

Mesodermochelys (Testudines; Chelonioidea; Dermochelyidae) from the Late Cretaceous of Nakagawa-cho, Hokkaido, North Japan

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北海道中川町の上白亜系より産出した*Mesodermochelys*

(カメ目; ウミガメ上科; オサガメ科)

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Abstract A right humerus from the Late Cretaceous Osoushinai Formation of Nakagawa-cho, Hokkaido, North Japan, is identified as *Mesodermochelys undulatus* Hirayama and Chitoku (Family Dermochelyidae; Superfamily Chelonioidea; Order Testudines) based on its characteristic lateral process. This discovery extends the geological range of this taxon from the Early Maastrichtian back to the Early Campanian, by 10 million years, and supports the dermochelyid-dominated assemblage of Japan among the Late Cretaceous chelonoids. This is also one of the oldest known dermochelyids as early as *Corsochelys* from the Early Campanian of North America. The Nakagawa specimen of which the carapace is estimated as 150 cm long might represent one of the largest individual among *Mesodermochelys*.

Key words: *Mesodermochelys*, Dermochelyidae, Testudines, Reptilia, Late Cretaceous, Hokkaido.

Introduction

Mesodermochelys undulatus Hirayama and Chitoku (1996) from the Late Cretaceous (Early Maastrichtian) of Hobetsu-cho, Hokkaido, North Japan, is the best Mesozoic representative of the Dermochelyidae, an aberrant sea turtle family. Here we report a referred specimen of this taxon from the older horizon of Nakagawa-cho, Hokkaido, and discuss its contribution to the geological history of the dermochelyids. This specimen was listed as gen. et sp. nov.? of Dermochelyidae by Hirayama and Chitoku (1994; No.1 of Table 1).

Geological setting and fossil occurrence (Figure 1)

The fossil turtle described here was contained within a solitary stone of sandy calcareous concretion, and was found from the upper reach of the Rubeshibegoe-no-sawa River, a branch of the Abeshinai River in Nakagawa-cho, Hokkaido, North Japan. Near the sampling site the Osoushinai Formation of the Upper Yezo Group is exposed. This Formation is divided into two members, the lower mudstone and upper sandstone (Hashimoto et al., 1967). The concretion bearing the turtle fossil was found at the river side where the area of the upper sandstone member is distributed.

The upper sandstone member is composed mainly of

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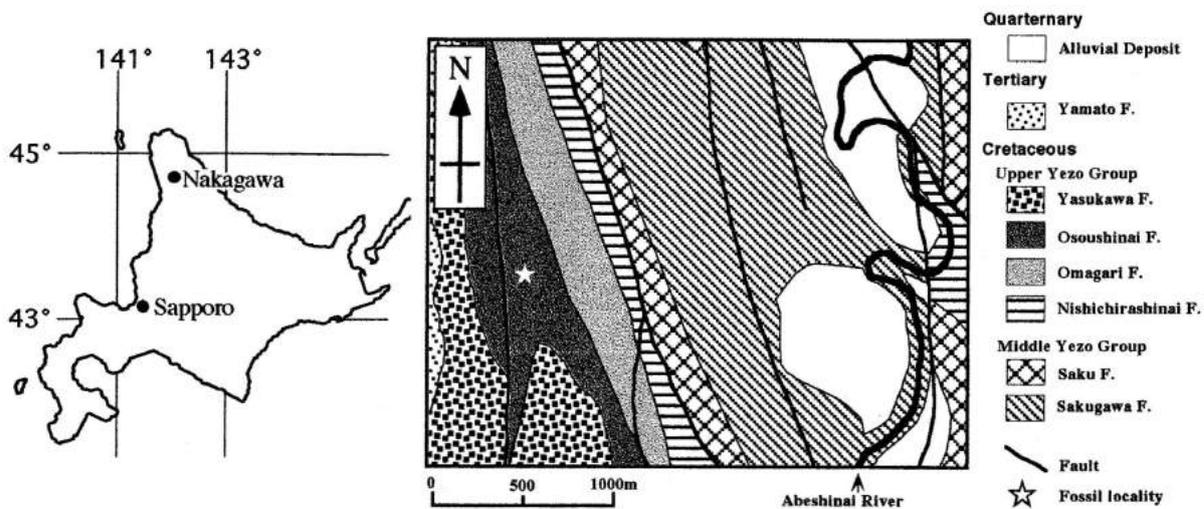


Figure 1. Geological map of Yasukawa region, Nakagawa-cho, showing locality of the fossil turtle (Hashimoto et al., 1967).

fine-grained sandstone with intercalations of very coarse-grained and tuffaceous sandstone beds. Marine invertebrates such as *Sphenoceras schmidtii* and *Canadoceras kossmati*, which indicate the age of the Campanian to lower Maastrichtian, occur from this sandstone member. (Hashimoto et al., 1967). Matsumoto (1942-43; 1954; 1959) reported that the uppermost part of the Upper Yezo Group in the Teshio Mountains including the Nakagawa-cho area is of Early Campanian age.

