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ON SOME ANISIC AMMONITES FROM THE HOLLANDITES BEDS  
OF THE KITAKAMI MOUNTAINLAND.

BY

SABURÔ SHIMIZU

*Plate XXIV (I), Figs. 1-14.*

E. v. MOJSISOVICS<sup>1</sup> was the first author who confirmed on fossil evidence the existence of Triassic deposits in the southern part of the Kitakami Mountainland. He described from this district 6 species of ammonites belonging to 4 genera; the fauna, according to him, is Fassanic in age and is intimately related to the fauna of the western North American region.

Much progress was made by C. DIENER who personally visited the Triassic district in company with Prof. H. YABE in 1915 and gave a more detailed account of the Middle Triassic fauna in his paper<sup>2</sup> "Japanische Triasfaunen." DIENER agrees with J. P. SMITH<sup>3</sup> in regarding the fauna of the *Hollandites* Beds<sup>4</sup> as not much related to the contemporaneous one of North America, as once though by MOJSISOVICS to be; according to DIENER, the *Hollandites* Beds are Anisic and the fauna is essentially of the Himalayan type.

Species of ammonites previously described from the *Hollandites* Beds are 12 in all, namely:

*Ceratites (Hollandites) japonicus* MOJS.

*Ceratites (Hollandites) haradai* MOJS.

*Ceratites (Hollandites) nodai* DIENER

*Danubites naumanni* (MOJS.)

*Ptychites inaicus* DIENER

*Ptychites sp. indet.*

*Gymnites watanabei* MOJS.

*Gymnites sp. indet. aff. kirata* DIENER

*Sturia japonica* DIENER

*Anolcites? kitakamicus* DIENER

*Anolcites? gottschei* (MOJS.)

*Monophyllites (Ussurites) yabei* DIENER

*Japonites planiplicatus*<sup>5</sup> described by MOJSISOVICS is known to have been dredged up from the sea bottom off Okatsuhama, about 16.5 km. NE of Inai; it is considered by him and later authors as derived from a deposit contemporaneous with the *Hollandites* Beds.

<sup>1</sup>E. V. MOJSISOVICS: Ueber einige Japanische Triasfaunen, Beiträge z. Pal. Oester.-Ungarns u. d. Orients, Vol. VII, 1888.

<sup>2</sup>C. DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, 1915.

<sup>3</sup>J. P. SMITH: The Middle Triassic Marine Invertebrate Faunas of North America, U.S. Geol. Surv., Prof. Paper, 83, 1914, p. 8.

<sup>4</sup>The most prolific locality of the fossils is Inai near Ishinomaki, and the fossiliferous deposit was formerly called the *Ceratites* Beds (YABE: Geological Ages of the Triassic Deposits of Japan, Jour. Geol. Soc., Tôkyô, Vol. XXV, 1915, p. 388) and now *Hollandites* Beds (YABE and SHIMIZU: The Triassic Fauna of Rifu, near Sendai, Sci. Rep. Tôhoku Imp. Univ., Second Ser. (Geology), Vol. XI, No. 2, 1927, p. 9).

<sup>5</sup>MOJSISOVICS: Loc. Cit., (1888), p. 8, Pl. IV.

There are several other occurrences of Triassic ammonites in the district, reported by various authors; these records, however, are neither accompanied by detailed descriptions nor figures of the fossils. Of these, 3 species once mentioned by H. HACHIYA,<sup>1</sup>

*Ceratites* sp. } Loc.: Near Yanaizu, Motoyoshi-gun; *Hollandites*  
*Gymnites* cfr. *watanabei* MOJS. } Beds.  
*Monophyllites* sp. . . . . Loc.: Irizuchi, Kashizaki-mura, Motoyoshi-gun;  
*Hollandites* Beds.

are based on the specimens examined by YABE at that time.

Our Institute of Geology and Palaeontology keeps nearly all the specimens of the Triassic ammonites from this district examined by DIENER, while there are several others which have not yet been studied in detail; some of these are new and deserve description, and in the present undertaking to describe them, the former are also revised to date; the essential results now obtained are:

