

# 山東萊陽白堊紀後期龜類化石\*

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## 一. 緒 言

本文記述的兩種白堊紀龜類化石，是1951年前新生代及脊椎古生物研究室在山東萊陽採集的大批脊椎動物化石中的一部分，係劉東生與王存義兩同志在萊陽的陡山及金剛口兩處所發現。金剛口發現的僅一片肋甲；陡山的包括一異常完整的龜類甲殼與另一個體的一部分甲殼，前者為我國至目前為止所發現的中生代龜類化石中最完整的標本，在地層與地理分佈上都有相當意義。

陡山龜化石產地位於萊陽縣城東北約1公里處。膠東的白堊紀地層由下而上可分為三部分，即萊陽層、青山層及王氏系。化石產於中部的青山層內，岩石性質是一種凝灰質砂岩，性質堅硬，呈深赭紅色。青山層的時代過去認為是下白堊紀後期，曾在其中找到過零星的恐龍骨骼化石。劉東生及王存義兩同志在該層內與龜化石一起還發現有完整及部分完整的鸚鵡嘴龍的骨架數個，經楊鍾健教授初步鑑定為鸚鵡嘴龍 (*Psittacosaurus*) 的一種，時代為白堊紀後期。陡山龜化石的產出層位與鸚鵡嘴龍的相同。

金剛口的標本產於王氏系中，係古脊椎動物研究室在修理該地所產的恐龍化石時修出。

## 二. 系統記述

亞目 *Amphichelydia*

科 *Pleurosternidae* Cope

屬 *Glyptops* Marsh, 1890

\* 1954年7月26日收到

? *Glyptops* sp.

(圖 1 a, b)

**產地及層位** 山東萊陽金剛口，白堊紀上部紅色粘土。

本種僅有大體完整的肋甲一塊為代表，由其外沿彎曲程度及表面上肋盾板印痕的情形可定為右邊的第四塊肋甲。標本左右長度超過 60 毫米，內側前後長約 15 毫米，外側長 20 毫米，骨片厚 4 毫米，外側露出肋條末端部分。表面滿佈粗細不等的突起及凹溝，靠近甲殼脊部處特別粗，向外側漸趨平整。突起飾紋有的連接成平行而微向後外方傾斜的脊突，有時間斷成串珠狀，除各脊突之間有凹溝外，外側部另有特別寬的縱行淺溝。

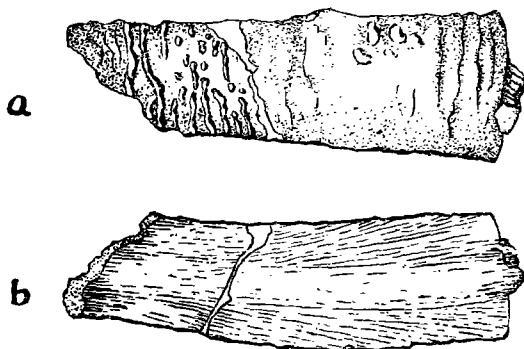


圖 1 ? *Glyptops* sp. 的右第四肋甲 a. 背視；b. 底視，(原大)

因材料太少，龜甲的全部形態無法推知，由保存的肋條觀察似代表一個體較小的兩棲龜類。第四肋甲的一般構造，大小及表面飾紋均與歐洲及北美中生代晚期的 *Glyptops* 十分相近，故暫歸入此屬。

亞目 *Cryptodira*科 *Dermatemydidae* Gray屬 *Peishanemys* Bohlin, 1953*Peishanemys latipons* Bohlin

(圖 2—5; 圖版 I, II)

**材料** 一全部完整的甲殼及腹甲外模，一較大個體左後部  $\frac{1}{3}$  甲殼，及另一個體緣板及肋板殘片。古脊椎動物研究室編號：V761, V762 和 V763。新型標本 (Neotype)——V762——的保存異常完好，但因受橫壓力影響，引起左側向前，右側向後的剪側錯動，使甲殼稍有變形，背甲的凸起度也較原來的稍大。

**產地及層位** 山東萊陽陡山上白堊紀下部 (青山層)。

**特徵** 背甲及腹甲寬大，輪廓幾近圓形。背甲骨板完全；椎板 8 塊，狹長方形，臀板 3 塊；肋甲完全，最後各對不在中線相接。腹甲前後短而寬；骨橋很

闊，每邊有 4 塊間緣盾，內腹甲大，間頤盾單塊。未成年個體腹甲中央有腹甲窗 (median fontanel)。

本種為一個體相當大的隱頸龜類。萊陽 V762 標本似為一未成年個體，長寬幾相等，約均為 240 毫米，故背甲輪廓幾成圓形。前端中央頸部微向內凹，後緣左右角緣稍向上彎。甲殼高度因受擠壓變大，原來高度估計至少在 60 毫米以上，表面有極細的不規則的凹紋。

