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NEW FOSSIL TURTLE, *Ocadia sinensis changwui* n. subsp. FROM LATE PLEISTOCENE, TAIWAN STRAIT.

Hsi-Jen Tao

ABSTRACT

The present report describes a new fossil turtle: *Ocadia sinensis changwui* n. subspecies. The studied material was collected from the Taiwan strait near Penghu island. However, the morphologic characteries of *Ocadia sinensis changwui* are closely similar to those of *Ocadia sinensis* (Gray), but it might differentiable from the following few aspects: i.e. 1. The pre-central lamina and the 3rd peripheral bony plate are longer. 2. The dorsal surface of the carapace is flater. 3. The 2nd marginal lamina is narrower. 4. The 1st central lamina is pentagonal and 5. the 2nd hexagonal central lamina. The geological age of this turtle is late pleistocene.

Key words: pleistocene, new record, Taiwan, fossil turtle.

INTRODUCTION

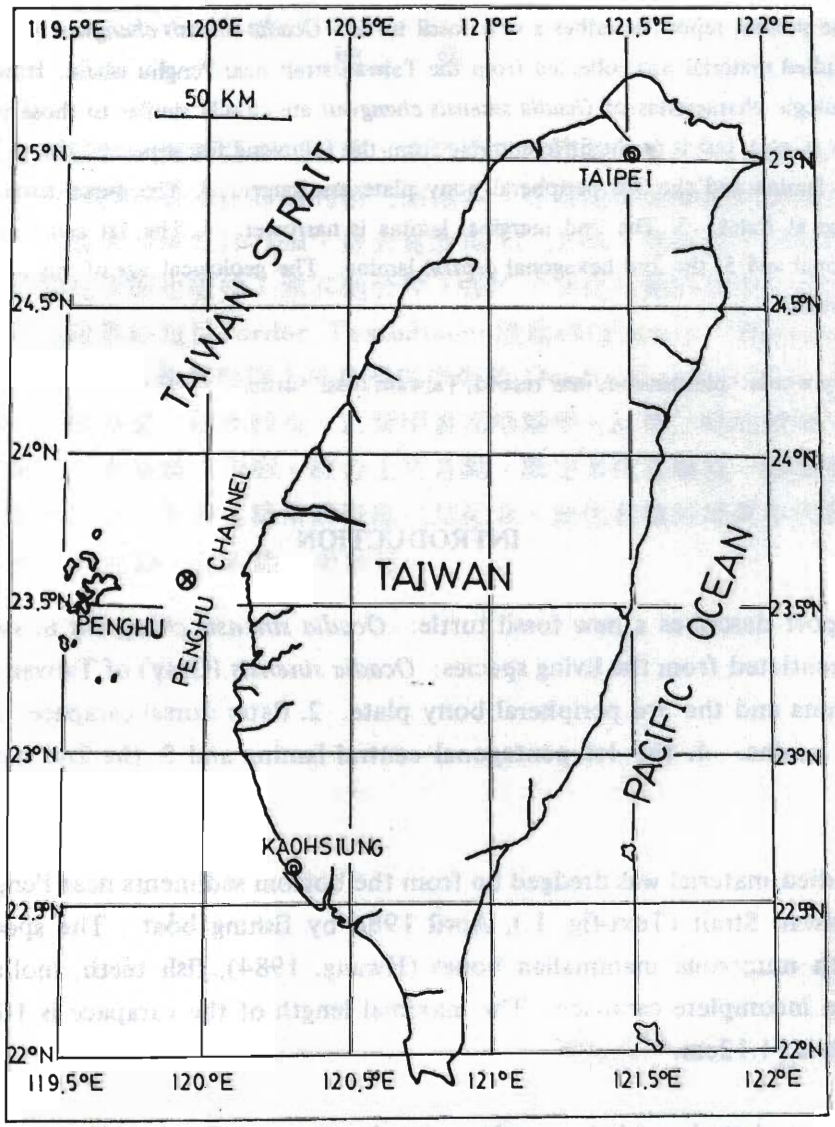
This report describes a new fossil turtle: *Ocadia sinensis changwui* n. subsp. This new turtle is differentiated from the living species: *Ocadia sinensis* (Gray) of Taiwan by its 1. longer precentral lamina and the 3rd peripheral bony plate. 2. flater dorsal carapace. 3. narrower the 2nd marginal lamina. 4. the 1st pentagonal central lamina and 5. the 2nd hexagonal central lamina.

