to the Arrialoor group (Upper Senonian) of the Southern India and the upper Yezo group (from upper most Senonian (s.s.) namely, Campanian to lower Mae-

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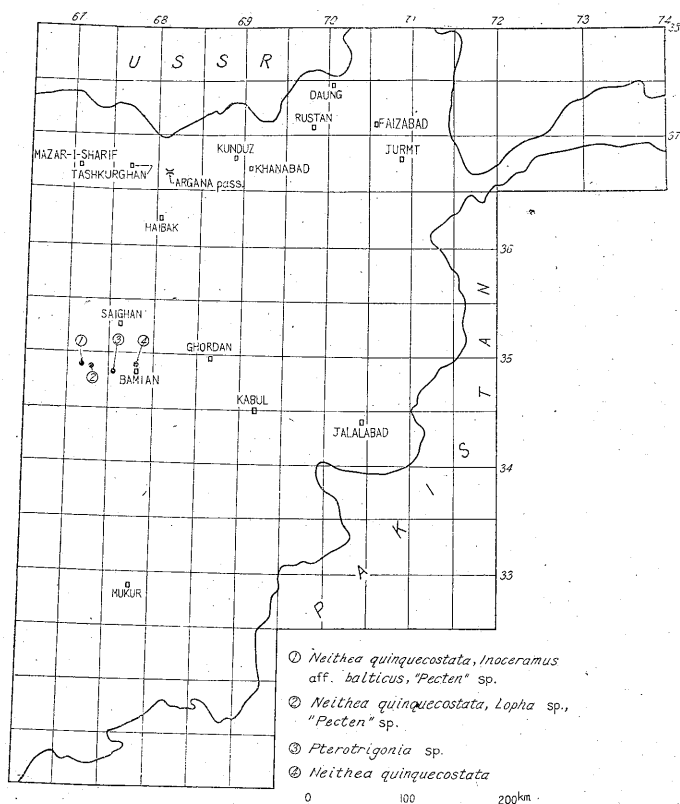


Fig. 1 Map showing several localities of some Cretaceous pelecypods in Afghanistan

strichitian) of Japan, as this locality yields *Neithea quinquecostata* with *Inoceramus aff. balticus*. The localities ② and ④ yielding only *Neithea quinquecostata* may represent the lower horizon than the Senonian, but the writer assumes these fossils to be also the Senonian. The locality ③ yielding *Pterotrigoia* (?) sp. may possibly represent the lower horizon than the Senonian (see p. 34).

Description of Species

Genus *Neithea* DROUET, 1824

Neithea quinquecostata (SOWERBY)

(Plate I, figs. 1~4)

- 1814. *Pecten quinquecostatus* SOWERBY; Mineral Conchology of Great Britain, Vol. 1, p. 122, pl. 56, figs. 4~8
- 1846. *Janira quinquecostata* D'ORBIGNY; Paleontologie française, Terrains crétacés, Vol. 3, p. 632, pl. 444, figs. 1~5
- 1846. *Pecten quinquecostatus* PICTET et ROUX; Description des Mollusques Fossiles, p. 296, pl. 45, figs. 3a~c
- 1870. *Pecten quadricostatus* CREDER; Deutsche. geol. Gesell. Zeitsch., Band 22, p. 232
- 1871. *Vola quinquecostata*, STOLICZKA; India. Geol. Survey Mem., Pal.

