

峡区宝塔灰岩(?)内,而今在北祁連山出現,可見此种分布頗广,也是中奥陶統的重要成分。*Pollicina*, *Raphistomina*, *Donaldiella*, *Lesueurilla* 等属,根据目前文献,也都是奥陶紀特有的,其中 *Raphistomina lapicida* (Salter) 见于北美东部奥陶系黑河組( $O_2$ ), *Ecculiomphalus robusta* 盛产于波罗的海沿岸中奥陶統上組中。因此,白楊河区軟體类应该是中奥陶統的产物。随着中奥陶世海浸的广布,軟體类散布,各处生态条件特别适宜的地方,如白楊河区,它們就大量繁殖起来,以至形成該区中奥陶統壳相堆积的主要化石羣。至于动物羣的发源,由于手边資料有限,不便討論。

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## MIDDLE ORDOVICIAN MOLLUSCS FROM THE PAIYANGHO REGION, CHILIENSHAN ("NANSHAN")

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### INTRODUCTION

This paper deals with all the fossil molluscs collected respectively by Dr. P. Li's party in 1956 and Dr. T. H. Yin's party in 1957 of the Institute of Geology, Academia Sinica. Preliminary reports regarding the discovery of the Ordovician in the Paiyangho region has been made by Li, and Yang (1957), and Li, Hsieh and Ho (1958), while the writer had twice reported on the faunal composition in the annual meeting of the Palaeontological Society of China (Yang, 1958). But the detailed description has been unduly delayed until now.

The region concerned is located to the southwest of Chiuchuan and southeast of Yümen, at 39°55'N and 97°53'E (text-figure 1)\*. Fossils were collected from the brownish to greenish calcareous sandstone of the Middle (to Upper?) Ordovician at Pingtingshan (text-figure 2). They are composed of 9 genera, 12 species with 2 new species as follows:

\* Text-figures are inserted in the Chinese text.

*Pollicina* sp. 1, *Pollicina* sp. 2, *Tropidodiscus gigas* Yang, sp. nov., *T. cf. mansuyi* (Patte), *T. sp.*, *Raphistomina cf. lapicida* (Salter), *Lesueurilla pentagonum* Yang, sp. nov., *Ecculiomphalus robusta* Koken, *Donaldiella* sp., *Poleumita* sp., *Discoceras verbekki* Frech, and *Cycloceras* sp.

## DESCRIPTION OF FOSSILS

### Class Gastropoda

#### Subclass Protogastropoda

#### Order Cynostraca

#### Superfamily Tryblidiacea

#### Family Tryblidiidae Pilsbry

#### Genus *Pollicina* Holzapfel, 1895

Eichwald, 1860; *Lethaea rossica ou paléontologie de la Russie décrite et figurée*, vol. 1, p. 1048.

Holzapfel, 1895; *Abhandlungen d. kon. Preus. geol. Landesanstalt, neue folge*, h. 16, p. 182.

Koken, 1925; *Mém. d. l'Acad. d. Sciences Russie*, ser. 8, v. 37, no. 1, p. 228.

Knight, 1941; *Special papers Geol. Soc. America*, no. 32, p. 264.

Genotype, by original designation, *Cyrtolithes corniculum*, Holzapfel, 1895; op. cit., p. 182.

**Diagnosis:** "Horn-shaped gastropods with subcircular cross section; apex unknown; aperture simple, subcircular; ornamentation sharp, somewhat irregular, lamellar transverse costae with finer interstitial lines of growth; shell rather thin, particularly at the aperture, seemingly of two layers" (Knight, 1941).

**Age and Distribution:** Ordovician of the Baltic region and Northwest of China.

#### *Pollicina* sp. 1

(Plate I, figures 2—5; text-figures 3b—c)

Compared with the genotype (text-figure 3f) this species is characterized by its narrower and smaller shell, by its smaller curvature and the absence of growth-lines due to poor preservation. There are about one dozen specimens, but all of them are flattened and broken at both ends, consequently it is not sound to erect a new specific name for them.

**Number of figured specimens:** Ga 0001—0004; field label no. 102-1.

#### *Pollicina* sp. 2

(Plate I, figure 1; text-figure 3a)

**Description:** Shell small, straight cone with an apical angle of about 20°; aperture broken; shell recrystallized but still preserving fine longitudinal striae while growth-lines are invisible; wall thick; 1.1 mm, apertural end measures 8 mm wide and the shell is 35.5 mm long.

The specimens at hand are characteristically distinct from all the species already described by other authors. But owing to the distortion no erection of new name is attempted for them.