The studied material was dredged up from the bottom sediments near Penghu (Pescadors) channel in Taiwan Strait (Text-fig. 1.), April 1986 by fishing boat. The specimen was also associated with numerous mammalian bones (Hwang, 1984), fish teeth, mollusks etc. This specimen is an incomplete carapace. The maximal length of the carapace is 10.01cm and the maximal width is 11.12cm.

The biological study of living turtles: *Ocadia sinensis* (Gray) of Taiwan was well known

by Pope (1935), Wang and Wang (1956), Mao (1971, 1987), Chen and Yu (1984) etc. and two fossil turtles: *Chinemys pani* Tao and *Trionyx liupani* Tao were reported by Tao from Taiwan recently (1985, 1986). The present report will be the third one on the same subject. Those three fossil turtles contribute an important evolutionary knowledge of our chelonia study and the recent geologic history of Taiwan.

According to Lin and Chou (1974) the geologic age of Penghu channel deposits is late pleistocene, where the present material was collected.



Text-fig. 1. Geographic map ⊕ showing the fossil locality.

MATERIALS AND METHODS

Materials:

The studied material is a carapace. It was dredged up in April 1986, from the Penghu Channel in the Taiwan Strait by fishing boat, about 150 to 200m in depth. (Text-fig. 1).

Methods:

The studied material was treated with the similar method as in the author's early report (1986).

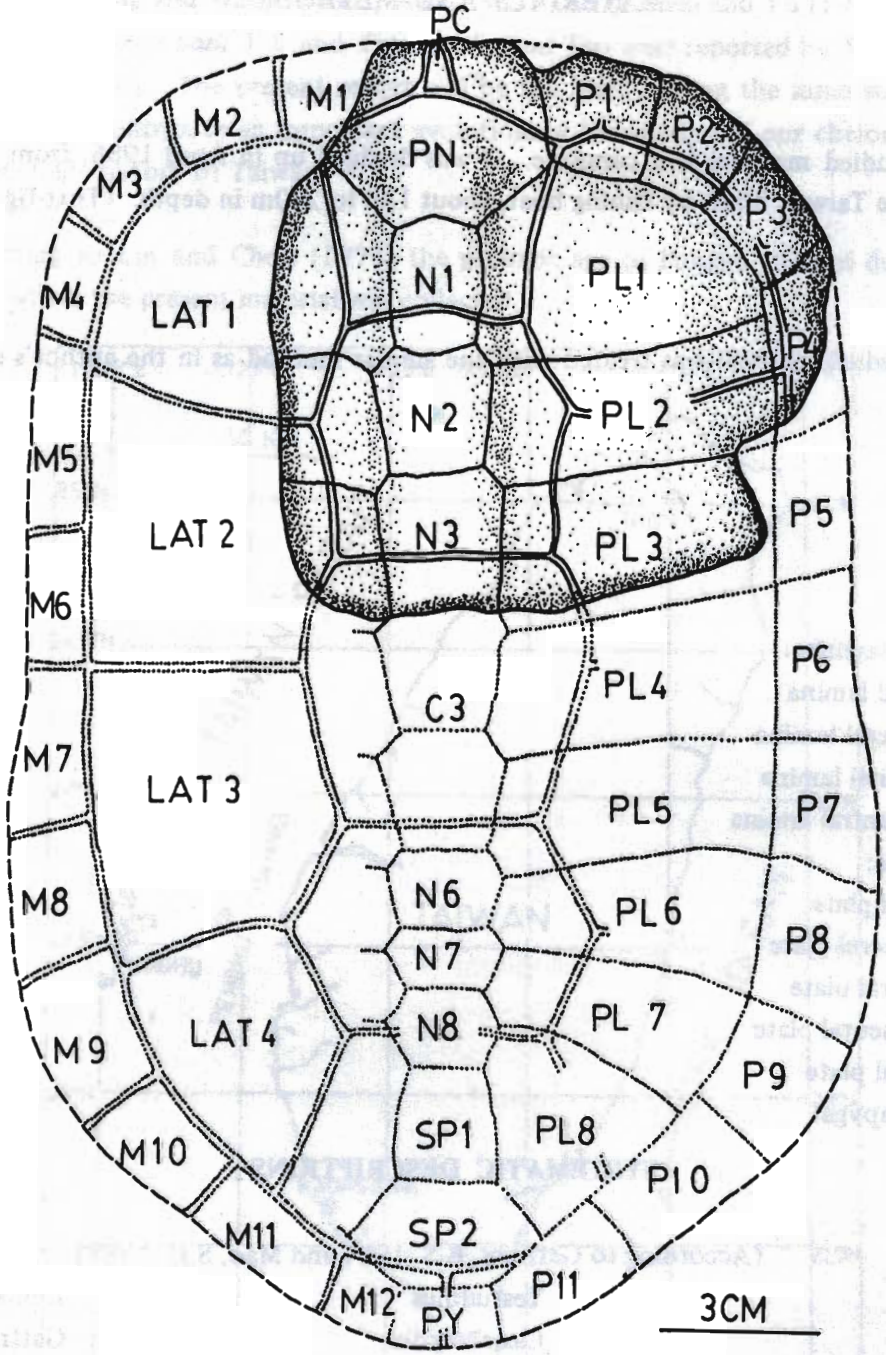
Abbreviation:

Anatomical:
Carapace:
Epidermal laminae:
C: central lamina
LAT: lateral lamina
M: marginal lamina
PC: precentral lamina
Bony plates:
N: neural plate
P: peripheral plate
PL: pleural plate
PN: proneural plate
PY: pygal plate
SP: suprapygal

SYSTEMATIC DESCRIPTIONS

(According to Gaffney, E.S. 1984 and Mao, S.H. 1987)

Order	Testudines	Linnaeus, 1758
Gigaorder	Casichelydia	Gaffney, 1975a
Megaorder	Cryptodira	(Cope, 1868)
Hyperorder	Diaocryptodira	Gaffney, 1984
Parvorder	Eucryptodira	Gaffney, 1975a
Suborder	Polycryptodira	Gaffney, 1984



Text-fig. 2. Dorsal view of the carapace of *Ocadia sinensis changwui* n. subsp. (Solid portion based on actual specimen).

Infraorder	Procoelocryptodira	Gaffney, 1984
Microorder	Chelomacryptodira	Gaffney, 1984
Superfamily	Testudinoidea	Baur, 1893
Family	'Batagurinae'	McDowell, 1964
Genus	Ocadia	Gray, 1870

***Ocadia sinensis changwui* n. subsp.**

Holotype:

The figured carapace is stored in the private museum of Mr. Pan, Chung-Wu (潘常武), Tainan city, Taiwan. The plaster model of it is stored in the museum of Zoology, National Taiwan University, Taipei:F0076.

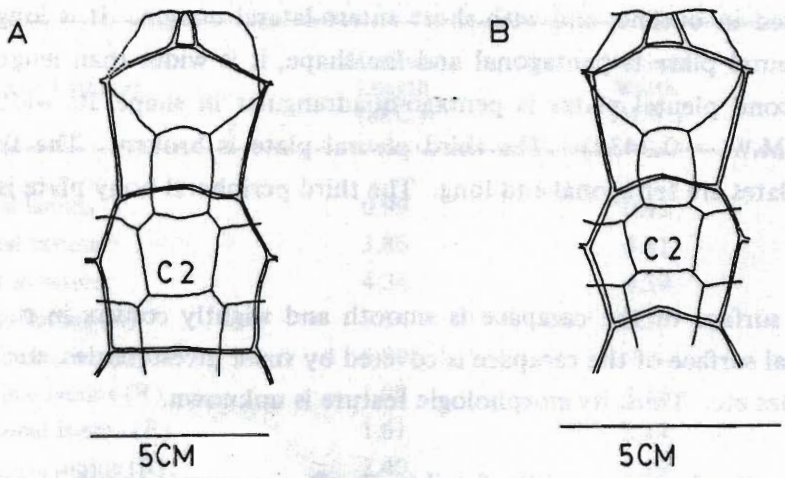
Locality: Penghu Channel in the Taiwan strait.