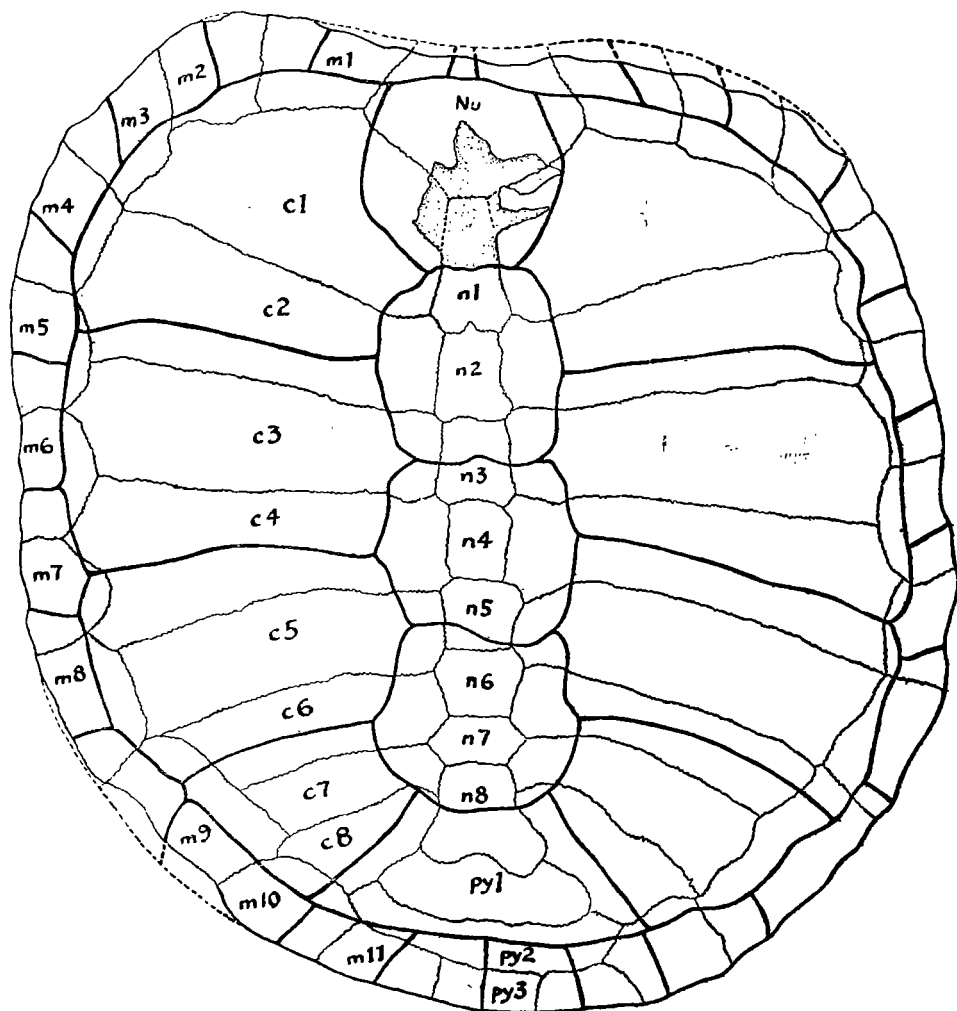


圖 2 *Peishanemys latipons* 新型標本背甲頂視，約為原大 1/2

背甲的骨板完全，包括頸板 1，椎板 8，臀板 3，肋板 8 對及緣板 11 對。頸板成正五形，寬大於高約 3 倍，後沿底邊短直，最大寬度在第一緣板與第一肋

板相接處，與兩者相接觸的長度約相等。椎板 8 塊，各板寬度大致相等，由第一椎板至第八椎板各板與兩側肋板間的縫合線大致平行。第一椎板特別長，寬度僅為前後長度的 $\frac{1}{2}$ ，被第一與第二椎盾間的溝所平分，後端稍顯擴大。第二及第三椎板相似，均為長方形，第四塊略小，夾於兩邊第四對肋板之間；第五及第六椎板近正方形；第七椎板成扁六角形，前後邊等長，最大寬度在兩側與第六及第七