- Indica, Cret. Fauna Southern India, Vol. 3, p. 437, pl. 31, figs. 1~6; pl. 38, figs. 4~9
1885. *Neithea quinquecostata* WHITFIELD; U. S. Geol. Survey Mon. 9, p. 56, pl. 8, figs. 12~14
1903. *Pecten (Neithea) quinquecostatus* WOODS; A Mon. Cret. Lamell. England, Vol. 1, p. 202, pl. 39, figs. 14~17; pl. 40, figs. 1~5, Palaeont. Soc. London
1908. *Pecten (Neithea) quinquecostatus* WOODS; Annals South African Mus., Vol. 4, pt. 12, p. 298, pl. 35, fig. 14
1914. *Pecten quinquecostatus* STEPHENSON; U. S. G. S. Prof. Paper 81, p. 24, tabs. 2~9
1916. *Pecten quinquecostatus* GARDNER; Maryland Geol. Survey, Upper Cretaceous, p. 596, pl. 34, fig. 10
1927. *Pecten quinquecostatus* WADE; U. S. G. S. Prof. Paper 137, p. 64, pl. 21, figs. 1~5
1950. *Neithea quinquecostata* COLLIGNON; Annales Géologique du Service de Mines, Madagascar, Fascicule N°. 17, p. 31

All specimens are right valve. The test remains only in one specimen, and others are all internal moulds.

The right valve ovately subtrigonal exclusive of auricles, nearly equilateral, usually a little higher than long, regularly and well swollen with very prominent umbo; maximum convexity lying at about one-thirds from the umbo in the height of shell.

Dimensions (in mm)

	Height	Length	H/L
Pl. I, Fig. 1	52.0 (ca.)	48.5 (ca.)	1.07
Pl. I, Fig. 2	46.0	39.0 (ca.)	1.18

Umbo located at the middle of the shell length, very protruded, pointed beyond the hinge-line, incurved, orthogyrate or slightly prosocline. Both dorsal margins feebly concaved, diverging at angle of about 80°. Both auricles distinctly differentiated with the disc. Surface sculptured with five, elevated, round-topped primary radials, subequal in size and intercostal spacing, existing three or rarely four, equal and regular secondaries between each pair of primaries, but the antero-dorsal part in the disc ornamented with rather fine close-set radial ribs. Dental feature unknown.

Observation and Remarks: Few specimens with poor preservation are available for the writer; they lack external sculptures of both auricles, ligamental and umbonal areas.

Many authors have hitherto stated their opinions concerning this species, because this species has tolerably wide range of the variation, namely, in the numbers, shape and interspaces of the secondary ribs. Until the beginning of the 20th Century, these factors had been thought to play an important role in the distinction of another species. Then, from the plates illustrated by many authors, it was examined by the writer how many forms are there, in many specimens identified under a name of *Neithea quinquecostata*. In this case, the writer neglected the above-mentioned factors, because STOLICZKA¹⁵⁾ and WADE¹⁶⁾ pointed out that there was little regularity in the numbers of the secondary ribs, though the original illustrator. SOWERBY¹³⁾ recognized the regularity of that.

Generally, four types are recognized as follows:

- 1) Straight shoulder of both auricles and less height of the shell (H/L proportion changes approximately from 0.96 to 1.08)
- 2) Straight shoulder of both auricles and higher height of the shell (H/L proportion changes approximately from 1.15 to 1.17)
- 3) Down shoulder of both auricles and less height of the shell (H/L proportion changes approximately from 1.02 to 1.05)
- 4) Down shoulder of both auricles and higher height of the shell (H/L proportion changes approximately from 1.11 to 1.18)

Concerning the affinities of *Neithea quinquecostata*, *N. morrisoni* instituted by PICTET and RENEVIER (1858) and *N. quadricostata* (SOWERBY) had been known in Europe and Asia, WOODS (1903) stated that the difference between *N. morrisoni* and *N. quinquecostata* was as follows:

As a rule *P. (N.) morrisoni* is characterized by the relatively greater height of the shell (and consequently smaller apical angle), by the smaller convexity of the right valve, the rather stronger main ribs, with the ribs of the interspaces rather more unequal in size, and lastly in having the area, as a rule, without ribs. The concentric ornamentation agrees with that of *P. (N.) quinquecostatus*.