Depth: About 150 to 200 meters.

Geologic age: Late pleistocene (10,000 to 30,000 years old.)

Diagnosis:

Carapace carinated and subrounded in outline; first central lamina pentagonal and second central lamina hexagonal; dorsal surface of the carapace slightly flat; the third peripheral bony plate long (Maximal length/Maximal width = 1.26); and the precentral lamina (Maximal length/ Maximal width = 1.21) long; the second marginal lamina narrow (Maximal length/Maximal width = 0.75).



Text-fig. 3. A comparsion of the anterior two central laminae of the two turtles.
A: *Ocadia sinensis changwui* n. subsp.
B: *Ocadia sinensis* (Gray)

Descriptions (Text-figs. 1–3; figs. 1–2; Tables 1–2).

The present species is represented by an half carapace only, it is convex and quadrate in outline. The bony plates, sutures and sulci are distinctly demarked. The keel is prominent on the neural plates, but not prominent on the anterior portion of proneural plate. In the central portion of carapace: the precentral, first and second central laminae are present. On the right side of the carapace, there are first lateral lamina, part of the second lateral lamina and first to fourth marginal laminae. The bony plates: proneural, first, second and part of third neurals, anterior four right pleurals and peripherals are present. The maximal length of the carapace is 10.01cm. The maximal width of the carapace is 11.2cm.

The precentral lamina is small, triangular and with broader posterior. The first central lamina is pentagonal in outline, its anterior portion is slightly broader than posterior. The second central lamina is hexagonal and its greatest width is in the 2/5 portion from the anterior end and the width is longer than the length. The third central lamina is not preserved. The first right lateral lamina is tetragonal and fan-shaped in outline, its width is almost equal to length (M.L./M.W. = 0.9772). The second right lateral lamina is not preserved. The first and second right marginal laminae are tetragonal and is wider than length (M.L./M.W. = 0.7441, 0.7523). The third and fourth right marginal laminae are narrow tetragonal (M.L./M.W. = 1.095, 1.41).

The proneural is hexagonal in outline, broader than long (M.L./M.W. = 0.7189), its frontal border arches slightly anteriorly and posterior border inwardly. The first neural plate is sub-quadrangular and elongate in outline (M.L./M.W. = 1.4114). The second neural plate is hexagonal and elongated in outline, and with short antero-lateral margin. It is longer than width. The first right pleural plate is pentagonal and fan shape, it is wider than length (M.L./M.W.= 0.6454). The second pleural plates is pentago-quadrangular in shape, its width is 3 times of the length (M.L./M.W. = 0.3434). The third pleural plate is broken. The first and second peripheral bony plates are tetragonal and long. The third peripheral bony plate is rhomboidal in outline.

The dorsal surface of the carapace is smooth and slightly convex in the central neural plates. The ventral surface of the carapace is covered by small investebrates, such as: bryozoas, corals, annelid tubes etc. Thus, its morphologic feature is unknown.

The total length of carapace of the fossil turtle after recover is about 21 cm.

Table 1. Measurements of bony plates on carapace of *Ocadia sinensis changwui* n. subsp. (in cm).