Unfortunately, sandy matrix of the concretion bearing the turtle fossil has no microfossils, however, judging from locality of the sample and its lithology, this concretion was probably isolated from the upper sandstone member of the Osoushinai Formation, the Lower Campanian.

The Yasukawa Formation characterized by a rather coarse-grained lithofacies consisting mainly of sandstone unconformably overlies the Osoushinai Formation. Matsumoto (1984) proposed this formation to be the Upper Campanian, and it is correlated to the Hakobuchi Group (Campanian to lower Maastrichtian), from which many fossil turtles have been found in Hobetsu-cho, Central Hokkaido (Hirayama and Chitoku, 1994; Hirayama and Chitoku, 1996).

Material and methods

The specimen examined is housed in the Nakagawa Museum at Nakagawa-cho, Hokkaido, Japan

(Institutional Abbreviation: NM). Specimen was prepared by using mechanical method. We adopt the higher categorial rank among turtles as proposed by Gaffney (1984) and Gaffney and Meylan (1988). Hirayama (1992) fully discussed the humeral morphology of sea turtles and recognized "toxocheilyd", "cheloniid", "protostegid", and "dermochelyid" grades among chelonioids. Therefore, we follow this "grade system" here.

Systematic paleontology

- Order Testudines Linnaeus, 1766
- Gigaorder Casichelydia Gaffney, 1975
- Megaorder Cryptodira Gray, 1825
- Parvorder Eucryptodira Gaffney, 1975
- Suborder Polycryptodira Gaffney, 1984
- Superfamily Chelonioidea Agassiz, 1857
- Family Dermochelyidae Gray, 1825

Genus *Mesodermochelys* Hirayama and Chitoku, 1996

Known Distribution.-Late Cretaceous of northwestern Pacific Ocean. Diagnosis.-Following Hirayama and Chitoku (1996) the genus can be diagnosed as a dermochelyid with moderately developed triturating surface; lingual ridge of dentary weak, much lower than labial one, but reduced anteriorly; symphyseal ridge of dentary high, exposed from lateral view above labial ridge; lateral process of humerus with primitively more proximal location, without distal expansion anterior to ectepicondylar foramen; iliac blade elongate, with prominent outward