**Number of figured specimen:** Ga 0005; field label no. 60-E-1=102-1.

### Subclass Eugastropoda

#### Superorder Prosobranchia

#### Order Archaeogastropoda

#### Family Bucaniidae

#### Genus *Tropidodiscus* Meek and Worthen, 1866

Conrad, 1842; *Jour. Acad. Nat. Sci. Philadelphia*, vol. 8, pt. 2,

Meek and Worthen, 1866; Geol. Surv. Illinois, v. 2, Paleontology, p. 160.

Knight, 1941; Special papers Geol. Soc. America, no. 32, p. 360—362, pl. 9, figs. 5a—c.

Genotype; by original designation; *Bellerophon curvilineatus*, Meek and Worthen, 1866; op. cit., p. 160.

**Diagnosis:** “Laterally compressed, discoidal, bellerophontid shells with a sharp subangular dorsum and moderately wide umbilici; a deep angular sinus in anterior lip culminates in deep slit that generates narrow selenizone at crest of the dorsum; parietal inductura thin; ornamentation, fasciculated, sometimes lamellar and sometimes crinkled growth lines, rarely revolving lirae.” (Knight, Bridge, Shimer and Shrock, 1944) Widespread in the Ordovician to Devonian.

### ***Tropidodiscus gigas* Yang, sp. nov.**

(Plate I, figures 7—8; text-figures 4a, b)

**Description:** Shell fairly large having a diameter of over 50 mm, nautiliconic with wide umbilicus; dorsum sharply subangular, selenizone not preserved; whorl-profile hastate, acutely angular at the dorsum, gently convex between the dorsal angulation and the umbilical shoulder, sharply rounded at the umbilical shoulder, slightly rounded and overhanging on the umbilical slope; sutures sharply incised, moderately deep; umbilicus half as wide as the whorl-width (text-figure 4); apex and aperture unknown; shell smooth without any ornamentation, apparently owing to poor preservation.

Measurements:	syntype Ga 0006	syntype Ga 0007
Diameter.....	43—73 mm	30—38 mm
No. of Whorls	3 $\frac{1}{2}$	3
Thickness.....	over 22 mm	15 $\pm$ mm

**Remarks:** Although we have only two specimens which are slightly distorted, they show the essential characters of the *Tropidodiscus*. Besides, they are so enormous in size that they can easily be distinguished from the other species including the genotype, hence a new name is erected for them.

**Number of types:** syntypes Ga 0006, 0007; field label no. 102-1.

### ***Tropidodiscus cf. mansuyi* (Patte)**

Patte, 1929; Bull. d. Serv. Geol. de l'Indo-Chine, v. 18, fasc. 1, p. 55.

Knight, 1941; Special papers Geol. Soc. America, no. 32, p. 162.

**Description:** Shell moderately large, reaching a diameter of about 20 mm, thinly discoidal with a thickness of about 6—7 mm; dorsum sharply subangular, but without showing the selenizone; the lateral surface near the dorsum is slightly concave while that part closer to the umbilical shoulder is slightly convex; umbilical width is less than that of the preceding species; ornamentation consists of transverse costae, but without nodules, bearing of the latter feature being quite typical of Patte's species.

In our collection there is only a single specimen which is referred to Patte's.

**Number of figured specimen:** Ga 0008; field label no. 102-1.

### ***Tropidodiscus* sp. nov. (?)**

**Description:** Shell of moderate size, reaching a diameter of about 25 mm, thinly discoidal with a thickness of 7 mm; whorls as a rule 3 in number; umbilicus half as wide as the whorl-

width; dorsum subangular but there is no selenizone; ornamentation is destroyed by recrystallization of the shell. A few dozens of specimens have been examined and they possibly belong to a new species.

**Number of figured specimen:** Ga 0009; field label no. 102-1.

### **Superfamily Pleurotomariacea**

#### **Family Raphistomiidae**

##### **Genus *Raphistomina* Ulrich and Scofield, 1897**

Salter, 1859; Figures and descriptions of Canadian organic remains, dec. 1; Geol. Surv. Canada, p. 12.

Ulrich and Scofield, 1897; The lower Silurian Gastropoda of Minnesota, in Geology of Minnesota. Final Rept., v. 3, pt. 2, p. 932.

Knight, 1941; Special papers Geol. Soc. America, no. 32, p. 296, pl. 19, figs. 1a—b.

Genotype, by original designation: *Raphistoma lapicida* Salter.