Bony Plate	Maximal Length (M.L.)	Maximal Width (M.W.)	M.L./M.W.
Proneural	3.12	4.34	0.7189
1st neural	2.47	1.75	1.4114
2nd neural	2.17	2.21	0.9819
3rd neural	2.34	2.23	1.0493
1st pleural (R)	3.55	5.50	0.6454
2nd pleural (R)	2.15	6.26	0.3434
3rd pleural (R)	2.20?	4.85?	----
1st peripheral (R)	2.40	2.20	1.0909
2nd peripheral (R)	2.36	1.97	1.1979
3rd peripheral (R)	2.78	2.20	1.2636
Carapace	10.01?	11.12?	

?: Indicated damage, true length probably longer.

Table 2. Measurements of the laminae on carapace of *Ocadia sinensis changwui* n. subsp. (in cm).

Name of Laminae	Maximal Length (M.L.)	Maximal Width (M.W.)	M.L./M.W.
Precentral lamina	0.99	0.82	1.2073
1st central lamina	3.86	3.81	1.0131
2nd central lamina	4.34	4.59	0.9455
1st lateral lamina (R)	5.14	5.26	0.9772
2nd lateral lamina (R)	5.39?	---	-----
1st marginal lamina (R)	1.92	2.58	0.7441
2nd marginal lamina (R)	1.61	2.14	0.7523
3rd marginal lamina (R)	2.40	2.19	1.0958
4th marginal lamina (R)	2.76	1.95	1.4153

?: Indicated damage, true length probably longer.

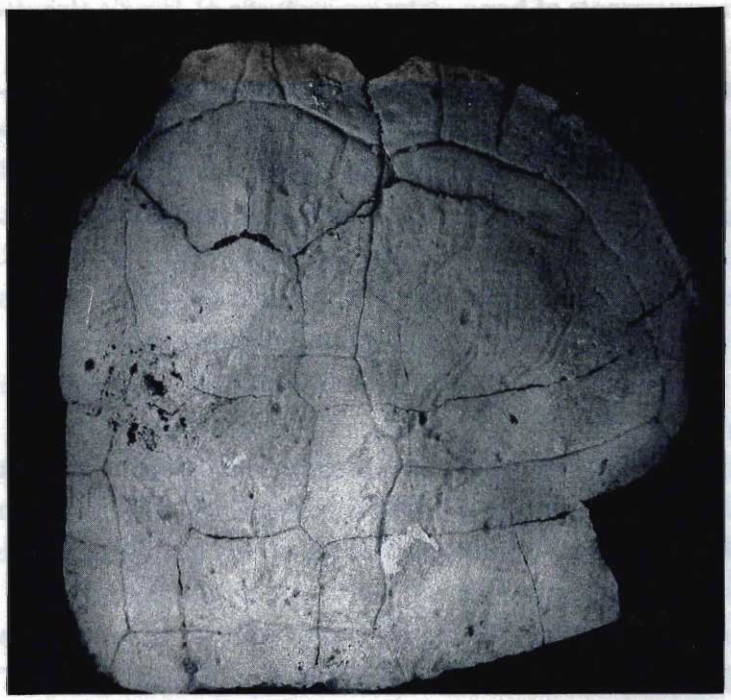


Fig. 1. Dorsal view of carapace of *Ocadia sinensis changwui* n. subsp.

Fig. 2. Ventral view of carapace of *Ocadia sinensis changwui* n. subsp. (Specimen surface covered by various matrixes).

Comparision and Discussion: (Text-fig. 3).

The present fossil specimen: *Ocadia sinensis changwui* n. subsp. is morphologically similar to these of the living species *Ocadia sinensis* (Gray) of Taiwan but differentiated by the following characters: 1. The first central lamina is more pentagonal than hexagonal (Text-fig. 3). 2. The second central lamina is hexagonal than octogonal (Text-fig. 3). 3. Dorsal surface of the carapace is slightly flater. 4. The third peripheral bony plate and precentral lamina are longer. 5. The second marginal lamina is narrower.

ETYMOLOGY

The name of this new fossil turtle is in honor of Mr. Pan, Chang-Wu (潘常武) for permission to study his valuable collection.