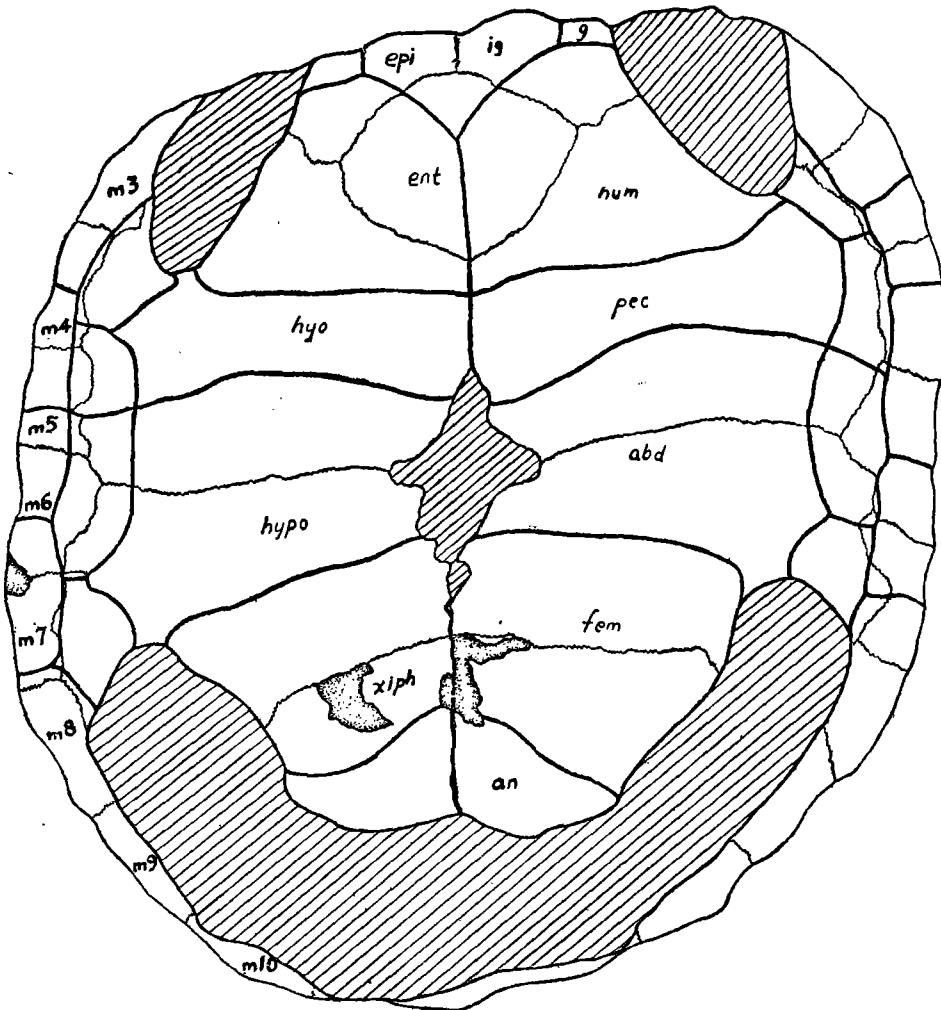


圖 3 *Peishanemys latipons* 新型標本腹甲底視，約為標本原大 $\frac{1}{2}$

對肋板的連接點上；第八椎板的後端擴大，幾為前端的 2 倍，輪廓成鐘狀，夾在最後一對緣板中間，大小及輪廓與後者相像。

肋板完全，左右兩列為脊部各骨板所隔離；第一對前方與頸板，第一、第二、

第三對緣板相接；由第二至第五<sup>3</sup>對大致相似，前後短，僅為橫寬長度的 $\frac{1}{4}$ 左右；由第六至第八對大小向後遞減，第八對內側與第八椎板邊緣後半段相接觸。緣板共 11 對，除與骨橋相接觸的各板外，其他的邊緣均薄。第一與第三對之間的縫合線在第一對肋板向外側的延長線上，第九緣板最大，內側與第六及第七肋板沿全長接觸。第十對的部分及第十一對與第二臀板後緣相接。

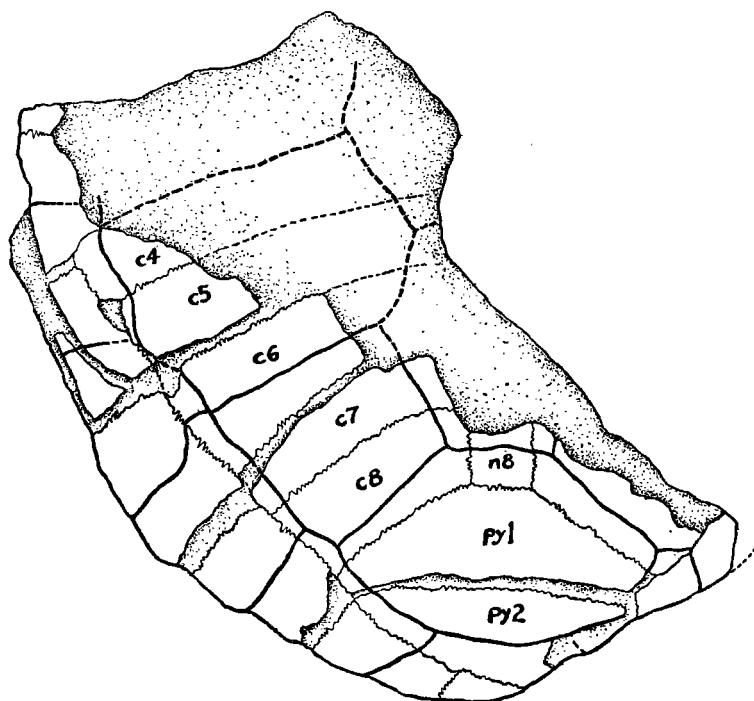


圖 4 *Peishanemys latipons* 一較大個體背甲在後部，約為原大 $\frac{1}{2}$

背甲的角質盾板痕很深，盾板溝附近的骨板下凹成相當深的槽，尤其以甲殼中央脊部附近最為顯著，故背甲中部成凹凸不平的構造。第一至第四椎盾的大小相近，長寬幾相等，寬度約為脊板的 3 倍，第一椎盾後緣線短，兩邊向外凸出成弧形，前方中央有一很小的頸盾，寬度僅為第一椎盾前沿長的 $\frac{1}{6}$ 。第二椎盾後緣溝平分第三椎板，第三椎盾後緣線與第五椎板後端相靠近，第四椎盾覆蓋第五椎板的一部，第六及第七椎板的全部，及第八椎板的前半；第五椎盾成正梯形，前緣線中央向後凹入，寬度僅相當於後緣線長的一半。肋盾寬大，外側將第一至第十緣板的內側三分之一覆蓋，大小由前向後遞減。第一對肋盾的內上角超覆於頸板上。緣盾狹長，各盾的長度大致相等，寬度亦相近，約為緣板寬的 $\frac{2}{3}$ 。