**Diagnosis:** Discoidal, phaneromphalous, of moderate size; dorsum sharply angular; outer lip without notch; top-surface flat or low conical, base more convex; umbilicus though clear is very narrow; inductura thick; apex not known; ornamentation of growth-lines only. Typically Ordovician genus.

##### ***Raphistomina* cf. *lapicida* (Salter)**

(Plate I, figures 13—17; text-figure 5)

Among the collection there are a few dozens of specimens which can be referred to this species.

This species was first reported from the Black River group ( $O_2^1$ ) of North America and its occurrence in the Chilianshan region is worth noting.

**Number of figured specimens:** Ga 0010—0013; field label no. 102-1.

### **Family Pleurotomariidae**

#### **Genus *Donaldiella* Cossman, 1903**

Donald, 1902; Quart. Jour. Geol. Soc. London, v. 58, p. 329.

Cossman, 1903; Revue critique de Paleozoologie, v. 7, p. 68.

Knight, 1941; Special papers Geol. Soc. America, no. 32, p. 194.

Genotype, by objective synonymy: *Goniospiral filosa* Donald, 1902; op. cit. p. 329.

##### ***Donaldiella* sp.**

(Plate I, figure 12)

A poorly preserved internal mold is referred to the genus.

**Number of figured specimen:** Ga 0018; field label no. 102-1.

### **Superfamily Euomphalacea**

#### **Family Euomphalidae**

##### **Genus *Lesueurilla* Koken, 1898**

Koken, 1898; Ueber untersilurische gastropoden, neues Jahrb. f. Min. Geol. u. Pal., vol. 1, p. 22.

Knight, 1941; Special papers Geol. Soc. America, no. 32, 173—174, pl. 94, figs. 2a—d.

Genotype, by subsequent designation of Perner: *Maclurea infundibulum* Koken, 1896; die Leitfossilien, p. 396.

**Diagnosis:** Rather large, discoidal, widely phaneromphalous; with spire deeply depressed and an elevated, sharply angulated border to the upper whorl face, within which lies a narrow, selenizone-like band; whorl section subovate with a sharp angulation on the upper-outer end, gently convex on the outer face, more strongly convex on the inner face, and strongly though broadly rounded below; sutures deeply incised, narrow, angular; outer lip with an asymmetrical sinus culminating at the angulation; ornamentation consisting of very fine growthlines.

***Lesueurilla pentagonum* Yang, sp. nov.**

(Plate II, figures 1—5; text-figures 6—7)

**Description:** Rather large shell, attaining a diameter of 6—10 cm, discoidal of four convolute whorls, widely phaneromphalous; spire deeply depressed but with highly convex outer border; base flat or slightly concave; whorl section subpentagonal (text-figure 7); ornamentation of coarse and uneven growth-lines which curve forward or locally backward on the flat under surface, probably owing to distortion; ornamentation on the top surface unknown.

Measurements:	syntype Ga 0014	syntype Ga 0015
Diameter.....	9.3—11.5 cm	6.8—7 cm
Thickness .....	over 2.5 cm	over 2 cm
Width of the umbilicus		
2nd whorl.....		13 mm
3rd whorl.....		25 mm
Width of the whorl (No. of whorl) .....	(4) (3) (2) (1) (1) (2) (3) (4)	
(mm)	>13.5 8 5.2 3.5 5.4 13.7 21 mm.	

**Remarks:** over 50 specimens have been examined which are all characterized by the large size, flat bottom and subpentagonal whorl section. These new characters are essential to this species.

**Number of types:** Ga 0014—0015; field label no. 102-1.

**Genus *Ecculiomphalus* Portlock, 1843**

(= *Eccyliopterus* Remaké, 1888)

Portlock, 1843; Report on the geology of the country of Londonderry and of parts of Tyrone and Fermanagh, p. 411.

Knight, 1941; Special papers Geol. Soc. America, no. 32, p. 106—107, pl. 71, figs. 3a—c.

Knight, Bridge, Shimer and Shrock, 1944; Index fossils of N. America, p. 467.

Genotype, by subsequent designation of S. A. Miller: *Ecculiomphalus bucklandi* Portlock, 1843; op. cit., p. 411.

**Diagnosis:** Shell discoidal, always loosely coiled, and usually with at least the later whorls out of contact; a V-shaped sinus in outer lip culminating at outer margin of the upper surface in a high, thin carina; without slit or selenizone; earlier whorls partitioned; ornamentation or growth lines or transverse lirae. Ordovician and Silurian.