1. *Anolcites*? *kitakamicus* DIENER must be placed in the genus *Balatonites* MOJS.
2. A new specific name (*Danubites japonicus*) is proposed for the two specimens of *Danubites naumanni* figured by DIENER, as these are not identical with the typical *Danubites naumanni* MOJS.
3. A specimen figured by DIENER as *Ceratites* (*Hollandites*) *japonicus* (Pl. II, Fig. 1) differs sufficiently from the typical form of the species to warrant its separation as a new variety (*var. crassicostatus*).
4. New to us are:
  - Danubites* cfr. *kansa* DIENER.  
 Loc.: Inai, Inai-mura, Oshika-gun; *Hollandites* Beds.
  - Cuccoceras* aff. *submarinonii* SHIMIZU.  
 Loc.: Inai, Inai-mura, Oshika-gun; *Hollandites* Beds.
  - Monophyllites* (*Leiophyllites*) cfr. *pseudo-pradyumna* WELTER.  
 Loc.: Kudanohama, Utatsu-mura, Motoyoshi-gun; *Hollandites* Beds.
5. New localities are:
  - Ceratites* (*Hollandites*) *japonicus* MOJS.  
 Loc.: Isadomae and between Kudanohama and Tate, both in Utatsu-mura, Motoyoshi-gun; *Hollandites* Beds.
  - Ceratites* (*Hollandites*) *haradai* MOJS.  
 Loc.: Iwaida, Oginohama-mura, Oshika-gun, and northeast of Oritate, Motoyoshi-gun; *Hollandites* Beds.
  - Balatonites kitakamicus* (DIENER).  
 Loc.: Iwaida, Oginohama-mura, Oshika-gun; *Hollandites* Beds.
  - Balatonites* cfr. *kitakamicus* (DIENER).  
 Loc.: Yanaizu and Oritate, both in Motoyoshi-gun; *Hollandites* Beds.
  - Sturia*? sp. *indet.*  
 Loc.: Higuchi, Utatsu-mura, Motoyoshi-gun; *Hollandites* Beds.
  - Monophyllites* (*Ussurites*) *yabei* DIENER.  
 Loc.: Kamaya, Okawa-mura, Monô-gun; *Hollandites* Beds.

I have here to thank cordially Prof. H. YABE for his kind advice given me during the present study.

<sup>1</sup>H. HACHIYA: On Some Mesozoic Fossils from the Kitakami Mountainland, Jour. Geol. Soc., Tôkyô, Vol. VIII, 1901, p. 202.

Gen. CERATITES DE HAAN

Subgen. HOLLANDITES DIENER

Ceratites (Hollandites) japonicus MOJS.

Pl. XXIV (I), Fig. 1.

1888. *Peltoceras athleta* D. BRAUNS: Vorläufige Notizen über Vorkommnisse der Juraformation in Japan, Mitt. d. Deutschen Geselsch. f. Natur u. Völkerkunde Ostasien, No. 20, p. 441.
1883. *Arietites* *cfr. rotiformis* C. GOTTSCHÉ: Note on the Geology of Japan, Science, Vol. I, p. 166.
1888. *Ceratites japonicus* MOJSISOVICS: Über einige japanische Trias-Fossilien, Beiträge z. Pal. Oesterr.-Ungarns etc., Vol. VII, p. 168, Pl. I, Figs. 1-2.
1915. *Ceratites (Hollandites) japonicus* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, p. 9, Pl. III, Fig. 1. (non Pl. II, Fig. 1).

There are two specimens of this species; the smaller one derived from the sea cliff between Kudanohama and Tate is a fragmental internal mould, while the larger one collected from Isatomae consists of two portions, one an internal mould with beautifully preserved suture-lines and the other an external mould. The latter specimen is here measured and figured.

Dimensions :

Diameter . . . . .	103 mm.	100
Height of the last whorl . . . . .	43 mm.	41
Breadth of the last whorl . . . . .	—	—
Width of umbilicus . . . . .	38	36

The identity of the specimen here figured with DIENER's plesiotype (Pl. III, Fig. 1) can not be doubted, as the two agree in all important characteristics. The whorls increase gradually in height and breath, and the amount of involution is rather small being about  $\frac{1}{4}$ . The umbilicus is wide and shallow, with low but steep walls and rounded margin. The ventral margin appears to have been rounded off, though its actual feature has not been satisfactorily ascertained. My attention has been specially drawn to the great similarity of the sculpture between this fossil and the DIENER's plesiotype, a regular change of sculpture taking place with age in the two. On the last  $1\frac{2}{3}$  volutions of the chambered whorls of the figured specimen, there are numerous simple or bifurcate ribs, separated by narrow interspaces; the point of bifurcation of ribs, occasionally, but not always, provided with a rounded tubercle, changes its position from the umbilical margin to one-third of the height of the whorl in the septated part of the last volution. About one-third of the outer volution which evidently belongs to the body-chamber, bears simple much more rounded, prominent ribs, separated by broader interspaces than those of the chambered part; the ribs become gradually faint towards the umbilical margin, and are provided with a strong, rounded tubercle on the ventral margin; interspaces between the ribs are covered by numerous narrow, radial elevated striae of variable strength as the accompanying figure shows.

The suture-lines of this specimen are very close to those of MOJSISOVIC's holotype.<sup>1</sup> They are ceratitic, with four serrated lobes and the corresponding number of rounded entire saddles; the external lobe is short and rather narrow, the first lateral broad and deep, the second lateral narrow, and the auxiliary one narrower and shallower.

<sup>1</sup>MOJSISOVICS: Loc. cit., (1888), p. 6, Pl. I, Fig. 1, 2.

Remarks: The present species is no doubt nearly allied to *Ceratites (Hollandites) vyasa*<sup>1</sup> DIENER from the Muschelkalk of Himalayas as pointed out by DIENER.<sup>2</sup> The latter is distinguished from the former by much broader and less involute whorls, much more pronounced ribs near the umbilical margin and a broader first auxiliary lobe.

