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Restudy of a Phylloceratid Ammonite from Peikang, Taiwan

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ABSTRACT

This is a result of my restudy on a phylloceratid ammonite which was previously obtained as one of the samples from the Well PK-2 drilled in western Taiwan by the Chinese Petroleum Corporation and described by Lin (1961). The ammonite is closely allied to but not quite identical with *Holcophylloceras caucasicum* (Sayn), from the Aptian of the Caucasus. Taking all the available data into consideration, I propose to call this ammonite *Holcophylloceras caucasicum taiwanum* Lin et Huang. This concept of geographical subspecies is compatible with the conclusions of age correlation by Matsumoto *et al.* (1965) and T. C. Huang (1978).

INTRODUCTION

The Cretaceous ammonites and other molluscan fossils were described by Matsumoto *et al.* (1965) on some samples from the two wells near Peikang, PK-2 and PK-3, drilled into the coastal plain of western Taiwan by the Chinese Petroleum Corporation. On that occasion a phylloceratid ammonite described by Lin (1961) was not included in the samples on loan.

Fortunately I was invited to visit the Paleontological Laboratory of the Chinese Petroleum Corporation at Miaoli in April 1979, when Dr. Weng-Rong Chi kindly showed and let me study that specimen. This paper is to report the result of my restudy.

PALEONTOLOGICAL DESCRIPTION

Subclass Ammonoidea
Order Phylloceratida
Family Phylloceratidae Zittel, 1894
Genus *Holcophylloceras* Spath, 1927

Type-species.—*Phylloceras mediterraneum* Neumayr, 1871, by original designation.

Generic diagnosis.—See Arkell *et al.*, 1957, p. L189 and also Wiedmann, 1964, p. 257.

Remarks.—I agree with Arkell *et al.* (1957) and Wiedmann (1964) in regarding *Salfeldiella* Spath, 1927 (established on the type-species *Phylloceras guettardi* Raspail *in* d'Orbigny, 1841) as a synonym of this genus. Spath (1929) gave importance to the character at the head of the saddles in the internal suture as a criterion to distinguish *Salfeldiella* (with a simple head) from *Holcophylloceras* (with a bipartite head). This idea has been followed by Drushchic (1956, 1960) who has drawn complete suture (i.e. external and internal both) of *S. milaschewitshi* (Karakasch), a Barremian species. If we put aside this point, which is probably minor, the two nominal genera, as

represented by the type-species and other examples, are closely similar to each other in the shell-form, periodic constrictions, fine lirae and also in the general pattern of suture. This is the reason why I follow Arkell *et al.*

Incidentally, Wiedmann (1964) treated *Holcophylloceras* as a subgenus of *Sowerbyceras* Parona et Bonarelli, but I would not discuss much on this occasion whether this treatment is favorable or not. I am rather impressed that Wiedman's concept of a large genus is much too comprehensive. For the time being I follow Arkell *et al.* (1957) in regarding *Holcophylloceras* as an independent genus.

This genus is long-ranging from the Bajocian (Middle Jurassic) to the Albian (Lower Cretaceous) and world-widely distributed.

Holcophylloceras caucasicum taiwanum Lin et Huang
Pl. I, Figs. 1-5

1961, *Holcophylloceras* aff. *mediterraneum* Neumayr, Lin, *Acta Geol. Taiwanica*, no. 9, p. 79.
1974, *Holcophylloceras taiwanum* Lin et Huang, *Ibid.*, no. 17, p. 37.

Material.—Embedded in a core sample of CPC PK-2 well. Repository is the Paleontological Laboratory of the Chinese Petroleum Corporation at Miaoli.

Description.—The specimen occupies the major part of a cross-section of the core sample, about 47 mm in diameter. It is coated with some olive black material on its surface. It is secondarily compressed and the ventral portion of the last quarter whorl is outside of the core.

The following is the approximate measurements (in mm) on a restored outline of this deficient specimen:

Diameter	Umbilicus	Whorl-height	Breadth
47.0(1)	5.5-6.1(?)(.12- .13)	25.0(.53)	

The sutures are visible on the smoothed part (marked as S in Fig. 2) of the last whorl. The last quarter is probably a part of the living chamber. Assuming that the living chamber occupies at least a half whorl, the entire shell diameter would be at least 65 mm.

The shell is involute and narrowly umbilicate. The original outline of the whorl-section is not accurately known because of the secondary compression (see Pl. I, Fig. 3b). Presumably the shell may have been fairly high-whorled.

The constrictions are rather narrow but distinctly marked. They number six. They are prorsiradiate and only very slightly sigmoidal, with a very slight convexity on the inner half of the flank and a distinct projection on the venter.