The writer tried the dimensions of H/L proportion of WOODS's examples of *N. morrisoni* (pl. 39, figs. 11~13) represented on the plate. As a result of this measurements, H/L proportion was from 1.22 to 1.26. Accordingly, it is clearly that there is evident gap in H/L proportion between two species. And also *N. morrisoni* is obviously less convexed on the right valve compared with that of *N. quinquecostata*. These facts call no question in the separation of two species. While, the question remains concerning two species of *N. quinquecostata* and *N. quadricostata*, as pointed out by STOLICZKA¹⁵⁾ and WADE¹⁶⁾. The criterion for the distinction of two species is illustrated by WOODS as follows:

	<i>N. quinquecostata</i>	<i>N. quadricostata</i>
Auricles	smaller	larger
Secondary ribs between each primary	four	three
Shell	smaller	relatively larger
Hinge-line	shorter	longer

Examining *N. quinquecostata* from the Ripley formation of Tennessee, U. S. A., WADE indicated that the Tennessee forms are very akin to *N. quadricostata* illustrated by WOODS; namely those sizes and the numbers of the secondary ribs (usually three), except for the posterior large auricle of *N. quadricostata*. Consequently, a sole factor distinguished from two species is one point of larger posterior auricle in *N. quadricostata* by WADE's observation. Furthermore, *N. quinquecostata* (pl. 21, figs. 1, 2) of the Tennessee form is obviously larger posterior auricle than those of the Southern Indian, European, and African forms.

Among several specimens disposed by the writer, a specimen (pl. I, fig. 1a) is very similar to the Tennessee form and the another specimen (pl. I, fig. 4a) is rather allied to *N. quadricostata* of WOODS, judging from only its size, though this specimen is laterally compressed.

The Afghan representations are so few in number that they offer very little assistance toward the solution of this problem. Among the Afghan form, however, the fact that there are intermediate form between *N. quinquecostata* and *N. quadricostata* will have to quantitatively examine many

tope types of *N. quadricostata*.

Localities and Geological horizon: Loc. ① (Band-i-Amir, N. 34.87°, E. 67.18°), Loc. ② (Band-i-Amir, N. 34.86°, E. 67.28°), and Loc. ④ (Band-i-Amir, N. 34.86°, E. 67.81°). May be Senonian.

Distribution: Ootatoor, Trichinopoly, and Arrialoor groups, Southern India, England, Western, Northern, and Central Europe, Middle and Northern Syria, Pondland, Southern Africa, Komihevitra-Mokaraha region, Madagascar, Tennessee, Maryland, New Jersey, U. S. A. and Mexico.

Genus *Inoceramus* PARKISON, 1819

Inoceramus aff. *balticus* BOEHM

(Plate II, figs. 1a, b)

1909. *Inoceramus balticus* BOEHM; Geologie und Paläontologie der Subhercynen Kreidemulde, Abhand. d. K. preuss. geol. Landesanst.; N.F. 56, p. 47, pl. 11, fig. 2a; pl. 12, fig. 1a
1912. *Inoceramus balticus* WOODS; A Mon. Cret. Lamell. England, Vol. 2, p. 293, text-figs. 51~53
1940. *Inoceramus balticus* NAGAO and MATSUMOTO; A Mon. Cret. *Inoceramus* Japan, pt. 2, Jour. Fac. Sci., Hokkaido Imp. Univ., Ser. 4, Vol. 6, No. 1, p. 18, pl. 10, fig. 1; pl. 13, fig. 1
1957. *Inoceramus balticus* AMANO; Upper Cret. Moll. from Shimo-Koshiki-Jima, Kyushu, Kumamoto Jour. Sci., Kumamoto Univ., Ser. B, Sect. 1, Vol. 2, p. 57, pl. 2, figs. 2~4

The specimen disposed by the writer is a sole bivalve exhibiting internal mould. Unfortunately, in the right valve, the portion from its umbonal area to the ventral is broken.