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I am grateful to Mr. Pan, Chang-Wu (潘常武) for permission to study his rather rare collection. Thanks also to Dr. Shen, S.C. (沈世傑), Professor of Zoology Department, National Taiwan University, and Dr. Mao, S.H. (毛壽先) Department of Biology and Anatomy, National Defence Medical Center, Taipei, for reading the present manuscript. Dr. Chen, S.N. (陳秀男), Professor and Chairman of Zoology Department, National Taiwan University, Dr. Hu, C.H. (胡忠恆), Professor of paleontology, National Taiwan Normal University, encouraged me to do this research are also appreciated.

REFERENCES

Bien, M.N. (1934) On the fossil Pisces, Amphibia and Reptila from Choukoutien Localities 1 and 3. Palaeo. Sinica. Ser. C.10(1):5–24.

——— (1973) On the Turtle Remains from the Archaeological Site of Anyang. China Geol. Soc. Bull. 17:121–133.

Carr, A. (1952) Handbook of turtles, the turtles of the United States, Canada and Baja California. Cornell Univ. Pre. 542pp.

Chen, T.F. and Yu, M.J. (1984) A synopsis of the Vertebrates of Taiwan. 3:74–77.

Dowling, H.G. and Duellman, W.E. (1978) Systematic Herpetology: A synopsis of Families and Higher Catalogirues. New York.

Endo, R. and Shikama, T. (1942) Mesozoic Reptilian fanna in the Jehol Mountainland. Cent, Nat. Mus. Manchoukuo Bull. 3:1–23.

Gadow, H. (1901) Amphibian and Reptiles. Cambri. Nat. Hist. 8:312–411.

Gaffney, E.S. (1975) A phylogeny and classification of the higher catelogorise of turtle. Amer. Mus. Nat. Hist. Bull. 155(5):387–436.

——— (1984) Historical Analysis of theories of Chelonian Relationship. Syst. Zool. 33(3): 283–301.

Gans, C. (1969) Biology of the Reptilia. Acad. Pre. London 1:311–339.

He, X.L. (1984) The Vertebrate Fossils of Sichuan. Schuan Sci. Technolo. Pub. House. 25–33.

Hwang, Y.C. (1984) The Buffalo Fossil (*Bubalus teihardi*) in the Sediments of the Penghu Channel in the Taiwan Strait. Master Thesis of Chinese Culture Univ.

Lin, C.C. and Chou, R.T. (1974) Geology of Taiwan. Taiwan Literature (in Science) Committee Press. 449pp.

Mao, S.H. (1971) Turtles of Taiwan. Taipei, 128pp.

———; Frair, W.; Yin, F.Y. and Guo, Y.W. (1987) Relationships of some Cryptodiran turtles and suggested by immunological cross-reactivity of Serum Albumins. Great Britain, Biochem. Syst. Ecol. 15(5):621–624.

Meylan, P.A. (1987) The phylogenetic Relationships of soft-shelled Turtles (Family Trionchidae). Amer. Mus. Natur. Hist. Bull. 186(1):1–101.

Nakamura, K. and Ueno, S.I. (1963) Japanese Reptiles and Amphibians in color. Japan. 67–84.

Ping, C. (1929) A new fossil land turtle from Honan. China Geol. Soc. Bull. 8:231–242.

——— (1930) On the remains of a turtle from Choukoutien. China Geol. Soc. Bull. 9(4): 205–212.

Pope, C.H. (1935) The Reptiles of China. Amer. Mus. Nat. Hist. 10:19–64.

Pritchard, P.C.H. (1967) Living turtles of the Would. TFH. Pub. Inc. 288pp.

Romer, A.S. (1956) Osteology of the Reptiles. Univ. Chicago Pre. 772pp.

——— (1966) Vertebrate Paleontology. Chicago Univ. Pre. 468pp.

Ruckes, H. (1929) The Morphological relationships between the girdles, ribs, and carapace. Amer. N.Y. Acad. Sci. 31:81–120.

