

A Dentary of the Flatfish *Paralichthys olivaceus*
(Pisces: Pleuronectiformes) from
the Pleistocene Hirayama Formation, Tokyo, Japan

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Abstract A single skeletal element of a teleostean fish was found in the Pleistocene Hirayama Formation, Tokyo, Japan, and identified as the right dentary of the flatfish *Paralichthys olivaceus* (family Paralichthyidae, order Pleuronectiformes) on the basis of its general shape, arrangement of teeth, and uniserial, strong and canine-like teeth which are slightly curved mesially.

Key words: Pleistocene, Hirayama Formation, flatfish, Pleuronectiformes, Paralichthyidae, *Paralichthys*

Introduction

A single element of the lower jaw of a teleostean fish was collected by Mr. Morihiko Ofusa in 1995 from a sandstone bed in the bank of the river Asakawa, about 100 m downstream of the Hirayama Bridge in Hino City, Tokyo (Fig. 1). This locality is the same as Baba's (1990) Hirayama-1 and Loc. E of Tanaka and Amano (1997). The river bank, a component of the Upper Member (about 50 m in thickness) of the Hirayama Formation (Takano, 1994) is composed of bioturbated fine-grained sandstone. An analysis of nannofossils from one bed in the uppermost part of the Upper Member has revealed that the horizon can be assigned to 1.57 to 1.10 Ma, early Pleistocene (Takano, 1994). Furthermore, this bed has yielded autochthonous mollusks which are dominated by *Mizuhopecten planicostulatus* and *Callithaca adamsi* (see Baba, 1990; Tanaka & Amano, 1997). Baba (1990) recorded over 50 species of mollusks from the Hirayama locality, and demonstrated that the assemblage is of cold water, upper neritic environments in origin.

After comparison with jaws of teleostean fishes, we have concluded that it is the right dentary of the lefteye flatfish *Paralichthys olivaceus* (Paralichthyidae, Pleuronectiformes).

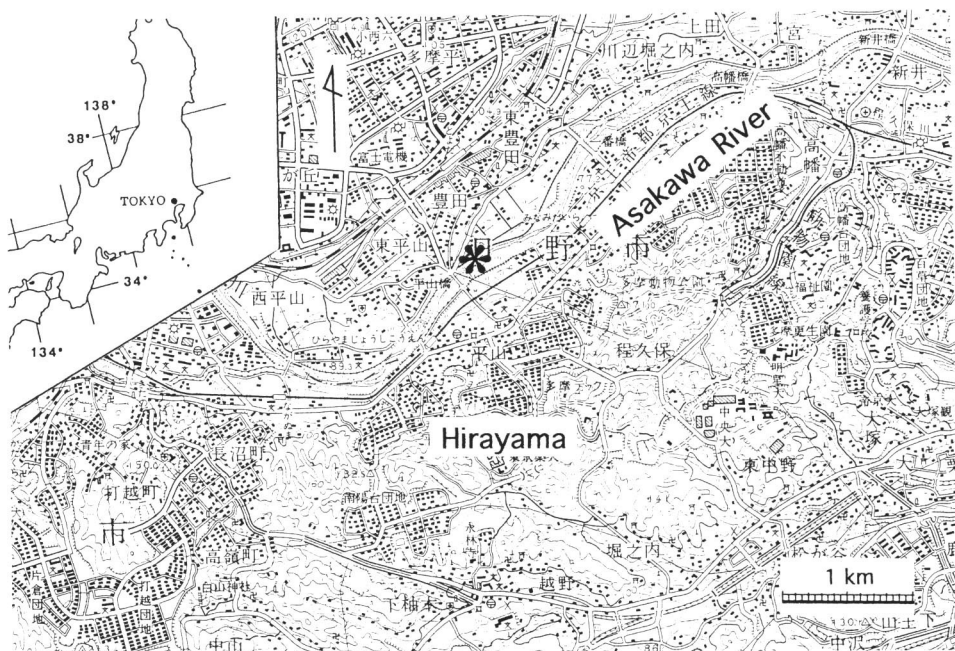


Fig. 1. Map showing the fossil locality of the Pleistocene flatfish (from 1 : 50,000 map of "Hachioji" published by the Geological Survey of Japan).