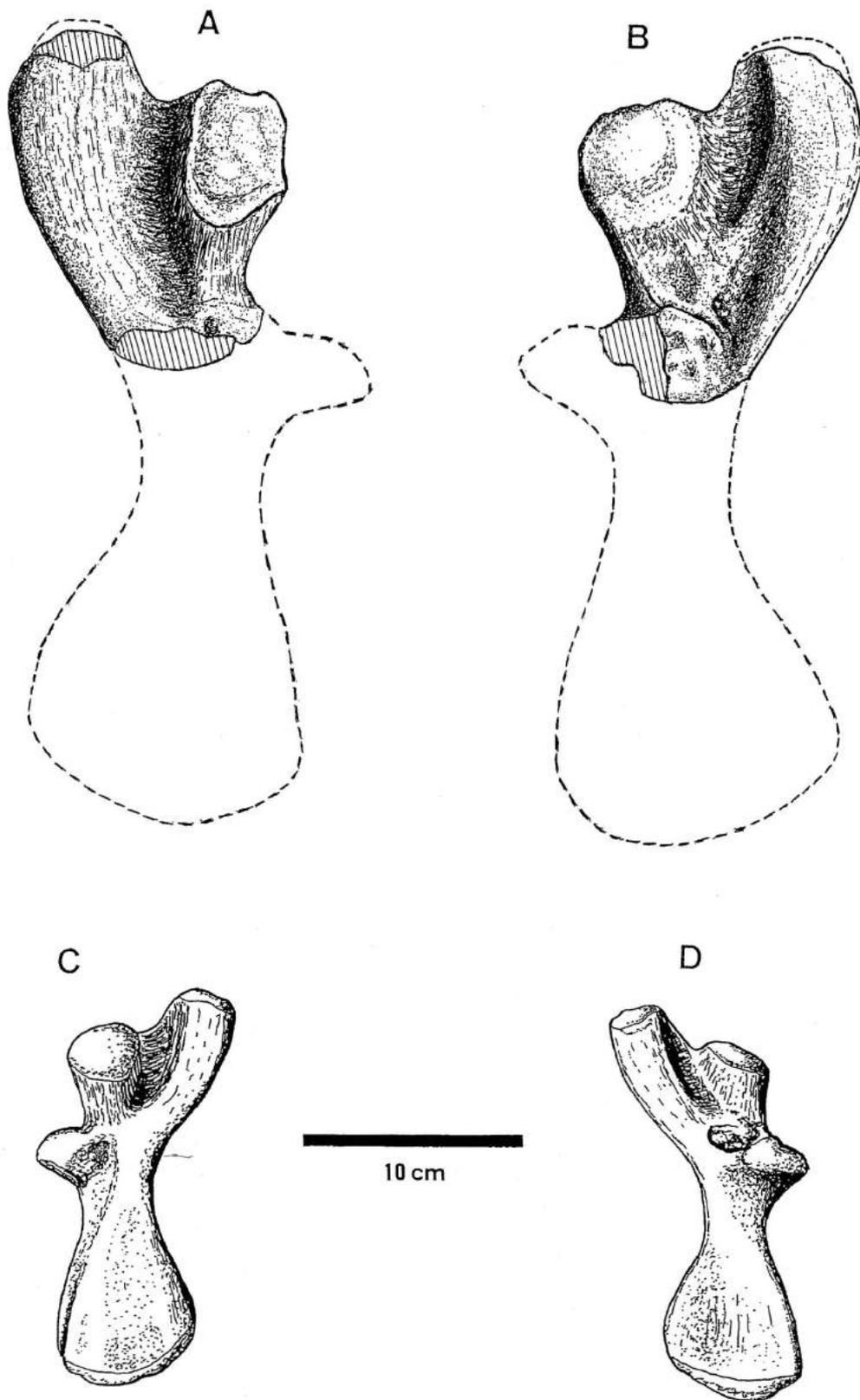


Figure 2. *Humeri of Mesodermochelys undulatus* Hirayama and Chitoku. A, B: NMV-3, from the Lower Campanian of Nakagawa-cho, Hokkaido, right humerus, dorsal and ventral views. Obliqued area shows eroded surface. Outline of missing portion is indicated by broken line. C, D: HMG 5, from the Early Maastrichtian of Hobetsu-cho, Hokkaido, left humerus, dorsal and ventral views (after Hirayama and Chitoku, 1996).

curvature; shell length up to 1.5m; shell ossification primitively well developed; scute sulci remain only on 3rd and 5th neurals and proximal portion of adjacent pleurals; neural plates narrowing posteriorly, 7th neural is reduced, 8th neural absent, 7th and 8th pleurals meet medially; peripherals broad and robust, with undulated medial border much expanded between costal ribs; T-shaped entoplastron with large lateral wings and rod-like posterior projection.

Mesodermochelys undulatus

Hirayama and Chitoku, 1996

Diagnosis.-As for genus.

Referred specimen.-NMV-3, a proximal half of right humerus.

Locality.-about 1.5 km above the Rubeshibe Bridge of the Abesinai River, Yasukawa-Ni, Nakagawa-cho, Hokkaido Prefecture, Japan (Figure 1).

Horizon.-upper part of the Osoushinai Formation (Early Campanian, Late Cretaceous; Nagao, 1962, Hashimoto et al, 1967; Matsumoto, 1942-43; 1954; 1959; 1984), Upper Yezo Group.

Collector.-T.Nakada, September 25, 1981.