Russell, L.S. (1934) Fossil Turtles from Saskatchewan and Alberta. Canada Trans. Royal. Soc. Sec. 4:101–110.

Schleich, H.H. (1982) Jungtertiäre Schildkrötenreste aus der Naturwissenschaftilichen Naturwissenschaftlichen Vereins für Schwaben e.V. 86(3,4):42–92.

Shikama, T. (1949) The Kuzun ossuaries: Geological and paleontological studies of the limestone fissure deposite, in Kuzuü, totige prefecture. Sci. Rep. Tohoku Univ. Ser. 2 (Geology) 23:1–201.

Stebbin, R.C. (1954) Amphibians and Reptiles of Western North America. New York. 528pp.
Stejneger, L. (1907) Herpetology of Japan and adjacent territory. Smiths. Inst. U.S. Nat. Mus. 58:514–532.
Swinton, W.E. (1973) Fossil Amphibians and Reptiles. Brit. Mus. (Nat. Hist.) 133pp.
Takashima, H. (1932) A list of Turtles of the Japanese Empire. Trans. Nat. Hist. Soc. Formosa. 22(120):152–163.
Tao, H.J. (1973) Guide to the Comparative Anatomy of Vertebrates. Vol. 3. Anatomy of Turtle. Eurasia Pub. Inc. Taiwan. 38pp. 38pls.
——— (1985) New fossil turtle, *Chinemys pani* n. sp. (Testudinidae) from the Chi-Ting Formation (Pleistocene), Tainan District, Taiwan Island. Taiwan Mus. J.38(1):43–52.
——— (1986) Report of A new fossil soft-shelled Turtle, *Trionys liupani* from Taiwan, with comparative study to the Living Species *Trionyx sinensis* (Wiegmann). Jour. Taiwan Museum. 39(2):21–41.
Tian, W.S. and Jiang, Y.M. (1986) Handbook of Amphibian and Reptilian of China. China Sci. Pub. Co. 164pp.
Wang, C.S. and Wang, Y.H. (1956) The Reptiles of Taiwan. Taiwan Mus. Quar. J.9(1):1–86.
Wiman, C. (1930) Fossile Schildkröten Aus China. China Geol. Sur. 4(3):5–56.
Young, C.C. (1935) Fossil Reptiles in China. Mem. Geol. Surv. China, Sec. b No. 8.
Zangerl, R. (1939) The homology of the shell elements in Turtles. J. Morp. 65:383–409.

Stebbin, R.C. (1954) Amphibians and Reptiles of Western North America. New York. 528pp.

Stejneger, L. (1907) Herpetology of Japan and adjacent territory. Smiths. Inst. U.S. Nat. Mus. 58:514–532.

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臺灣海峽產一新亞種化石龜、常武斑龜

(*Ocadia sinensis changwui* n. subsp.)的報告

陶 錫 珍

摘 要

本報告描述臺灣產的一隻新亞種化石龜，命名爲常武斑龜（*Ocadia sinensis changwui* n. subsp.）。本研究材料爲臺灣化石龜的第三個標本。採集地爲臺灣海峽澎湖水道。本化石龜只有一個背甲，其最大長度爲10.1cm，最大寬度爲 11.12 cm。背甲前半部保存完整，後半部缺失。在前半部的左側面也破損，無其他骨片。復原後此化石龜的背甲長約21cm。

在分類上此化石龜屬龜鼈目(order Testudines)陸龜科(Family ''Batagurinae'')斑龜屬(Genus *Ocadia*)。本化石龜其形態上與臺灣現生斑龜(Ocadia sinensis (Gray))同種，但不同之點爲：1.前中央盾及第三緣板較長。2.背甲表面略扁平。3.第三緣盾較窄。4.第一中央盾爲五角形。5.第二中央盾爲六角形。綜合上述各點，鑑定本化石龜爲一新亞種。此標本由台南市潘常武先生所提供，故命名爲常武斑龜以誌紀念。此化石龜的地質年代爲晚更新世。

關鍵字：臺灣，新記錄，化石龜，更新世。