Shell somewhat inequivalve, extremely inequilateral; length greater than height; very prolonged postero-ventrally, like as a genus *Bakevellia*, accordingly the angle between the hinge-line and the line from the beak to the poster-ventral portion forming about 50°, and that line runs almost parallel with the posterior, moderately convex except the posterior and the postero-dorsal, in which are somewhat compressed. Anterior and the postero-ventral parts broadly arcuated; the posterior margin forming an obtuse angle (ca. 130°) with the hinge-line. In the right valve, the antero-ventral portion forms clearly inward-bending (about 90°) in the juvenile stage, but that of the left one is more obscure than that of the right one. Hinge-line relatively long.

Dimensions (in mm)

Length	Height	L/H
12.6	3.6	3.5

Umbo nearly terminal. Internal surface of the shell consists of very broad, but indistinct ribs and the interspaces. Curvature of the interspace is relatively asymmetrical. Bifurcation of the ribs are indistinctly recognized at the several parts of the internal surface. On the marginal part of this specimen, rib is obliterated.

Observation: Judging from the illustration concerning this species by BOEHM¹²⁾, WOODS¹⁸⁾ and NAGAO and MATSUMOTO⁹⁾, its characteristics will be summarized in the following respects.

- 1) Much elongate outline from the beak to the postero-ventral angle

- 2) The antero-ventral portion of the shell forms distinctly inward-bending in the juvenile stage
- 3) Becoming very convex in the adult specimen
- 4) Umbo subterminal
- 5) Very broad concentric ridges and numerous concentric rings
- 6) Sometimes with the bifurcation of the concentric ridge
- 7) On the marginal parts of the adult specimen ribs are obsolete or absent

Among these characteristics, the Afghan form is accordant with the England one in the respects of 1), 2), 5), 6) and 7). The former, however, is distinguishable from the latter in having nearly terminal umbo and less convex shell. Owing to the fact that the umbo of this specimen is nearly terminal, the curvature of its antero-dorsal margin is weaker than that of *I. balticus* illustrated by WOODS (1912, p. 294, fig. 51)¹⁸⁾ and BOEHM (1907, pl. 11, fig. 2; pl. 12, fig. 1). Furthermore, concentric rings of the marginal part of this specimen are obliterated, notwithstanding this specimen seems not to show the adult stage, judging from the measurement of WOODS's specimen, and also this specimen is distinctly less convex compared with the figures (text-figs. 51, 52) illustrated by Woods.

From the consideration of the illustration of NAGAO and MATSUMOTO, the Afghan form is distinguishable from the Japanese one by having less convex shell.

WOODS pointed out that one important distinction between *I. balticus* and *I. inconstans* was the location of umbo. The former has subterminal umbo and the latter has nearly terminal one. In just-mentioned point, this specimen is similar to *I. inconstans*, but obviously differs from that species, in the outline and surface sculptures of the shell.

Judging from just-mentioned facts, the Afghan form may represent a new form which is closely related to *I. balticus*. As the specimen is a sole, the writer tentatively identified this form with *I. balticus* at present stage.

Locality and Geological horizon: Loc. ① (Band-i-Amir, N. 34.87°, E. 67.18°), Upper Senonian.

Genus *Lopha* RÖDING, 1798

Lopha sp.

(Plate III, figs. 1a, b)

Material: A single, bivalve specimen with almost complete outline.

Shell medium for the genus, *Pterotrigonia*-like in outline, but its ventral area more swollen than that of a genus *Pterotrigonia*. Convexity of both valves nearly equal, but somewhat stronger in the left valve than in the right one. The right valve bears prominent, occasionally bifurcating plications which diverge from broadly arcuated medial ridge to the ventral margin and the plications seem to increase with the growth of the shell either by bifurcation or by intercalation; the first bifurcation originates at the neighbourhood of the medial ridge, and the second one originates at weakly nodose middle stage of the growth, though those are irregular. Those plications generally forming sharp angulation (ca. 50°) in the ventral, but tend to broader and weaker on the posterior and the anterior side of the shell; a maximum number of plication of the right valve measured at the margin is about 30.