腹甲寬大，長寬約相等，前後葉短而寬，兩者約等長，末端兩邊角上微向上彎。內腹板大，成橫橢圓形，位於腋柱正前方腹甲前葉的中央，寬度約當前葉的一半。上腹甲短，與舌腹甲間的縫合線外端相交於前葉前面 $\frac{1}{3}$ 處；舌腹甲大，與下腹甲間的縫合線近水平，位置較腹甲前後平分線稍靠後，下腹甲長度約為舌腹甲的 $\frac{2}{3}$ ，上下邊近乎平行，兩側微向後斜，劍腹甲大，後沿成圓角的切割，中央略向內凹，兩角部稍擴大，骨板亦變厚。間頤盾單塊，成左右兩角受切割的倒置正三角形，頂部覆蓋內腹甲的前部，頤盾小，位於前葉角上，成橫置的小正方形。胸板前緣中段平，兩端微向前彎，後緣中央稍向後凹；股板很大，佔後葉前面的大部分，肛板中間長，兩邊短，與股板間的溝向前凸出，在腹甲中線上與下腹甲後緣距離約與至後葉邊沿距離相等。間緣板發達，每邊 4 塊，前後兩對較中間兩對稍短，寬度約為骨橋寬的一半。骨橋很寬，前端至第三對緣板前沿，後端包括第八對緣板，前後的腋柱及鼠蹊柱相當發達。

在萊陽發現的完整標本上，腹甲中央有一菱形的腹甲窗，由原標本及外模的保存情形，及腹甲窗四沿骨板變薄情形觀察，應為甲殼原有的構造，而不是因龜甲殘缺乏造成，在甘肅標本上則中央接合緊密，與萊陽的顯然不同。

標本測量 (單位毫米):

(1) 緣板及第三臀板長寬度比較

	新型標本 (V762)		(V763)		正型標本 (依 Bohlin)	
	長	寬	長	寬	長	寬
第一緣板 (m1)	34	24 +	--	--	36	30
m2	36	29 +	--	--	33	34
m3	36	29	--	--	38	--
m4	34	33	--	--	40	--
m5	35	33	--	--	39	--
m6	34	34	--	--	39	?34
m7	35	36	32	34	42	--
m8	34	35	37	37	42	--
m9	39	40	33	34	42	34
m10	36	37	36	35	43	36
m11	36	32	32	28	43	36
Py3	38	27	45	28	46	28

(2) 新型 (V762) 椎板及肋板的寬與長

	長	寬	
		前	後
第一椎板(n1)	35	—	17
n2	24	15	17
n3	23	15	19
n4	21	15	14
n5	35	15	—
n6	16	19	17
n7	21	23	19
n8	40	19	35

	長	寬
第一肋板(c1)	45	101
c2	36	111
c3	35	112
c4	37	112
c5	32	91
c6	27	73
c7	17	65
c8	22	51

**比較及討論** 前中瑞西北考察在甘肅所採集的龜類化石，最近已由步林(Bohlin)完成研究報告發表<sup>[1]</sup>，其中有在玉門北邊北山二家梧桐發現的白堊紀隱頸類一種，經定名為 *Peishanemys latipons*，其主要特徵與萊陽陡山的龜類完全相符合。根據現有材料觀察，陡山標本與甘肅的主要不同之點有二：第一、在萊陽的一完整龜甲的腹甲中央，各骨板尚未縫合一起，中間有一長寬各約 20 毫米的菱形孔穴，周圍界線因骨板受壓破裂，已不很清楚，但由孔穴四周骨片變薄及外模上亦有同樣情形存在，表示似係原標本所固有的特徵，應該是代表原有的腹甲窗的構造。這一特點與步林所記述的標本有顯著不同，甘肅標本的腹甲各骨板完全癒合。這一差別表示將兩者歸於同一種內尚不無疑問，但萊陽 V 762 標本係一較年幼個體，此點由其各甲板間縫合線的特別清楚，腹甲中央部分較薄，及比甘肅標本及陡山另外兩個破碎標本都小  $1/5$  至  $1/4$  等各點可以證明，故 V 762 腹甲中央有腹甲窗的存在應為本種龜類甲殼個體發育中所具的特徵；第二、萊陽陡山標本根據個體大小與甘肅的相近比較，最後 3 對緣板特別狹小，但這一點不同差別不大，故不能作為代表不同種的根據；且因標本邊緣略有殘缺，緣板的測量長度，可能較實際長度稍小，所以，至少依目前材料說，萊陽陡山青山系所產龜化石與步林在玉門採集的 *Peishanemys* 歸入同一種內，似較合理，果然，陡山標本係代表較 *P. latipons* 稍為原始的新種或新亞種也相當可能，加以兩化石產地間的距離亦相隔很遠。

### 三. 結 論

萊陽白堊紀爬行動物羣中包括 *Peishanemys latipons* 及 ? *Glyptops* sp. 兩種龜類化石。*P. latipons* 曾在甘肅白堊紀地層中發現，產化石地層為紅色砂礫岩及

粘土層，除龜化石外尚有節結龍類 (Nodosauridae) 的 *Peishansaurus* 化石，地層時代經步林初步定為白堊紀，由其中所產龜化石 *Peishanemys* 與萊陽陡山的接近情形，兩者的層位可能相當，地層的一般岩石性質亦相似，以步林的報告中並無地層詳細記述和剖面故不易作進一步的對比。萊陽青山層的時代過去一般認為係下白堊紀的晚期，最近由其中發現的豐富的鸚鵡嘴龍化石觀察，楊鍾健教授認為應係白堊紀後期；與 *Peishanemys* 相近的 *Dermatamydidae* 科的龜化石在北美都發現於上白堊紀。