***Ecculiomphalus robusta* (Koken)**

(Plate I, fig. 6; text-figure 8)

*Eccyliopterus princeps* Rem. var. *robusta* Koken, 1925; die gastropodes des baltischen untersilurs, Mem. Acad. d. Sci. d. Russie, ser. 8, v. 37, no. 1, p. 104—105.

**Description:** Shell completely loosely coiled, two and half whorls; whorl section triangular with sharply angular upper corner, while the other two corners being rounded.

A single specimen is put here, although it differs slightly from Koken's original (text-figure 8a). It is considered that such difference is intraspecific.

**Number of figured specimen:** Ga 0016; field label no. 102-1.

### **Superfamily Trochonematacea**

#### **Family Trochonematidae**

#### **Genus *Poleumita* Clarke and Ruedemann, 1903**

J. Sowerby, 1814; Nos. 1x and x in the Mineral Conchology of Great Britain, p. 113.

Clarke and Ruedemann, 1903; New York State Museum, mem. 5, p. 59.

Knight, 1914; Special Papers Geol. Soc. America, no. 32, p. 263—264, pl. 79, figs. 1a—d.

Knight, Bridge, Shimer and Shrock, 1944; Index Fossils of N. America, p. 475.

**Genotype**, by objective synonymy: *Euomphalus discors* J. Sowerby, 1814; op. cit., p. 113.

**Diagnosis:** Discoidal or turbinate, phanerocephalus and with rounded or shouldered whorls; outer lip oblique, without sinus; operculum multispiral and calcareous; ornamented with revolving angulations, carinae or costae and transverse often fasciculate or lamellose growth lines, usually notched where they cross revolving elements.

The genotype occurs in the Wenlock of Great Britain but others such as Koken's species have been collected from the Baltic Ordovician.

#### ***Poleumita* sp.**

(Pl. I, figs. 18—19)

A single specimen with broken spire possesses the generic characters, such as the outline of the whorl section, nature of aperture and ornamentation, so it is put here.

**Number of figured specimen:** Ga 0017; field label no. 102-1.

### **Class Cephalopoda**

#### **Subclass Nautiloidea**

#### **Order Tarphyceratida Flower.**

#### **Family Tarphyceratidae**

#### **Genus *Discoceras* Barrande, 1867**

Eichwald, 1860; Lethaea rossica ou paleontologie de la Russie, decrite et figuree, v. 1.

Barrande, 1867; Systeme silurien du centre de la Boheme, 1ere partie, Recherches paleontologiques, v. 3, Classe des mollusques.

**Genotype:** *Clymenia antiquissima* Eichwald, 1860, op. cit.

**Diagnosis:** Shell discoidal, convolutely nautiloid; ornamentation consisting of coarse transverse costae, which curve backwards at the outer border; whorl section subrectangular, its width being greater than the height which increases gradually; siphuncle near the dorsum in position.

**Distribution:** China, western Europe and N. America.

#### ***Discoceras verbeeki* Frech, 1911**

(Plate II, figs. 6—7)

*Discoceras verbeeki*, Frech in Richthofen: China V, p. 1, pl. 1, figs. 3a, 6.

**Discussion:** According to Frech, this species is quite close to the genotype, *D. antiquissima*, but it differs from the latter in having different whorl section and ornamentation.

Our specimens agree well with Frech's species in whorl section, shell-ornamentation, and the position of siphuncle, but they are all small shells, having only three whorls, hence they apparently represent young shells.

**Number of figured specimens:** Ce 0001.

### Order Michelinoceratida F. and K.

#### Family Michelinoceratidae

#### Genus *Cycloceras* sp.

(Plate II, fig. 8)

A few specimens in our collection measure 16 mm in diameter, and are characterized by fairly closely-placed septa—4 septa in a distance of 10 mm and coarse transverse costae (3 and 1/2 in 10 mm). All the other features, such as character of siphuncle etc. are unknown.

**Number of figured specimen:** Ce 0002; field label no. 102-1.

### CONCLUSION

From the description given above it is worth noting that among the fauna *Discoceras verbeeki* Frech is an important middle Ordovician element which was first reported from the Yangtze Gorges district. Genera such as *Pollicina*, *Raphistomina*, *Donaldiella*, and *Lesueurilla*, etc. are all confined to the Ordovician so far as known, among which *Raphistomina lapicida* (Salter) occurs in the Black River group of the United States, while *Ecculiomphalus robusta* abounds in the *Chasmops* bed of the Baltic region. Hence, it is possibly not unsafe to conclude that the fauna concerned is of Middle Ordovician epoch, and flourished where ecological conditions were at the optimum, such as occurring in the Paiyangho region of Chilianshan.