Dimensions (in mm)

Length	Height
9.8	6.1

Observation: The left valve covered with cementing material of calcareous sand, accordingly, characteristic sculpture of the shell is obscure. So far as the writer has observed, surface sculpture of the left valve is nearly same to that of the right. But the postero-dorsal part is more clearly convex than that of the right (see pl. III, fig. 1b). The umbonal area of the left valve forms irregular process suggesting the attachmental area of the shell.

Locality and Geological horizon: Loc. ② (Band-i-Amir, N. 34.86°, E. 67.28°). May be Senonian.

Genus *Pterotrigonia* VAN HOEPEN, 1929

Pterotrigonia (?) sp. indet.

(Plate I, fig. 5; Plate III, fig. 2)

Remark on the geological horizon: Recently, the study of subfamily *Pterotrigoniinae* was done by T. KOBAYASHI and M. NAKANO⁷⁾. According to them, among this subfamily, a genus *Pterotrigonia* distributed cosmopolitan in the early Cretaceous, declining in Europe, but flourished in the other regions in the middle Cretaceous. The relic members of this genus in the late Cretaceous are known only from North America and New Zealand. Accordingly, if these specimens represent actually the genus *Pterotrigonia*, these specimens have a great probability representing the lower horizon than the Senonian.

Locality: Loc. ③ (N. 34.82°, E. 67.54°)

"*Pecten*" sp. indet

(Plate IV, figs. 1, 2)

Localities: Loc. ① (Band-i-Amir, N. 34.87°, E. 67.18°) and Loc. ② (Band-i-Amir, N. 34.86°, E. 67.28°)

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アフガニスタン産白堊紀二枚貝類

矢 部 之 男

要 旨

現在、アフガニスタンに滞在中の沢田秀穂の依頼により、属種名同定のため、同国産二枚貝・ウニ・菊石・腕足貝・四射サンゴなどが送られてきた。そのうち、二枚貝類について検討した結果は次の通りである。

Neitheia quinquecostata (SOWERBY)

Inoceramus aff. *balticus* BOEHM

Pterotrigonia (?) sp. indet.

"*Pecten*" sp. indet.

Limidae or *Cardiidae* gen. et sp. indet.

これらの二枚貝はすべて上部白堊紀を指示するが、*Pterotrigonia* (?) sp. はより下位の層準を示す可能性がある。

Plate I¹

- Neithea quinquecostata* (SOWERBY) 29
- Fig. 1a A right valve and the posterior auricle somewhat preserved (GSJ. Reg. No. 5101) ×1
- Fig. 1b Dorsal view of same specimen ×1
- Fig. 2a Internal mould of a right valve (GSJ. Reg. No. 5102) ×1
- Fig. 2b Dorsal view of same specimen ×1
- Fig. 3a Internal mould of a right valve, both auricles not preserved (GSJ. Reg. No. 5103) ×1
- Fig. 3b Dorsal view of same specimen, beak not preserved ×1
- Fig. 4 Deformed large specimen, posterior part rather fairly preserved (GSJ. Reg. No. 5104) ×1
- Pterotrignia* (?) sp. indet. 34
- Fig. 5 A right valve (GSJ. Reg. No. 5107) ×1

(All specimens here illustrated are tentatively repositied in Geological Survey of Japan.)