*Glyptops* 屬在歐洲及北美的發現時代自侏羅紀末至白堊紀晚期，金剛口發現的材料太少，不能作確定層位的根據。

中國中生代陸相地層中的龜鱉類化石過去知道得很少，一方面因發現不多，另一方面已發現的材料亦都未經系統研究，近兩年來，關於這方面的知識增加了不少。中國中生代龜鱉類化石；根據現在已發表的材料，至少有下列 22 種，代表時代自侏羅紀晚期至白堊紀末期。

#### 1. 侏羅紀晚期或白堊紀初期

- (1) *Chenyuchelys baenoides* Young & Chow (四川)
- (2) *Plesiochelys latimarginalis* Y. & C. (四川重慶)
- (3) *P. radiplicatus* Y. & C. (全上)
- (4) *P. chungkingensis* Y. & C. (全上)
- (5) *Tienfuchelys tsuyangensis* Y. & C. (四川資陽)
- (6) *Manchurochelys manchoukouensis* Endo & Shikama (遼寧)
- (7) *Sinaspideretes wimani* Y. & C. (四川)

#### 2. 白堊紀初期

- (8) *Sinemys lens* Wiman (山東蒙陰)
- (9) *Stnochelys applanata* W. (全上)
- (10) *Scutemys tecta* W. (全上)

#### 3. 白堊紀

- (11) *Osteopygis kansuensis* Bohlin (甘肅嘉峪關)
- (12) *O. latilimbata* B. (全上)
- (13) *O. acutus* B. (全上)
- (14) *Heishanemys imperfectus* B. (全上)
- (15) *Tsaoianemys rugosus* B. (全上)
- (16) *T. compressus* B. (全上)
- (17) *T. parvulus* B. (全上)
- (18) *T. undulatus* B. (全上)
- (19) *Yümenemys inflatus* B. (甘肅玉門)

#### 4. 白堊紀後期



(20) *Peishanemys latipons* B. (甘肅玉門；山東萊陽)

(21) *Aspideretes planicostatus* Riabinin (黑龍江)

(22) ? *Glyptops* sp. Chow (山東萊陽)

由上表可見中國的中生代後期龜類化石的材料相當豐富，但依目前情形說，絕大部分係在四川、山東及甘肅三省發現，中生代主要各科多數均有代表，其中以蛇頸龜科 (*Plesiochelyidae*)、*Thalassemydidae* 及 *Dermatemydidae* 三科為最多，均為淡水生活的龜類。蛇頸龜科化石均發現於四川，為歐洲類型的代表，在我國發現的時代均限於侏羅紀末或白堊紀初，其他兩科則屬北美類型，在我國分佈較廣泛，但至今仍限於秦嶺以北區域，這一地理及地層上分佈的情形在中生代後期古地理研究有相當重要意義，目前所知材料不多，尚不能下肯定的結論。

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## CRETACEOUS TURTLES FROM LAIYANG, SHANTUNG

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The material covered in this paper is a part of the rich collection of the Cretaceous reptiles collected in 1951 by the Laboratory of Vertebrate Paleontology from Laiyang, Shantung. Remains of the turtles are comparatively rare in contrast to the abundance of the fossil eggs and dinosaurian bones found in the fossiliferous Cretaceous beds of Laiyang. The fossil turtles discovered hitherto include parts of four individuals belonging to two species, e. g., *?Glyptops* sp. and *Prishanemys latipons* Bohlin. They are all Late Cretaceous in age as indicated by the associating dinosaurian faunas.

### 1. SYSTEMATIC DESCRIPTIONS

#### Suborder Amphichelydia

#### Family Pleurosternidae Cope

#### Genus *Glyptops* Marsh, 1890

#### *?Glyptops* sp.

(Fig. 1)

Locality and Horizon: Chingkongkou, Laiyang, Shantung. Upper part of Wangshih formation, Late Cretaceous.

This species is represented only by a fourth right costal (V734). It is about 15 mm long and 60 mm wide. The surface of the plate is ornamented with small nodules and ridges separated by furrows of varying depth. They are more pronounced on the proximal side of the plate. Owing to the scantiness of the material, it is difficult to give an exact identification of the species. The surface ornamentations and their orientation resemble rather closely to those in the genus *Glyptops* which is a common form in the Late Jurassic and Cretaceous of North America.

**Suborder Cryptodira**  
**Family Dermatemydidae Gray**  
**Genus *Peishanemys* Bohlin, 1953**  
***Peishanemys latipons* Bohlin**

(Text-figs. 2-4; pls. I-II)

**Materials:** A perfectly preserved shell with complete carapace and plastron, and the cast of the plastron (Cat. No. V672, Neotype). Left posterior third of another larger shell (V761). Fragmentary parts of marginals and broken costals of another shell (V763).

**Horizon and locality:** Lower part of the Upper Cretaceous Tsinghan series, Tushan, Laiyang, Eastern Shantung.

**Description:** The species is a cryptodirian turtle of rather large size. The complete shell is about equal in length and width, so the carapace, when viewed dorsally, is almost circular in outline. It is about 240 mm as wide as long. The anterior edge of the carapace is slightly notched and the postero-lateral corners turn slightly upward. As the shell was a little deformed due to shearing stresses from the sides, the height of the carapace is slightly exaggerated by compression. The original height would be 60 mm in its approximation.

The bony plates of the carapace are complete in number, e. g. one nuchal, eight neurals, and three pygals for the vertebral series, and eight costal and eleven marginals on each side. The nuchal is pentagonal in outline. It is three times wider than long. The sides of the neural series are nearly parallel. The first one, though its anterior margin is obliterated, is unusually long. Except the fifth and the sixth neurals which are square-shaped, all the ones anterior to the former are elongate and more or less alike in shape. The last one is greatly expanded at its posterior, being twice wider than its anterior.

