

A Marine Fauna from the Liutang Series of the Niuhsintai Coal-Field, South Manchuria

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A Marine Fauna from the Liutang Series of the Niuhsintai Coal-Field, South Manchuria

By

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The lower and upper coal-bearing formations in the Taitzuho (River Taitzu) district, the Huangchi series of Sakmarian and the Liutang series of Lower Rotliegendes respectively, contain several workable coal seams and many plant fossils. Concerning the ecological condition of their deposition, T. OGURA⁽²⁴⁾ and the present writer^(15, 18, 19) pointed out that these series are not completely continental and the coal seams may be littoral, accompanying some inter-coal formations of marine origin. OGURA discovered a marine siliceous Foraminifera (*Ammodiscus* sp.) in the shale immediately under the Paotsa coal seam of the Liutang series in Penhsihu, together with many remains of Radiolaria, Sponge spicules and Foraminifera (*Nodosinella* sp.) from the shale (and nodules in it) under- and overlying the Ichieh coal seam of the Huangchi series in Penhsihu. The similar fossils are found also in the shale (and nodules in it) overlying the Sanchieh coal seam of the same series in Yentai. The writer discovered also four layers of thin black limestone, 20-50 cm in thickness, in the black shale of about 5 m thick resting upon the lowermost coal seam of the Huangchi series in the southern part of Chuanchiaputzu in the Tienshihfu coal-field, in which abundant minute Gastropods such as *Sphaerodoma r-endoi* NODA, *Sph.* sp. and *Naticopsis* sp. have been imbedded. N. KOBATAKE⁽¹²⁾ concluded that these limestones belong to the Lower Jurassic in age, and that the boundary between the black shale and underlying Huangchi coal seam may be over-thrust. But according to the writer's reinvestigation, over-thrust cannot be recognized in that locality of over-thrust reported by KOBATAKE. Moreover some Palaeozoic plant fossils such as *Cordaïtes* sp. and *Stigmaria* sp. were found in the gray sandstone, which is intercalated in the black shale of a horizon of about 20 m upper from the uppermost stratum of limestone. Evidences so far available indicate that the limestones undoubtedly belong to the Huangchi series.

Some years ago, the writer collected many interesting fossils of marine Brachiopods, which are well preserved in general, together with some other ones, from the dark gray shale of the lower part of the Liutang series in a valley of the west of Hsiaonankou in the Niuhsintai coal-field. The fauna is distinctive, comprising the following species:

Brachiopoda

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1. *Chonetes latesinuata* SCHELLWIEN
2. *Ch. pygmaea* LOCZY
3. *Ch. substrophomenoides* HUANG
4. *Ch.* spp.
5. *Waagenoconcha* cfr. *purdoni* (DAVIDSON)
6. *Productus taiyuanfuensis* GRABAU
7. *P. gruenewaldti* KROTOW
8. *Marginifera pusilla* SCHELLWIEN
9. *Linoproductus koninchianus* (VERNEUIL)
10. *L.* spp.
11. *Striatifera* sp.
12. *Schellwienella regularis* HUANG
13. *Sch.* spp.

Pelecypoda

14. *Aviculopecten manchuriensis* CHAO
15. *Lima striatoplicata* CHAO
16. *Nucloopsis* sp.

Gastropoda

17. *Paromphalus* cfr. *mapingensis* GRABAU

Cephalopoda

18. *Orthoceras* ? sp.
19. *Apheloceras* sp.

Anthozoa

20. Gen. sp. indet.

Crinoidea

21. Gen. sp. indet.

Geological ages of 12 species which are specifically identified as shown above are discussed below.

Chonetes latesinuata was first described by SCHELLWIEN⁽²⁶⁾ from the "Fusulinenkalk" of the Carnic Alps. CHAO⁽³⁾ found abundantly this species in the Taiyuan series of Kansu, Shansi, Hopei and Honan. GRABAU⁽⁷⁾ introduced another specific name *Ch. nyströmi* for a group of shells from the same series of North China, which, in the opinion of the writer, is synonymous to the SCHELLWIEN's species. The writer^(16, 17) also reported *Ch. latesinuata* from the Atung series of the east of Ting-chiatun in the Fuchou (Wuhutsui) coal-field, and from the Hunglohsien series at Pingtingshan, south of Yangchiachangtzu, Chinsi-hsien. In Niuhsintai, this species is rather common and well preserved.

Chonetes pygmaea in Russia is not only a characteristic form of the Moscovian stage, but extends in age up to the *Cora* and *Pseudoschwagerina* stage as well. In North China, this species has essentially the same vertical range as the Russian form,

being found both in Moscovian Penhsi series and in the Sakmarian Taiyuan formation. According to CHAO,⁽³⁾ the species occurs in the Yanghukou limestone of the Penhsi series at Yanghukou, Shantan-hsien, Kansu, and in a shaly bed of the Taiyuan series at Hsikou-Chienyao of the same district. In Shansi, it was found in the Kuantikou limestone of the east of Taiyuan. In Hopei, it was obtained from a dark limestone exposed just beside the Lincheng coal mine, where it is in association with *Marginifera pusilla*, *Ch. latesinuata* and the other species of the typical Sakmarian Taiyuan fauna. In Niuhsintai, it is also rather abundant.