*Arpadites? sp. indet.*<sup>3</sup> figured by MOJSISOVICS was thought by DIENER<sup>4</sup> to belong to this species; a view in which I also concur.

Localities: Isatomae and the sea cliff between Kudanohama and Tate, both in Utatsumura, Motoyoshi-gun.

### *Ceratites (Hollandites) japonicus* MOJS. var. *crassicostatus* var. nov.

Pl. XXIV (I), Fig. 2.

1915. *Ceratites (Hollandites) japonicus* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss. Wien, p. 9, Pl. II, Fig. 1.

Our Institute possesses many specimens of *Ceratites (Hollandites) japonicus* from the *Hollandites* Beds of the Kitakami Mountainland. Having examined all of those examples, I found that *Ceratites (Hollandites) japonicus* has a rather wide range of variation in form and sculpture. None of them, however, is comparable with the specimen (Pl. II, Fig. 1) figured by DIENER and the latter appears to be sufficiently different from the others to be worthy of varietal separation.

The specimen in question really strikingly resembles the typical *Ceratites (Hollandites) japonicus* in its general habitus. The most noteworthy points of its demarcation from the latter are (1) somewhat greater involution of whorls, (2) slightly narrower umbilicus and (3) much coarser and stronger costation on the body-chamber. Of these, the last one is the most attractive, the radial ribs on the body-chamber being provided with much stronger, prominent tubercles near the ventral margin than the typical examples of *Ceratites (Hollandites) japonicus* bear.

Locality: Inai, Inai-mura, Oshika-gun.

### *Ceratites (Hollandites) haradai* MOJS.

Pl. XXIV (I), Fig. 3.

1880. *Ceratites haradai* MOJSISOVICS: Ueber einige japanische Trias-Fossilien, Beiträge z. Pal. Oesterr. Ungarns etc., Vol. VII, p. 169, Pl. I, Fig. 3.

1915. *Ceratites (Hollandites) haradai* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, p. 12, Pl. I, Figs. 1-2; Pl. III, Fig. 2; Pl. V, Fig. 3.

This species is represented by two specimens. The larger which has been here measured and figured, is an internal mould obtained from Iwaida. The second specimen is a fragmental internal mould collected from NE of Oritate, in which the umbilical region is not well preserved.

<sup>1</sup>DIENER: The Cephalopoda of the Muschelkalk, Pal. Indica, Ser. XV, Himalayan Fossils, Vol. II, Trias, Pt. 2, 1895, p. 19, Pl. VI, Fig. 2 (non Fig. 1); DIENER: The Fauna of the Himalayan Muschelkalk, ibidem, Vol. V, No. 2, 1907, p. 66, Pl. VII, Figs. 1-2; DIENER: Triassic Fauna of Kashmir, ibidem, New Series, Vol. V, No. 1, 1913, p. 56.

<sup>2</sup>DIENER: Loc. cit. (1915), p. 10.

<sup>3</sup>MOJSISOVICS: Loc. cit. (1888), p. 9, Pl. I, Figs. 4a-b.

<sup>4</sup>DIENER: Loc. cit. (1915), p. 11.

Dimensions :	Along the major diameter		Along the minor diameter.	
	mm.		mm.	
Diameter . . . . .	110	100	54	100
Height of the last whorl . . .	30	27	20	37
Breadth of the last whorl . . .	—	—	—	—
Width of umbilicus . . . . .	35	31	17	31

Remarks: MOJSISOVICS' original description<sup>1</sup> of and DIENER'S additional remarks<sup>2</sup> on *Ceratites (Hollandites) haradai* are as follows :

“Das hochmündige und enggenabelte Gehäuse ist von zahlreichen, ziemlich gerade verlaufenden, faltenartigen Rippen bedeckt, welche am Rande der Seitenflanken mit einer schwachen Verdickung enden und in der Mehrzahl sich nächst dem Nabelrande oder gegen die Mitte der Seitenflanken paarig vereinigen. Die Zahl der gedrängt stehenden Rippen ist eine viel bedeutendere, als wie bei *Ceratites japonicus*, lässt sich jedoch wegen der Unvollständigkeit des Exemplares nicht genau feststellen. Der Externteil dürfte glatt und abgeflacht gewesen sein.” (MOJSISOVICS)