The anterior of the first costal is in contact with the nuchal and the first three marginals. The second, third, fourth, and fifth costals are nearly alike. They are about four times wider than long. The posterior pairs are smaller and their size decreases caudally. The marginals, except those which are in connection with the bridges, have sharp edges. The ninth one is the largest of all, and its proximal side is in contact with the sixth and seventh costals for their entire length.

The sulci of the epidermal shields are very deep, especially those on the

proximal region of the carapace. The nuchal shield is extremely small. All the vertebral shields, except the last one are nearly equal in size. They are almost as wide as long. Their width is about three times greater than the average for those of the neural plates. The fifth shield has a base that is twice wider than that of the anterior margin. The costal scutes are broad and cover the proximal-third of the marginal plates from the first pair back to the tenth. The marginal shields are nearly equal in size. They are about two third as wide as those of the marginal plates.

The plastron is broad and nearly equal in length and width. The anterior and the posterior lobes are of same size. Their corners turn slightly upward dorsally. The entoplastron is large and oval in outline. It located at the center of the anterior lobe just in front of the line connecting the anteriors of the axillary buttresses and is about half as wide as the plastral lobe. The intergular shield is undivided and the gulars are small quadrangle in shape. The four pairs of intermarginal scutes are well developed. The first and the last pairs are longer than the two intermediate pairs. The bridge is long and broad. It includes the third marginals in front and the eighth marginals posteriorly.

At the center of the plastron of the complete shell (neotype) there is a fontanel-like rhombic opening. As it is found likewise on the corresponding part of the cast and the edges of the surrounding plates, the hyoplastra and hypoplastra, thin out thereof, it is assumed to represent the median fontanel which is present in the immature shells.

The measurements of the different elements of the shells are tabulated in the Chinese text together with the figures taken by Bohlin for the Kansu specimen for comparison.

Comparison and discussion: The structures of the shell of the fossil turtles from Toushan, Laiyang show close resemblance to the species *Peishanemys latipons* described by Bohlin from the Cretaceous of Yumen, Kansu, collected by the Sino-Swedish Expedition. The only differences between them are that the posterior marginal plate in the Laiyang specimens are somewhat narrower and there is very probably a median fontanel on the plastron. The difference in the size of the marginals is not pronounced enough to have much taxonomic value because the edges of the carapace in the Laiyang specimens are partly damaged. The presence of the median fontanel is significant, but as this structure

is present only on one specimen which, judging from by the degree of the ossification of the shell and its relatively smaller size, seems to be that of a young individual. Therefore, it is safer at present to consider that, even if a median fontanel is really present in that specimen, it is a characteristic found only in the immature shells.

## 2. CONCLUSION

Among the turtle remains found in the Cretaceous of Laiyang described above, the species *Glyptops* sp. from the Wangshih formation is only inadequately known, while the occurrence of *Peishanemys latipons* in the Tsinshan "formation" is interesting, for it was first described by Dr. B. Bohlin from the Cretaceous of Kansu along with the nodosaurid dinosaurs. In Laiyang they occur in association with the remains of *Psittacosaurus* of which several complete or partly complete skeletons have been found and the age of the fossil-bearing beds, according to Dr. C. C. Young, is of early Late Cretaceous. The Cretaceous of Kansu from which the remains of *Peishanemys* was found may be a correlative of the Tsinshan and the two formations, according to the description given by Bohlin to the Kansu section, are also quite similar.

Recently our knowledge of the Mesozoic turtles of China have been increased considerably. A complete list of all the species known to date is given in the concluding section of the Chinese text to which references may be made.

## EXPLANATION OF THE TEXT FIGURES AND PLATES IN THE CHINESE TEXT

Fig. 1. *Glyptops* sp. the right fourth costal (V734), (natural size).

Fig. 2. *Peishanemys latipons* Bohlin. Carapace of the neotype (V762), ( $\frac{1}{2}$  of natural size).

Fig. 3. *Peishanemys latipons* Bohlin. Plastron of the neotype (V762), ( $\frac{1}{2}$  natural size).

Fig. 4. *Peishanemys latipons* Bohlin. Left posterior of carapace (V761), ( $\frac{1}{2}$  natural size).

Plate I. *Peishanemys latipons* Bohlin.

1. Carapace of the neotype (V762); 2. same of a larger shell (V761). Both about one half natural size.

Plate II. *Peishanemys latipons* Bohlin.