Chonetes substrophomenoides was originally described by HUANG⁽¹⁰⁾ from the *Lyttonia* bed of the Middle Permian age, at Panshan, Tungtzu-hsien and Pichieh-hsien, Kueichou. The species from Niuhsintai is represented by two shells, that is, one pedicle valve, the other branchial valve.

Waagenoconcha purdoni, though not abundant, is widely distributed in the Carboniferous and Permian formations of India,⁽⁴⁾ Himalaya,⁽⁵⁾ Spitzbergen,⁽³⁰⁾ Mongolia^(3,8) and the others. The Mongolian form is represented by a single specimen from the Jisu Honguer limestone of early Permian age. The writer⁽²¹⁾ described this species from the Lower Permian sandstone at Yuchuan (Erhtsengtientzu), east of Harbin. The shell from Niuhsintai, however, is imperfect and needs of additional data for its positive identification.

Productus taiyuanfuensis is one of the most abundant and wide-spread *Productus* in the Taiyuan and Shansi series of North China. Wherever marine Permian strata are exposed, this *Productus* species is often innumerably found. According to CHAO⁽³⁾ and OZAKI,⁽²⁵⁾ it occurs in the marine beds of the Taiyuan series, for instance in Kuantikou limestone near Kuantikou village, east of Taiyuan; the Pankou, Miaokou, Maoerhkou and Hsiehtao limestones in the western district of Taiyuan; the Houkou limestone of the Lincheng coal-field, Hopei; all the limestone at different localities of the Tse-hsien and Liuhokou coal-field; a shale layer at the base of the Yangchia-tun coal series, Western Hills of Peiching; the Tangshan limestone and a marine bed of an upper horizon of the Kaiping Basin; the marine beds of Hsin-an-hsien, Honan and the Poshan coal-field, Shantung. It is by far the most common in the Tuntayao limestone, the Paotechou limestone and the Tumen shale of the Shansi series in central and western Shansi. The writer⁽²⁰⁾ observed a large amount of remains of this species in the limestone of the Taiyuan series at the Laiwu coal-field, Shantung. It occurs also in the Permian formations, especially in the Sakmarian strata, such as the Atung and Hunglohsien series of Manchuria. Namely, it was found in the Atung series of the Fuchou coal-field by CHAO⁽³⁾ and the writer^(16, 17) who also found it in the Hunglohsien series of Pintingshan, south of Yangchiachangtzu. It is moreover found in the Lamakou shale of the Hsinglung coal-field, Jehol,^(22, 23) which may be correlated to the Taiyuan series. In Niuhsintai, this species predominates, though it is more or less incompletely preserved.

Productus gruenewaldti is an important and wide-spread species in the Lower Permian of Asia. In Ural and Timan, it first appears in the *Cora*-horizon and extends up to the Artinskian.⁽¹³⁾ SCHELLWIEN⁽²⁶⁾ described it under the name of *Pr. semireticulatus* var. *balhykolpus* from the Fusulinenkalk of the Carnic Alps. MANSUY⁽¹⁴⁾ reported it from the *Productus* limestone of Indochina, while CHAO⁽³⁾ noted that the species is entirely restricted in North China to the Moscovian Penhsi series. OZAKI⁽²⁵⁾ described it from an unknown horizon at Mingshankou, Penhsihu, which should be, the writer considers, obtained from the limestone of the Penhsi series. GRABAU⁽⁹⁾ also reported it from the Maping limestone of Kuangsi and Kueichou. The Maping limestone is exactly equivalent to the the Chuanshan limestone of South China and the Taiyuan series of North China. In Niuhsintai, it is rather common, though its preservation is bad in general.

Marginifera pusilla was originally described by SCHELLWIEN⁽²⁶⁾ from the Fusulinenkalk of the Carnic Alps. Later on, KIEDEL⁽¹¹⁾ also reported it from the Upper Palaeozoic sediments of South Tienshan. According to CHAO^(1, 3) it is a very characteristic and wide-spread species in the Taiyuan series of North China. It occurs abundantly in the Miaokou, Maoerhoku and Hsiehtao limestones of Shansi, in the Hokou limestone just beside the Lincheng coal mine, Hopei; all the five limestone beds (Taching, Hsiaoching, Fuching, Shanching and Yehching) exposed at different localities of the Tze-hsien coal-field, Hopei; a limestone of the Taiyuan series in the Changchiu coal-field, Shantung; Taching limertone of the Liuhokou coal-field, Honan; and in the Sinho formation at Sinho, Shantan-hsien, Kansu. In Niuhsintai, it is represented by abundant well preserved shell.