Faint lirae are discernible on an outer half of the flank. They are of unequal length, but even the longer ones disappear before they reach the umbilical margin. They are not impressed on the internal mould where the sutures are exposed. Therefore, they are interpreted as lirae. However, on the living-chamber they are fairly distinct and about 8 in the interval between the two constrictions. At the stage about 180° earlier, they are also 8 in the same interval, but they are very faint and discernible in an oblique lighting. They are projected on the ventral part, following generally the curvature of the constriction.

The character of the very apertural margin is uncertain. The lateral lapet is not suggested by the curvature of the constrictions or lirae.

The suture is not wholly exposed, but its essential part on the flank is observable (Pl. I, Figs. 4, 5). Folioles show phylloid terminals, while the lobules have a pointed end. Every element is not much multipartite at the examined stage, with shell diameter of about 35 mm, and accordingly less complex for the genus.

The first lateral saddle between E and L seems to be roughly bifid, although the details of

the external lobe (E) is not well shown. The first lateral lobe (L) is somewhat asymmetrically trifid. The second lateral saddle (between L and U2) is diphyllitic, but looks apparently triphyllitic on account of the development of the foliole on the inner side of L up to the size as large as the size of the inner foliole at the head of the saddle, with the largest outer foliole in between. The second lateral lobe (U2) is also trifid but much smaller than L. Presumably there are at least 4 auxiliary saddles, of which outer 2 are exposed, showing diphyllitic heads.

Comparison and discussion.—From all the described characters, this form certainly belongs to the group of *Holcophylloceras guettardi* (Raspail), that is *Salfeldiella* of Spath, but it differs from the typical form of *H. guettardi,* as represented by the specimens from the Upper Aptian of France, figured by d'Orbigny (1841, p. 169, pl. 53, figs. 1-3) and Sayn (1920, p. 197, pl. 1, fig. 5) and the finely illustrated ones from the Upper Aptian of Madagascar by Collignon (1937, p. 109, pl. 16, fig. 1; 1962, pl. 216, fig. 941), in that the latter has more clearly biconcave constrictions and denser, more numerous and more distinct lirae. In the typical form of *H. guettardi,* the lirae are about twice as numerous as those in the Taiwan form. In the former, the constriction shows an unmistakable convexity at about the middle of the flank and a weaker ventral projection, whereas in the Taiwan form the constriction is nearly prorsiradiate, showing a distinct projection on the ventral part.

In the above respect, the Taiwan specimen is closer to *H. caucasicum* (Sayn, 1920), which was originally proposed as a variety for *"Phylloceras guettardi"* from the Aptian of the Caucasus, figured by Anthula (1899, p. 97[43], pl. 5[4], fig. 5a-c). Anthula's figure was a drawing, but photographs of the specimens in the subsequent collections from the Aptian of the Caucasus were published by Drushchic (1956, p. 136, pl. 13, figs. 56-57; 1960, p. 255, pl. 3, figs. 6, 7) as well as by Sayn (1920, pl. 1, fig. 7). In these figures the constrictions and the lirae show a distinct projection on the ventral part and sometimes a slight convexity at about the middle of the flank. Their flexuosity is clearly less distinct than in the typical form of *H. guettardi.*

Wiedmann (1964) preferred the subspecific ranking for various forms belonging to the group of *H. guettardi.* This may be indeed favorable in some cases, but in my experience the curvature of the constrictions and lirae is fairly important, since it is related to the character of the apertural margin. Therefore the difference in this character can be evaluated as a specific distinction, aside from the case of sexual dimorphism. On this ground, I separate *H. caucasicum* (Sayn) form *H. guettardi* (Raspail) as a distinct species. In addition to the difference in the curvature of constrictions and lirae, *H. guettardi* has more distinct lirae than *H. caucasicum,* and the former has more complex sutures, with more numerous incisions in lobules, than the latter (compare d'Orbigny, 1842, pl. 53, fig. 3 with Anthula, 1899, pl. 5, fig. 5c), although I have not examined the sutures on a sufficient number of specimens at various growth-stages. With respect to the weakness of the lirae and less complexity of the suture, the Taiwan specimen is closer to the hitherto described specimens of *H. caucasicum* from the Caucasus.

There are, however, some difference between the two forms. Namely, the lirae are less dense and less numerous in the Taiwan specimen than in the Caucasian ones. The constrictions are more straightly prorsiradiate, with less sinuosity in the former than in the latter. The suture of the former (Pl. I, Figs. 4-5) is not quite identical with the latter (Anthula, 1899, pl. 5, fig. 5c), although Anthula may have misjudged the second lateral saddle as triphyllitic. Anyhow, these differences are not so great that the subspecific distinction would be adequate.