1. Plastron of the neotype (V762); 2. same of a larger shell (V761). Both about one half natural size.

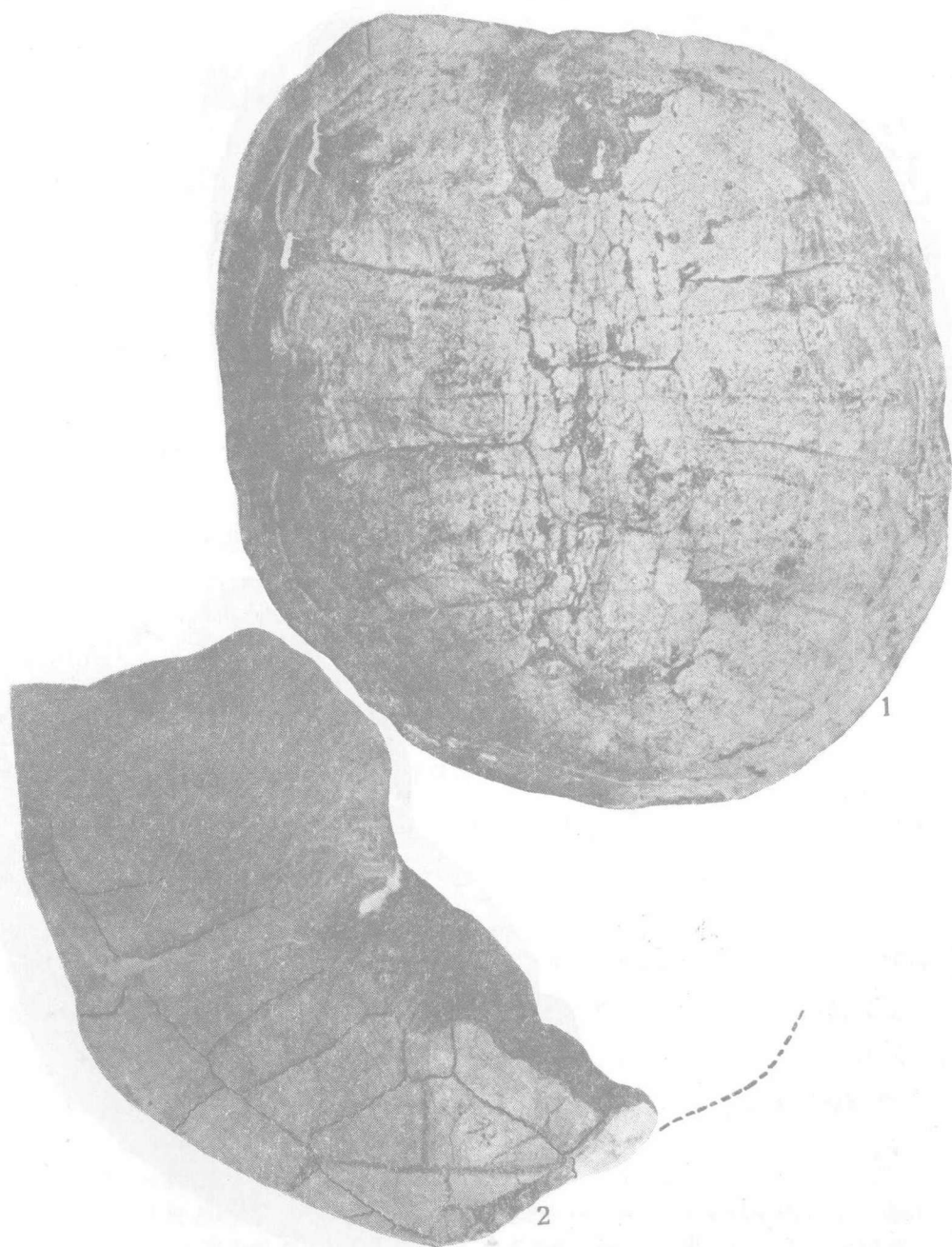
## 圖 版 說 明

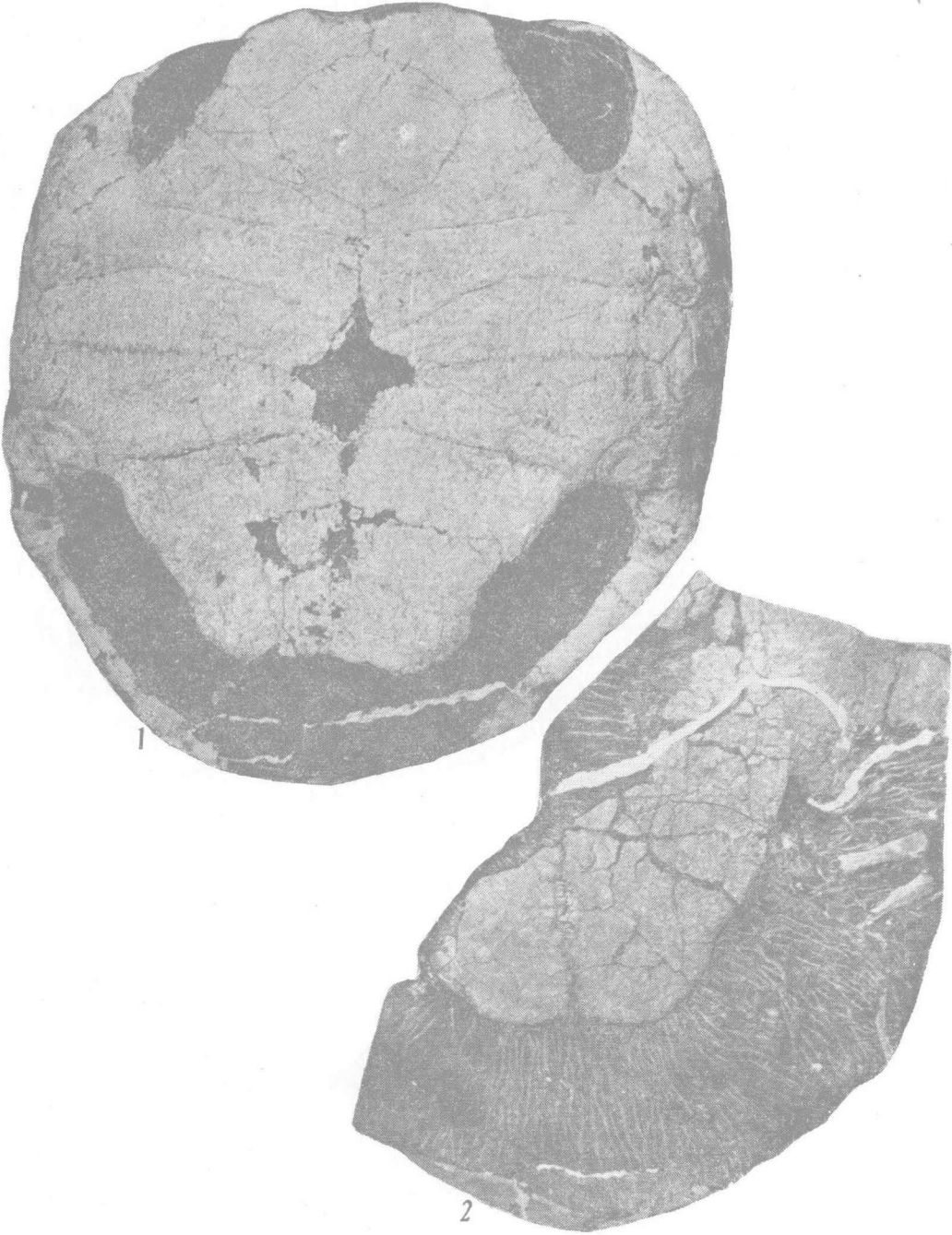
### 圖版 I

1. *Peishanemys latipons* Bohlin. 新型標本 (V762) 背甲背視, (約為原大 $\frac{1}{2}$ ).