“Der Externteil ist nicht abgeflacht, sondern regelmässig gerundet, ähnlich wie bei *Hollandites Voiti* OPP. oder *Hollandites ravana* DIEN. Für den Skulpturtypus unserer Art ist die Uebereinstimmung der Ornamentierung des gekammerten Schalteiles und der Wohnkammer charakteristisch. Die Rippen sind durchaus faltenförmig und verlaufen in radialer Richtung gerade oder leicht geschwungen. Selbst in der Nähe des Peristoms der grössten Exemplare, bei denen bereits die Hälfte der Schlusswindung der Wohnkammer angehört, treten neben den an Zahl stets überwiegender einfachen noch dichotome Rippen auf. Die Gabelung vollzieht sich zumeist in der Mitte der Flanken und ist manchmal mit einer knotigen Anschwellung an der Gabelstelle verbunden. Doch können solche laterale Anschwellungen auch gänzlich fehlen. Ueberhaupt weist die Rippen-skulptur selbst an einem und demselben Individuum beträchtliche Veränderungen auf. So sind an dem grossen Wohnkammerexemplar, das auf Taf. I, Fig. 1 zur Abbildung gebracht ist, die Rippen in dem dem Beginn der Schlusswindung gegenüberliegenden Quadranten sehr breit und flach gewölbt, in den beiden benachbarten Quadranten hingegen schmal, stellenweise sogar scharfkantig und viel dichter gedrängt. Umbilikale oder marginale Knoten fehlen durchaus. In der Nähe des Externrandes erlöschen die Rippen allmählich, so dass die eigentliche Externseite vollständig glatt bleibt.”

“Loben: Brachyphyll zerschlitzt, Sättel bis zu den Köpfen gekerbt. Loben mit langen, fingerförmigen Zacken im Grunde, sehr ähnlich jenen des *Hollandites japonicus*. Infolge der Verdrückung der Schale sind in den Einzelheiten der Suturlinien an demselben Stück oft erhebliche Abweichungen zu konstatieren. Die Auxiliarreihe ist auch bei dieser Art den Hauptsätteln gegenüber in auffallender Weise verkümmert.” (DIENER)

The foregoing quotations sufficiently give us the specific characters of this species, which can thus easily be recognized by the compressed, oblong-elliptical outline of whorls in cross-section, somewhat narrow umbilicus, numerous ribs, which are either simple or bifurcate and free from any distinct tuberculation both on the lateral or ventral margins, and the suture-lines, which are brachyphylloid, with saddles serrated near the top and deeply digitated lobes.

The specimen from Iwaida now under consideration shows all the important characteristics of this species, except the suture-lines which are not exhibited.

<sup>1</sup>MOJSISOVICS: Loc. cit. (1888), p. 7.

<sup>2</sup>DIENER: Loc. cit. (1915), p. 13.

*Ceratites (Hollandites) haradai* is distinguished from *Ceratites (Hollandites) nodai*<sup>1</sup> DIENER by less numerous bifurcated ribs; besides, the latter species has more or less prominent tubercles on the ribs. It is also distinguished from *Ceratites (Hollandites) japonicus* chiefly by much narrower whorls, more crowded ribs and by lacking distinct ventral tubercle.

Localities: Iwaida, Oginohama-mura, Oshika-gun and northeast of Oritate, Oritate-mura, Motoyoshi-gun.

### Gen. DANUBITES MOJSISOVICS

#### Danubites cfr. kansa DIENER

Pl. XXIV (I), Fig. 4.

1895. *Danubites kansa* DIENER: The Cephalopoda of the Muschelkalk, Pal. Indica, Ser. XV, Vol. II, pt. 2, p. 103, Pl. XXIX, Fig. 1.

1907. *Floriamites cfr. kansa* DIENER: The Fauna of the Himalayan Muschelkalk, Pal. Indica, Ser. XV, Vol. V, No. 2, p. 70, Pl. V, Fig. 5.

One internal mould at our disposal has the following dimensions:

	A				B	
	Along the major diameter		Along the minor diameter		mm.	
	mm.		mm.			
Diameter . . . . .	125	100	84	100	89	100
Height of the last whorl . .	40	32	27	32	33	37
Breadth of the last whorl . .	—	—	—	—	27	30
Width of umbilicus . . . . .	53	42	35	41	29	43

A=Japanese specimen.

B=The holotype of *Danubites kansa* from Himalayas.

Shell discoidal, laterally compressed and consisting of several slowly enlarging whorls. Whorls flattened but slightly convex on the flanks, higher than broad, and oblong-elliptical in cross-section. Venter narrow and rounded. Umbilicus wide and shallow, with rounded margin and somewhat steep inner walls. Involution about  $\frac{1}{4}$ .

Surface of the mould ornamented with numerous simple, rounded radial ribs, separated by intervals nearly as broad as the ribs; ribs extending from the umbilical margin to the ventral margin with increasing pronouncement, but abruptly disappearing on the venter; they are about 42 in number on the outer volution and 36 on the next inner. Umbilical wall smooth.

Suture-lines: Ceratitic, but the saddles high and narrow, slightly serrated even near the top; siphonal lobe very short; lateral lobes deep and comparatively broad, being distinctly digitated. First lateral lobe nearly as broad as the external, and rather deeply digitated at the base. First lateral saddle nearly as broad and high as the external.

Remarks: DIENER once placed *Danubites kansa* DIENER from the Muschelkalk of the Himalayas in the genus *Floriamites*<sup>2</sup> HYATT, established by HYATT on *Ammonites floriani* MOJS., but he overlooked the fact that *Ammonites floriani* is really the genotype of *Danubites* MOJS.; hence DIENER<sup>3</sup> is quite correct in placing *Danubites kansa* again in the genus *Danubites*.