Strictly speaking, it is desirable to examine more numerous specimens to know the extent of variations in the two areas. After that the subspecific distinction should be determined and until that it might be wise to call the single, incompletely preserved specimen from Taiwan as *Holcophylloceras* aff. *caucasicum* (Sayn). However, Lin and Huang (1974) have already proposed *Holcophylloceras taiwanum* for it, although without giving a diagnosis. They seem to have depended

on some difference from *H. mediterraneum* which was mentioned by Lin (1961).

The two specimens described by Shimizu (1931, p. 20, pl. 3, figs. 15-17, 28) under *"Salfeldiella caucasica"*, from the Upper Aptian Hiraiga Sandstone of the Miyako Group on the Pacific coast of Northeast Japan, closely resemble the Taiwan specimen, especially in the way of running of the constrictions and the pattern of suture. As they are internal moulds, the lirae are not well shown. Anyhow, the lirae must be very faint. Thus, the close resemblance between the specimens from Taiwan and Japan seem to support the probability of the subspecific distinction between the region of the Caucasus and that of northwestern Pacific.

To sum up, I propose to call the specimen under investigation *Holcophylloceras caucasicum taiwanum* Lin et Huang.

Occurrence.–The fossil was obtained from the compact, finesandy siltstone, at the depth of 1961.8 m below the surface in the well of PK-2, near Peikang, western Taiwan. For its location reader may refer to Matsumoto et al., 1965, figs. 1,2 and Huang, 1978, figs. 1, 2.

CONCLUDING REMARKS

On the basis of careful restudy, the phylloceratid ammonite in a sample from the depth of 1961.8 m of the PK-2 well is determined to be called *Holcophylloceras caucasicum taiwanum* Lin et Huang. There is a sufficient reason to separate *H. caucasicum*(Sayn) from *H. guettardi* (Raspail), but they are allied to each other. *H. caucasicum taiwanum* is probably a geographical subspecies of *H. caucasicum caucasicum* from the Aptian of the Caucasus.

The stratigraphical position of this ammonite is somewhat (46.8 m deeper) below that of *Cheloniceras (Epicheloniceras)* aff. *orientale* (Jacob) and slightly (about 3.4 m shallower) above the bed with bivalves *(Cucullaea* aff. *acuticarinata* Nagao etc.) As Matsumoto et al. (1965) discussed, the bed with *Ch. (E.)* aff. *orientale* is certainly correlated with the Upper Aptian and the beds with two other ammonites, *Dufrenoyia* aff. *justinae* (Hill) and *D.* aff. *discoidalis* Casey, and other marine mollusca in PK-3 well are also correlated with the Aptian, probably the lower part of the Upper Aptian. The result of the recent study of Huang (1978) on the calcareous nannofossils from the wells of PK-2 and PK-3 supports this age correlation. Therefore, the bed with *Holcophylloceras caucasicum taiwanum* is certainly referable to the Aptian. This is compatible with the concept of geographical subspecies.

Species of the Phylloceratidae have generally long vertical ranges. It is, however, interesting to find *H. caucasicum* and its allied species *H. guettardi* in the same stage (Aptian), if not in the strictly synchronous zone, in various areas of the world, with some subspecific differentiation within each of them.

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RE

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雲林北港地區所產菊石化石之再研究

松 本 達 郎

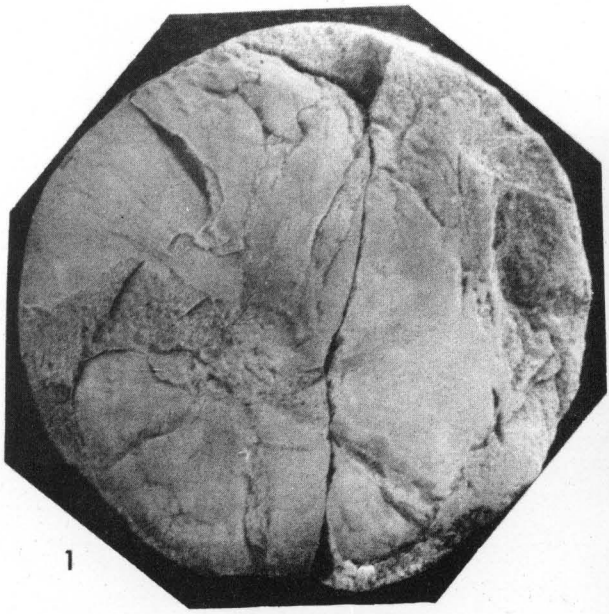
節 要

本文是中國石油公司於北港二號井 1961.80 公尺岩心所採取之葉菊石化石 (Phylloceratid Ammonite) 的再研究結果。該化石曾由臺灣大學地質系林朝棨教授詳細描述 (C. C. Lin, 1961)。經筆者再就原標本檢討結果，認爲此菊石化石與歐洲地中海高加索 (Caucasus) 之阿普第階所產之 *Holcophylloceras caucasicum* (Sayn) 極爲類似，但不相同，故提議稱爲 *Holcophylloceras caucasicum taiwanum* Lin et Huang。此地理亞種之概念與松本等 (Matsumoto *et al.*, 1965) 及黃 (T. C. Huang, 1978) 之時代對比的結論並不相矛盾。