2. 同上, 另一較大個體 (V761) 背甲左後部背視, (約為原大 $\frac{1}{2}$ ).

### 圖版 II

1. *Peishanemys latipons* Bohlin. 新型標本 (V762) 腹甲腹視 (約為原大 $\frac{1}{2}$ ).
2. 同上, 另一較大個體 (V761) 腹下左後部腹視, (約為原大 $\frac{1}{2}$ ).







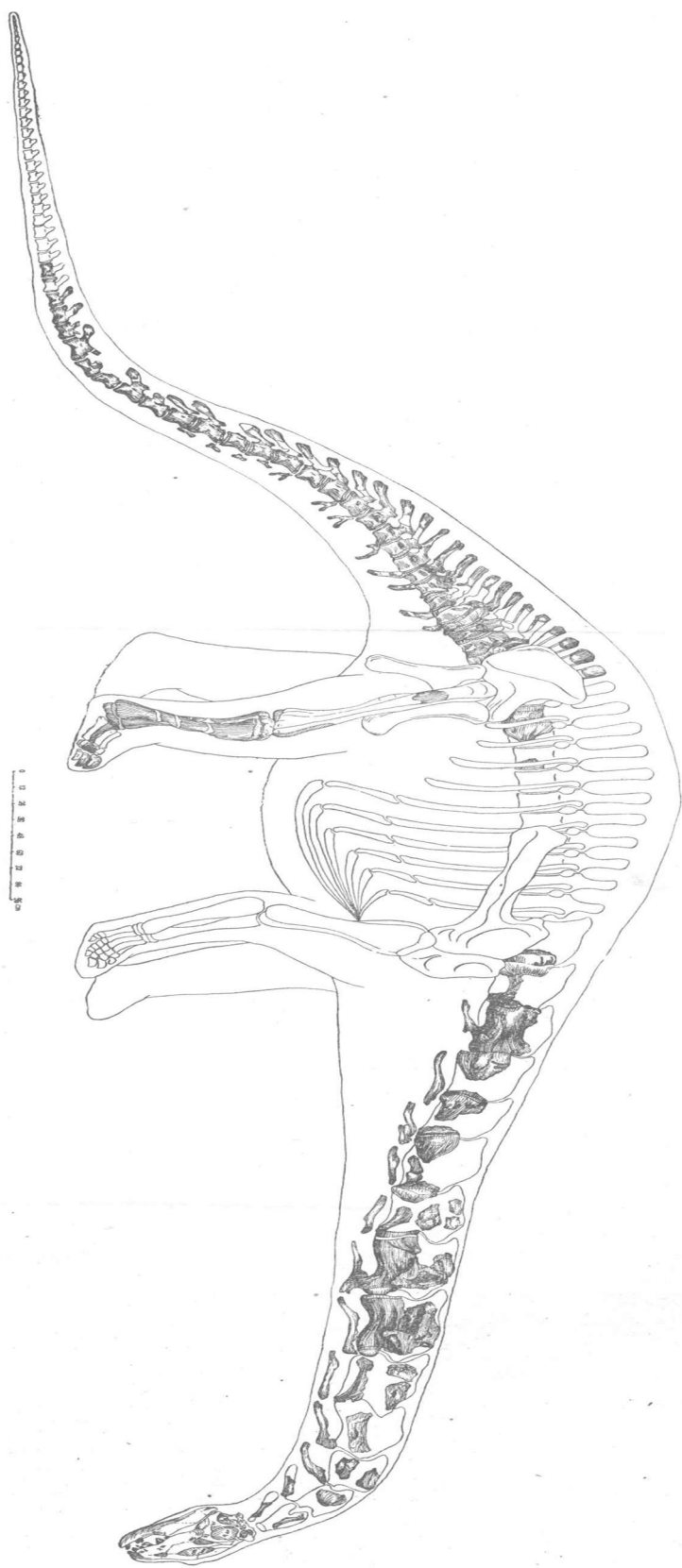


圖 5 周門猿人的再造圖。保存部分均繪線條，未保存或補充部分空白，× 1/50