Linoproductus koninchanus was first reported from the *Pseudoschwagerina* limestone of Russia.⁽²⁷⁾ GRABAU⁽⁹⁾ noted it from the Maping limestone of Kueichou. In North China, though the species is rather rare in the Taiyuan series, it was described by CHAO⁽³⁾ from a dark limestone of the Taiyuan series in the Lincheng coal-field, Hopei; and the Kuantikou and Maoerhoku limestones, east and west of Taiyuan, respectively.

Schellwienella regularis was obtained by HUANG⁽¹⁰⁾ from the *Lyttonia nobilis* horizon of the Permian coal-bearing formation of Pichieh-hsien, Kueichou, and from the *Lyttonia* bed at Panshan, Tungtzu-hsien, Kueichou. In Niuhsintai, it is represented by two brachial valves.

Aviculopecten manchuriensis was found by CHAO⁽²⁾ in the Atung series at Yanshukou in the Fuchou coal-field and the Kuantikou limestone of Taiyuan in Shansi. The species from Niuhsintai is represented by a single specimen.

Lima striatoplicata occurs in the *Spirifer taiyuanensis* zone of the Taiyuan series. It was obtained by CHAO⁽²⁾ from the Miaokou and Kuantikou limestones at Taiyuan, Shansi. In Niuhsintai, two specimens identified to this species were found.

Paromphalus mapingensis was obtained by GRABAU⁽⁹⁾ in the the Maping

limestone of Kueichou. In Niuhsintai, a single, imperfect specimen of this species was collected.

As stated above, one of the striking features of this fauna is that the common species in the Taiyuan series of North China are found in comparatively abundant. The Maping series of South China and the Atung series of South Manchuria, however, are especially noteworthy since they have another characteristic feature of this fauna, in having the characteristic species of *Lyttonia* bed of South China, such as *Chonetes substrophomenoides* HUANG and *Schellwienella regularis* HUANG. From all the indications as above mentioned, the geological age as shown by the faunal evidence of the Liutang series is considered to not be conflicting with the conclusion from the standpoint of the floral evidences that this series should belong to the Lower Rotliegendes. The marine fossils from the Liutang series not only indicates conclusive data concerning the ecological condition of the deposition of this series, as it has been confirmed by OGURA and the writer, but also reveals a criterion showing the geological age and the correlation of the Liutang series, as well as the latest marine transgression in South Manchuria.

In conclusion, the writer wishes to offer his cordial thanks to Prof. Iwao TATEIWA of Tokyo University for his kindness in reviewing the manuscript.

Chinese geographical names referred to in this report.

Atung 亞當	Kuangsi 廣西	Shanching 山青
Changchiu 章邱	Kuantikou 關底溝	Shansi 山西
Chinsi-hsien 錦西縣	Kueichou 貴州	Shantan-hsien 山丹縣
Chuangchiaputzu 全家堡子	Laiwu 萊蕪	Shantung 山東
Chuanshan 船山	Lamakou 拉馬溝	Sinho 新河
Erhtsengtientzu 二層甸子	Liaoning 遼寧	Taching 大青
Fuching 復青	Lincheng 臨城	Taitzuho 太子河
Fuchou 復州	Liuhokou 六河溝	Taiyuan 太原
Harbin 哈爾濱	Liutang 柳塘	Tanshan 唐山
Honan 河南	Maoerhkou 莫兒溝	Tianshan 天山
Hopei 河北	Maping 馬平	Tienschihfu 田師付
Hokou 後溝	Miaokou 廟溝	Tingchiatun 丁家屯
Hsiaoching 小青	Mingshankou 明山溝	Tumen 土門
Hsiaonankou 小南溝	Niuhsintai 牛心台	Tungtsu-hsien 桐梓縣
Hsiehtao 斜道	Pankou 半溝	Tungtayao 東大窑
Hsikou-Chienyao 西溝前窑	Panshan 半山	Tze-hsien 磁縣
Hsin-an-hsien 新安縣	Paotechou 保德州	Wuhutsui 五湖嘴
Hsinglung 興隆	Paotsa 寶砦	Yangchiachangtsu 楊家杖子
Huangchi 黃旗	Peiching 北京	Yangchiatun 楊家屯
Hunglohsien 虹螺岬	Penhsihiu 本溪湖	Yanghukou 羊虎溝
Ichieh 一接	Pichieh-hsien 畢節縣	Yangshukou 楊樹溝
Jehol 熱河	Pingtingshan 平頂山	Yehching 野青
Kaiping 開平	Poshan 博山	Yentai 煙台
Kansu 甘肅	Sanchieh 三接	Yuchuang 玉泉

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