**Descriptions and comparisons
(Figures 2-A, B; Plate 1)**

NMV-3 is the proximal portion of an uncrushed right humerus, which is 176 mm long as preserved from the medial process, lacking its proximal tip, to an eroded surface of the shaft, just below to the lateral process. The shaft is nearly straight, extending toward large caput humeri and high medial process. The much expanded and deep muscle scars for the *M.coracobrachialis brevis*, *latissimus dorsi* and *teres major*, and the lateral process are located more distally and ventrally than in primitive cheloniids of the "toxochelyid grade" such as *Toxochelys* or *Osteopygis* (Hirayama, 1992). The lateral process is well developed along the ventral portion of the shaft as in dermochelyids or advanced cheloniids, not limited within anterior portion of the shaft as in protostegids (Hirayama, 1992). The proximal portion of the lateral process is nearly straight relative to the shaft as in dermochelyids and lacks the V-shaped structure of advanced cheloniids such as *Syllomus*, although its anterior process is eroded away. The lateral process appears to be located at a more proximal position as in *Mesodermochelys* than in Cenozoic dermochelyids (Hirayama and Chitoku, 1996).

In summary, the humeral morphology of NMV-3 is

quite identical with that of *Mesodermochelys undulatus*, a primitive dermochelyid (Figures 2-C, D; Hirayama and Chitoku, 1996). The humerus of *Mesodermochelys* is adopted as a typical primitive "dermochelyid grade", intermediate between the Cenozoic dermochelyids with an advanced "dermochelyid grade" and the primitive cheloniids with the "toxochelyid grade" (Hirayama, 1992). Comparison with the humeri of *M. undulatus* from the early Masstrichtian of Hobetsu-cho suggests that NMV-3 was originally about 380 mm long, almost twice the size of HMG 5, the holotype (195 mm long, left side), or HMG 369 (172 mm long, right side; Hirayama and Chitoku, 1996).

Discussion

Although Hirayama and Chitoku (1994) listed some dozen dermochelyids from the Late Cretaceous of Japan, only 15 specimens from Hobetsu-cho, Hokkaido, were fully described as *Mesodermochelys undulatus* by Hirayama and Chitoku (1996). The discovery of NMV-3 extends the geological range of *Mesodermochelys* from the Early Masstrichtian back to the Early Campanian. This is also one of the oldest known dermochelyids as early as *Corsochelys* from the Early Campanian of North America (Zangerl, 1960; Hirayama and Chitoku, 1996).

Hirayama (1995, 1997) and Hirayama and Chitoku (1996) demonstrate the provincialism among the Late Cretaceous chelonioids unlike the cosmopolitan distribution of the most living chelonioid genera, particularly the cheloniid-dominated assemblage of North America and Europe and the dermochelyid-dominated assemblage of Japan. The occurrence of dermochelyid from Nakagawa-cho is consistent with this dermochelyid-dominated assemblage of Japan during the Late Cretaceous.

NMV-3 appears to be almost twice the size of humeri of HMG 5 or HMG 369, both of which the carapace is estimated as about 75cm long. Thus, the carapace of the Nakagawa specimen could be estimated as reaching up to 150 cm long, as large as HMG 363 and 365, largest individuals of *M. undulatus* (Hirayama and Chitoku, 1996).

Conclusion

1. The proximal portion of a right humerus (NMV-3) from the Upper Cretaceous Osoushinai Formation of Nakagawa-cho, Hokkaido, North Japan is identified as *Mesodermochelys undulatus* Hirayama and Chitoku, a primitive dermochelyid sea turtle, based on its character-

istic lateral process.

2. NMV-3 extends the geological range of *Mesodermochelys* from the Early Masstrichtian back to the Early Campanian. This is also one of the oldest known dermochelyids as early as *Corsochelys* from North America.

3. The discovery of NMV-3 supports the dermochelyid-dominated assemblage of Japan among the Late Cretaceous chelonioid fauna.

4. The Nakagawa specimen might represent one of the largest individuals among *Mesodermochelys*.

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要 旨

北海道中川町の上部白亜系オソウシナイ層より発見された右上腕骨は外側突起の特徴に基づき *Mesodermochelys undulatus* Hirayama and Chitoku (オサガメ科; ウミガメ上科; カメ目) に同定された. この発見は本分類群の時代分布をマーストリヒト期前期からシャンパーニュ期前期へ約1000万年延ばし、白亜紀後期の日本のウミガメ上科はオサガメ科が優勢であったことを支持する. また、当該標本は北米のシャンパーニュ期前期より発見されている *Corsochelys* と共に最古のオサガメ科の一つである. 中川標本は背甲長150cmと推定され、*Mesodermochelys* の最大級の個体を代表するかもしれない.

Plate 1. Right humerus of *Mesodermochelys undulatus* Hirayama and Chitoku, NMV-3, from the Lower Campanian of Nakagawa-cho, Hokkaido. A: dorsal view, B: ventral view.



A



B