<sup>1</sup>DIENER: Loc. cit. (1915), p. 12, Pl. I, Fig. 3.

<sup>2</sup>A. HYATT: Text-book of Palaeontology, by K. v. ZITTEL, 1900, p. 558 (Translated by C. R. EASTMAN).

<sup>3</sup>DIENER: Cephalopoda triadica, Fossilium Catalogus, I, Animalia, 1915, p. 116.

The present fossil differs from the typical *Danubites kansa* only in having saddles slightly more serrated, and the first lateral one lower and as high as the external; in *Danubites kansa*, the first lateral saddle is higher than the external.

Besides, the present example is much similar to *Danubites naumanni* MOJS.,<sup>1</sup> but the latter has more numerous ribs and a higher external saddle. As regards the suture-lines, this specimen is just intermediate between *Danubites kansa* and *Danubites naumanni*.

DIENER<sup>2</sup> gave a figure of the suture-line of *Danubites naumanni*; the specific identity of his specimen from which the suture-line is drawn with the holotype is questionable. His suture-line differs from that of the holotype, but resembles that of *Danubites* *cf.* *kansa* from the *Hollandites* Beds in Inai and has a similar first lateral saddle, being as high as the external.

Locality: Inai, Inai-mura, Oshika-gun.

***Danubites japonicus* SHIMIZU nom. nov.**

Pl. XXIV (I), Figs. 5, 6.

1915. *Danubites naumanni* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, p. 14, Pl. IV, Figs. 3-4.

Two more or less deformed external moulds of *Danubites naumanni*, DIENER's plesiotypes, were examined.

Dimensions:

	A				B				C	
	Along the major diameter		Along the minor diameter		Along the major diameter		Along the minor diameter			
Diameter . . . . .	75 mm.	100	36 mm.	100	63 mm.	100	31 mm.	100	100 mm.	100
Height of the last whorl. . .	18	27	10	27	16.5	25	8	25	29	29
Breadth of the last whorl . .	10	13	—	—	—	—	—	—	—	—
Width of umbilicus . . . . .	43	57	20	52	34	52	16	51	44	44

A=The holotype of *D. japonicus* [Pl. XXIV (I), Fig. 5]. C=The holotype of *D. naumanni* MOJS.  
B=The paratype of *D. japonicus* [Pl. XXIV (I), Fig. 6].

The specimens now under consideration differ sufficiently from MOJSISOVICS' holotype of *Danubites naumanni*. As the differences are not essentially due to the different stages of growth, the two are now believed to deserve specific separation: hence a new name is given to DIENER's examples. The two forms are evidently closely related, though DIENER's examples show a wider umbilicus and lower whorls than MOJSISOVICS' holotype. On the outer volution of this species, the ribs are narrower than their interspaces, whereas in *Danubites naumanni* the ribs are as wide as their interspaces at the same diameter of the shell as the former.

*Danubites japonicus* is distinguished from *Danubites* *cf.* *kansa* from Inai, in having wider umbilicus, less involute whorls and broader interspaces of ribs.

The two specimens of *Danubites japonicus* are by no means strictly identical, the larger one (DIENER's Pl. IV, Fig. 4), selected here as the holotype, differs slightly from the smaller (DIENER's Pl. IV, Fig. 3) in having a somewhat wider umbilicus, coarser ribbing and broader interspaces of ribs.

<sup>1</sup>MOJSISOVICS: Loc. cit. (1888), p. 7, Pl. II, Fig. 1.

<sup>2</sup>DIENER: Loc. cit. (1915), Pl. I, Fig. 4.



## Gen. STURIA MOJSISOVICS

*Sturia* ? sp. indet.

There is a small very fragmental mould, in an unfavourable state of preservation, but believed to represent a species of *Sturia*.

Fragmental as the specimen is, there is at least one distinctive feature which attracts our attention. The mould is ornamented with characteristic spiral striations which are narrow, flat-topped and sharply edged, and are separated by intervals nearly equal to or little narrower than the breadth of the ribs.

As regards to the sculpture, this specimen though imperfect reminds us strongly of such type as *Sturia japonicus*<sup>1</sup> DIENER from the *Hollandites* Beds of Inai and *Studia sansovinii*<sup>2</sup> MOJS. from the Muschelkalk of the Himalayas and Europe.

Locality: Higuchi, Utatsu-mura, Motoyoshi-gun.

## Gen. CUCCOCERAS DIENER

*Cuccoceras* aff. *submarinoii* SHIMIZU

Pl. XXIV (I), Fig. 7.

1912. *Cuccoceras marinoii* G. v. ARTHABER: Ueber die Horizontierung der Fossilfunde am Monte Cucco (Italianische Carnia) und über die systematische Stellung von *Cuccoceras* DIEN., Jahr. k. k. Geol. Reichsanstalt, Wien, p. 346, Pl. XVI, Fig. 1 (non. Figs. 2, 3, 4, 5.).