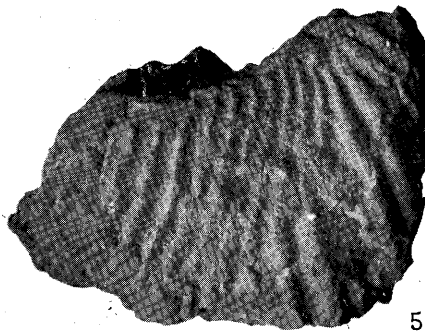
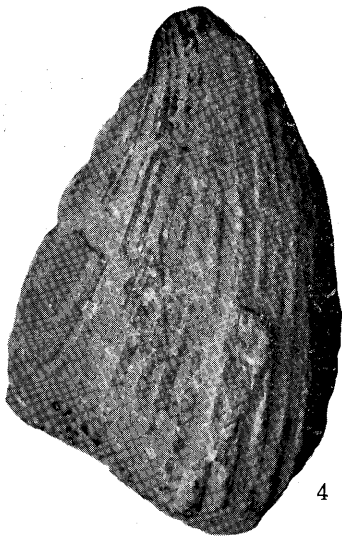
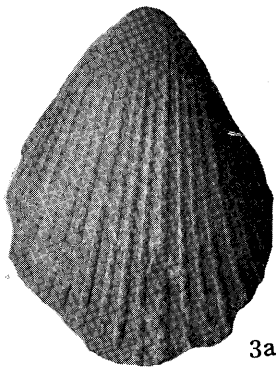
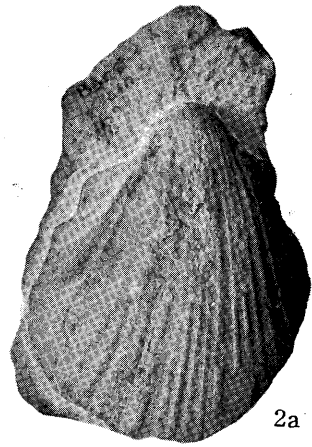
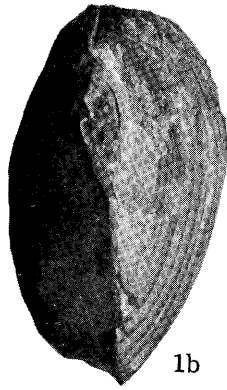
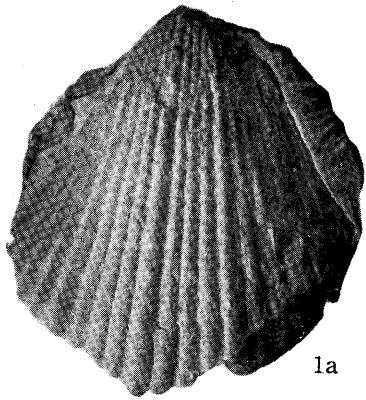


Plate II

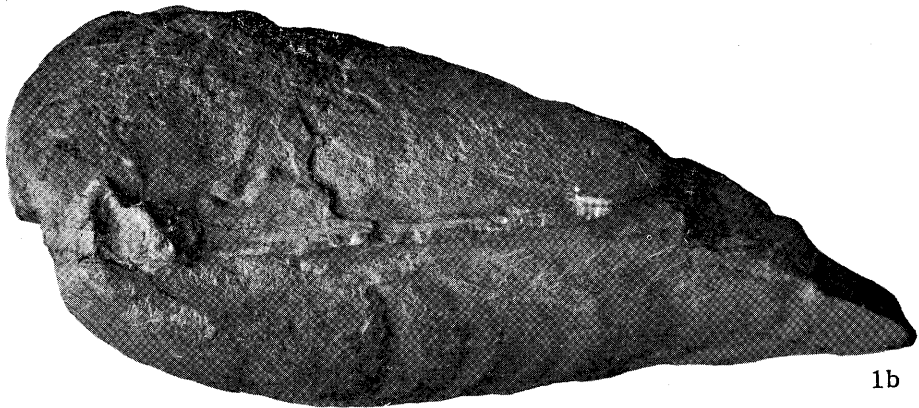
Inoceramus aff. *balticus* BOEHM 32

Fig. 1a Internal mould of a left valve, characteristic "Rippengabelung" is exhibited
on the surface of the shell. (GSJ. Reg. No. 5105) $\times 1$