EXPLANATION OF PLATE I

Holcophylloceras caucasicum taiwanum Lin et Huang, Specimen from CPC PK-2 well, Peikang.
Figure 1. Lateral view, embedded in a core sample.
Figure 2. Ditto, diagrammatic sketch (partly restored). Bar indicates 10mm. (Figs. 1-3 are of the same scale.)
Figure 3. Lateral (a) and frontal (b) views of a partly extracted piece.
Figure 4. Suture-line (at s in Fig. 2), drawn. Bar indicates 3 mm.
Figure 5. Ditto (in part), photo.

C. H. Hu photos; T. M. *delin.*



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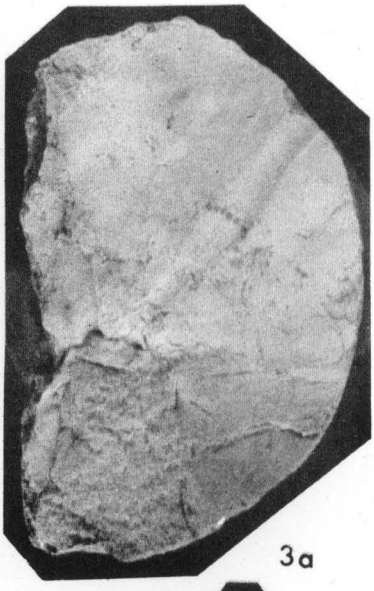

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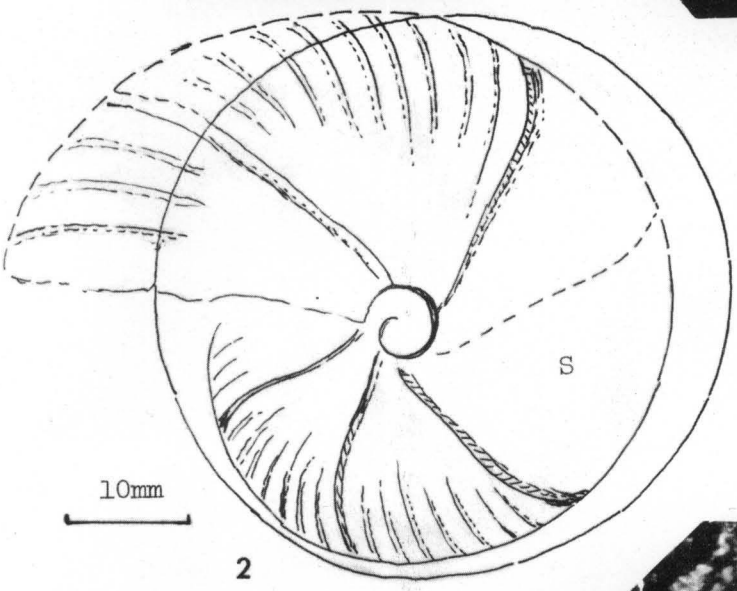

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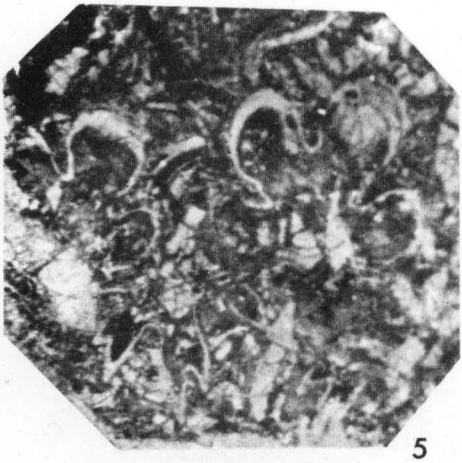

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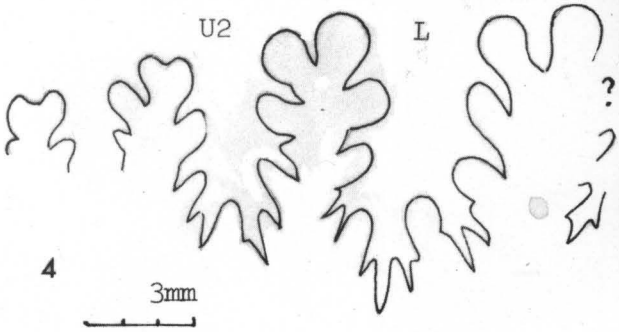

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