A poorly preserved internal mould, here figured, shows the following dimensions:

	A				B	
	mm.	Along the major diameter	mm.	Along the minor diameter	mm.	
Diameter . . . . .	53	100	24	100	28	100
Height of the last whorl . . . . .	20	37	10	41	10	35
Breadth of the last whorl . . . . .	—	—	—	—	5.5	19
Width of umbilicus . . . . .	19	35	8	33	10.5	37

A=Japanese specimen.

B=The holotype of *Cuccoceras submarinoii* from the Anisic of the Alps, (measured from ARTHABER'S Pl. XVI, Fig. 1.).

Shell evolute, considerably compressed, composed of a few gradually growing whorls and provided with wide and shallow umbilicus, surrounded by low but steep inner walls; flanks almost flattened but slightly converging towards the narrow rounded venter. Involution about  $\frac{1}{6}$ .

Ornamentation consists of both ribs and constrictions. Ribs narrow and rather weak, extending almost radially from very small umbilical tubercles and the venter which they traverse in a slight forward curve. Intervals between the ribs marked with several weak but somewhat

<sup>1</sup>DIENER: Loc. cit. (1915), p. 18, Pl. VI, Figs. 1-2.

<sup>2</sup>MOJSISOVICS: Die Cephalopoden der Mediterranean Triasprovinz, Abhandl. k.k. Geol. Reichsanst., X, 1882, p. 241, Pl. XLIX, Figs. 6-7 (non Figs. 5); Pl. L, Figs. 1; DIENER: Loc. cit. (1895), p. 61, Pl. XV; A. MARTELLI: Cephalopodi Triasici di Boljevici, Palaeontographia Italica, X, 1904, p. 102, Pl. VI, Fig. 5; F. NOETLING: Die Asiatische Trias. Lethaea Mesozoica, I, 1906, Pl. XXXVI, Fig. 3.

broad striations. Constrictions slightly broad and deep, and parallel to the ribs; 10 on the one-half outer volutions.

Suture-lines: unseen.

Remarks: G. v. ARTHABER has described five specimens of *Cuccoceras* from the Anisic of the Alps which he identified with *Cuccoceras marinoii* MOJS. On examining the figures of ARTHABER and comparing them with MOJSISOVICS' protograph<sup>1</sup> of *Cuccoceras marinoii* from the Anisic of the Alps, I have come to the conclusion that the latter, Pl. I, Fig. 3 of ARTHABER differs evidently from the two specimen represented by Pl. I, Figs. 1 and 2 of ARTHABER. The specimen of ARTHABER'S Fig. 2 has a somewhat wider umbilicus, less involute whorls and coarser ribs than the typical form, and its ribs on the anterior part of the outer volution bear a small lateral tubercle. As to the lateral tubercles on the ribs, it resembles *Cuccoceras carnicum*<sup>2</sup> ARTHABER from the Anisic of the Alps, but is not so pronounced as in the latter species.

In the specimen of ARTHABER'S Fig. 1 the umbilicus seems to be far wider and the whorls far less involute.

I prefer to distinguish these two specimens of ARTHABER'S Figs. 1 and 2 from *Cuccoceras marinoii* on account of these differences, in spite of their undoubted affinity with typical *Cuccoceras marinoii*; and wish to propose the specific name *Cuccoceras submarinoii* for the specimen of ARTHABER'S Fig. 1 and *Cuccoceras pseudomarinoii* for his Fig. 2.

Although the suture-lines are unknown, yet the Japanese specimen in question may apparently belong to the genus *Cuccoceras* DIENER; it is comparable with *Cuccoceras submarinoii* from the Anisic of the Alps cited above. Since, however, the present example is an internal mould somewhat poorly preserved and slightly deformed, of which the suture-lines and original shape of the whorl-section can not accurately be determined, the specific separation is here for a while suspended.

Now we know only seven species of *Cuccoceras*; of them five are from the Anisic of the Mediterranean region, one from the Muschelkalk of the Himalayas, and one from the Ladinic of Nevada.

Locality: Inai, Inai-mura, Oshika-gun.

## Gen. BALATONITES MOJSISOVICS

### *Balatonites kitakamicus* (DIENER)

Pl. XXIV (I), Figs. 8-12.

1915. *Anolcites ? kitakamicus* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, p. 17, Pl. XI, Fig. 2.

DIENER'S type specimen of *Anolcites ? kitakamicus* is at our disposal, and there are two other specimens essentially identical with this specimen; one of them is from Inai and in the possession of the Geological Institute of the Kyôto Imperial University, which is rendered accessible to me through the courtesy of Prof. S. NAKAMURA, while the other is an external mould from Iwaida; the former of the two, in gypsum mould, is here figured.

<sup>1</sup>MOJSISOVICS: Loc. cit. (1882), p. 12, Pl. XL, Fig. 8.

<sup>2</sup>ARTHABER: Über die Horizontierung der Fossilfunde am Monte Cucco (italienische Carnia) und über die systematische Stellung von *Cuccoceras* DIEN., Jahr. k.k. Geol. Reichsanstalt, Wien, p. 349, Pl. XVI, Figs. 10-11.