Fig. 1b Apical view of same specimen $\times 1$



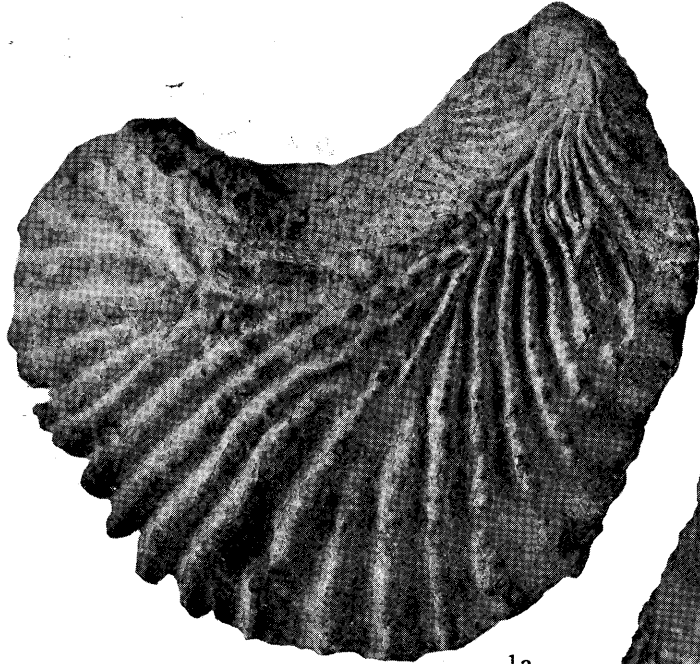
1a



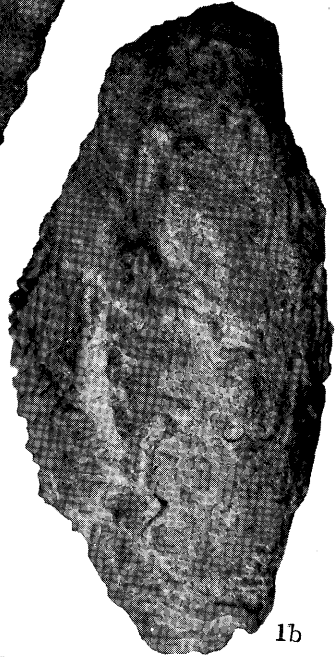
1b

Plate III

Lopha sp. 33
Fig. 1a Almost complete right valve (GSJ. Reg. No. 5106) ×1
Fig. 1b Posterior view of same specimen
Pterotrignia (?) sp. indet. 34
Fig. 2 Internal mould of a left valve (GSJ. Reg. No. 5108) ×1



1a



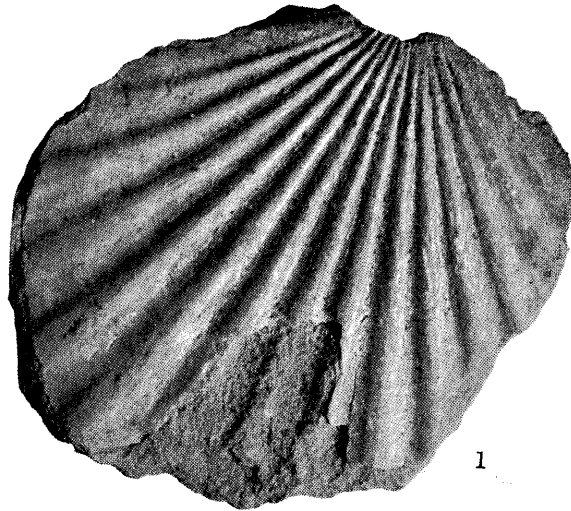
1b



2

Plate IV

- “*Pecten*” sp. indet. 34
Fig. 1 A left valve, both auricles not preserved (GSJ. Reg. No. 5109) ×1
Fig. 2 Internal mould of a right valve (GSJ. Reg. No. 5110) ×1



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