Dimensions :	A				B			
	Along the major diameter		Along the minor diameter		Along the major diameter		Along the minor diameter	
	mm.		mm.		mm.		mm.	
Diameter . . . . .	70	100	36	100	67	100	37	100
Height of the last whorl . .	23	32	12	33	21	31	14	37
Breadth of the last whorl . .	10 ?	14 ?	—	—	—	—	—	—
Width of umbilicus . . . . .	31	44	15	41	27	40	16	43

A=The paratype (Pl. XXIV (I), Figs. 10, 11.)

B=The holotype (Pl. XXIV (I), Fig. 8.)

Shell consisting of a few gradually growing whorls, laterally compressed; rather evolute. Umbilicus wide and shallow with nearly vertical walls and subangular margin. Involution about  $\frac{1}{6}$ . Whorls considerably higher than broad; flanks almost flattened or but slightly convex, passing rather abruptly into the narrow venter with a tuberculated median keel, not bordered by furrows.

Ornamentation consists of a number of simple, tuberculated radial ribs and constrictions. One longer, broader, flattened rib usually alternates with one or two shorter, narrower, rather rounded ribs; longer ones extending from very small tubercles on the umbilical margin to the venter and the shorter from the one-fourth of the height of whorls from the umbilical margin, to the venter which are crossed over by all of them uninterruptedly. Longer ribs counting 17 in number on the outer volution, broader than their interspaces, and provided with tubercles in three rows on the flanks: one row on the umbilical margin, the second on the middle of the flanks and the third on the ventral margin; tubercles of the lateral row somewhat smaller than the corresponding ones of the longer ribs. Apparently with eight constrictions on the outer volutions; they rise from the umbilical margin.

Suture-lines: Ceratitic, with rounded saddles and serrated lobes. The first lateral lobe broad and deep and lying more slightly ventral than the lateral tubercles; the second lateral narrow and shallow and lying slightly above the umbilical margin; the auxiliary lobes narrow and shorter and lying on the umbilical walls.

Remarks: It will be seen from this description that the two specimens evidently belong to the genus *Balatonites* MOJS., a genus which is diagnosed by ARTHABER<sup>1</sup> as follows: "*Balatonites* ist eine weitnabelig, nur wenig involute Gruppe, mit einer im Reifestadium kräftigen Rippen-und Dornen-oder Knotensklulptur. Der Unterschied gegen *Ceratites* liegt daher in diesen Merkmalen, besonders aber im Auftreten eines medianen Dornenkiels auf dem Externteile, sowie in der äusserst schwachen Entwicklung von Auxiliarelementen in der Suture."

The identification of these specimens with DIENER'S species has given me some trouble because DIENER'S type specimen, although provided with suture-lines, does not clearly show its venter and is assigned provisionally by him to the genus *Anolcites*. Otherwise, they agree precisely with DIENER'S type specimen in general form, sculpture and suture-lines, and I believe, therefore, that they are specifically identical.

Hence, the present species seems to belong to *Balatonites* and not to *Anolcites*.

*Balatonites kitakamicus* is a member of the group of *Balatonites egregius* and greatly resembles *Balatonites egregius*<sup>2</sup> ARTHABER from the Reiffinger Kalk of the Alps. However, it differs from the latter by its somewhat less numerous longer ribs and more numerous shorter ones in alternation.

<sup>1</sup>ARTHABER: Die Trias von Bithynen (Anatolien), Beiträge z. Pal. u. Geol. Oesterr.—Ungarns u. d. Orients, Vol. XXVII, 1914, p. 127.

<sup>2</sup>ARTHABER: Die Cephalopodenfauna der Reiffinger Kalke, II, Abteilung, Die Fauna des Fundortes "Rahnbauerkogel," Beiträge z. Pal. Geol. Oesterr.—Ungarns u. d. Orients, Vol. X, 1896, p. 201, Pl. XXIII, Fig. 2a-c.

It is distinguished from *Balatonites egregius* ARTHABER var. *minus*<sup>1</sup> ARTHABER from the Reiflinger Kalk of the Alps by its less involute whorls and less numerous rows of tubercles.

It is noteworthy that *Balatonites* is not yet known to occur in the Himalayas,<sup>2</sup> while 36 species of it have been recorded from the Middle Triassic of Europe and 3 from the Middle Triassic of Nevada.

Localities: Inai, Inai-mura, and Iwaida, Oginohama-mura, both in Oshika-gun.

**Balatonites cfr. kitakamicus (DIENER)**

Pl. XXIV (I), Fig. 13.

1915. *Anolcites ? kitakamicus* DIENER: Japanische Triasfaunen, Denkschr. k. Akad. Wiss., Wien, Vol. XCII, p. 17, Pl. XI, Fig. 2.

Two external moulds were examined, the better one of which, collected near Yanaizu, is here measured and figured.

Dimensions:

	mm.	
Diameter . . . . .	43	100
Height of the last whorl . . . . .	17	35
Breadth of the last whorl . . . . .	—	—
Width of umbilicus . . . . .	19	39

These two examples closely resemble the preceding species, but differ slightly from it by having a rather narrower umbilicus and being a little more involute. The lateral sculpture is almost identical between those two and the other, but the lateral tubercles on the shorter ribs are more strongly marked on the specimen here figured. There are five constrictions on the last one-half revolution of whorl.

Localities: Near Yanaizu, Utatsu-mura, and Oritate, Oritate-mura, both in Motoyoshi-gun.

**Gen. MONOPHYLLITES MOJSISOVICS**

**Subgen. LEIOPHYLLITES DIENER**

**Monophyllites (Leiophyllites) cfr. pseudo-pradyumna WELTER**

Pl. XXIV (I), Fig. 14.

1915. *Monophyllites pseudo-pradyumna* J. WELTER: Die Ammoniten und Nautiliden der Ladinschen und Anisischen Trias von Timor, Pal. v. Timor, Vol. V, No. 10, p. 117, Pl. XC, Figs. 4 a, b, c.

This species is represented by a single internal mould, in a state of preservation unfavourable for specific determination.

Dimensions:

	mm.	
Diameter . . . . .	37	100
Height of the last whorl . . . . .	12	32
Breadth of the last whorl . . . . .	—	—
Width of umbilicus . . . . .	17	45

<sup>1</sup>ARTHABER: Loc. cit. (1896), p. 204, Pl. XXIII, Fig. 5a-c.

<sup>2</sup>*Balatonites punjabiensis* was described by W. WAAGEN (Fossils from the Ceratite Formation, Pal. Indica, Ser. XIII. Vol. II, 1895, p. 64, Pl. XXVI, Fig. 5) from the Skytic of Himalayas; but it does not seem to belong to the same genus, as thought by DIENER (Cephalopoda triadica, p. 64).

It belongs to the subgenus *Leiophyllites* DIENER and strongly resembles ammonites of the genus *Lytoceras* SUESS, in its general appearance and involution, but is provided with monophyllitic suture-lines, characteristic of the genus *Monophyllites* MOJSISOVICS.

The present species is either very closely allied to or identical with *Monophyllites* (*Leiophyllites*) *pseudo-pradyumna* WELTER from the Muschelkalk of Timor, but for a while it is not possible to establish the identity of the two in full certainty, since the whorl-section can not accurately be determined in the specimen at hand.

It is quite as evolute as the Timor species and each whorl overlaps the preceding one not more than the siphonal part. The surface of the mould is at first sight almost smooth, but examined in details it shows numerous fine striae of growth. Further, there are periodic constrictions, about five of them being counted on the one-half penultimate volution; these are nearly radial on the inner half of the flanks and run slightly forwards on the outer. These constrictions are thought of as corresponding to ribs on the surface of the shell, as in *Monophyllites* (*Leiophyllites*) *pseudo-pradyumna*.

The suture-lines are monophyllitic; saddles are narrow, contracted at the base, and lobes are digitated. First lateral lobe is nearly symmetrically and the second asymmetrically trifold.

Remarks: *Monophyllites* (*Leiophyllites*) *pseudo-pradyumna* is most closely related to *Monophyllites* (*Leiophyllites*) *pradyumna*<sup>1</sup> DIENER from the Lower Muschelkalk of the Himalayas, though distinguished from it by periodic ribs which are less numerous and become faint towards the umbilicus.

Locality: Kudanohama, Utatsu-mura, Motoyoshi-gun.

#### Subge. USSURITES DIENER

#### *Monophyllites* (*Ussurites*) *yabei* DIENER

1915. *Monophyllites* (*Ussurites*) *yabei* DIENER: Japanische Triasfaunen, Denksch. k. Akad. Wiss., Wien, Vol. XCII, p. 22, Pl. V, Figs. 1-2.

A fragmental external mould was examined, which shows a wide and shallow umbilicus and characteristic sculpture quite similar to those of the holotype of this species, and is undoubtedly identical with it. This species is distinguished from its close ally *Monophyllites* (*Ussurites*) *sichoticus*<sup>2</sup> DIENER from the Anisic of the Gulf of Ussuri and *Monophyllites* (*Ussurites*) *kingi*<sup>3</sup> DIENER from the Anisic of the Himalayas and the Skytic of Albania by having more prominent and stronger sculpture.

Locality: Kamaya, Okawa-mura, Monô-gun.

<sup>1</sup>DIENER: Loc. cit. (1895), p. 106, Pl. XXI, Figs. 3-4.

<sup>2</sup>C. DIENER: Triadische Cephalopodenfaunen der Ostsibirischen Küstenprovinz, Mém. Com. Géologique, Vol. XIV, No. 3, 1895, p. 29, Pl. V, Fig. 1.

<sup>3</sup>DIENER: Loc. cit. (1895), p. 109, Pl. XXXI, Fig. 10; DIENER: Loc. cit. (1907), p. 105, Pl. XIII, Fig. 5; ARTHABER: Die Trias von Albanien, Beiträge z. Pal. u. Geol., Oesterr.-Ungarns u. d. Orients, Vol. XXIV, 1911, p. 235, Pl. XX, Fig. 12.