Systematic Paleontology

Class Osteichthyes

Order Pleuronectiformes

Family Paralichthyidae

Genus *Paralichthys* Girard, 1858

***Paralichthys olivaceus* (Temminck & Schlegel, 1846)**

(Japanese name: hirame)

Material: National Science Museum catalogue no. NSM PV-20033. Right dentary. 42 mm in length (Fig. 2).

Description: The fossil is an almost complete right dentary. It is slightly concave mesially. Six strong canine-like teeth are uniserially arranged on the dentigerous surface. These teeth slightly curve mesially, and become shorter posteriorly. There is a cavernous space between the dorsal and ventral limbs which held the Meckelian cartilage. The anterior edge is 13 mm high. A shallow groove on the mesial side becomes wider and shallower posteriorly.

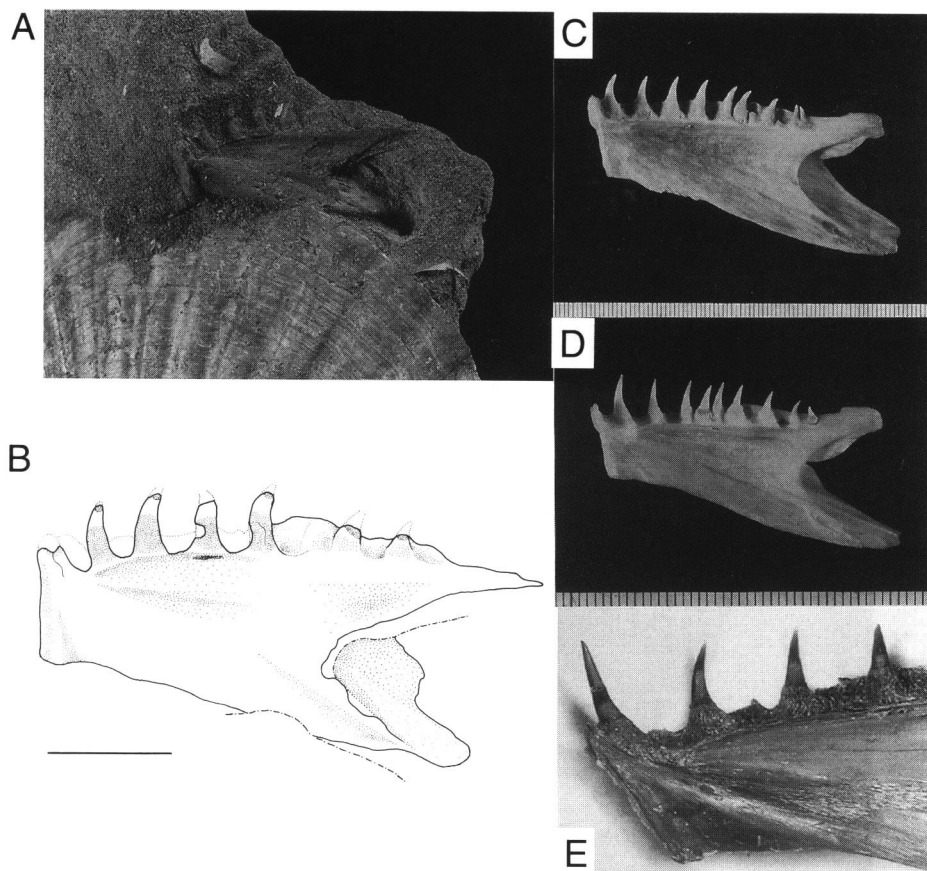


Fig. 2. Right dentaries of the lefteye flatfish *Paralichthys olivaceus* with a part of *Mizuhopecten planicostulatus* Nomura & Niino, 1932). A & B, NSM PV 20033; C, NSM PV dried skeleton no. 743, 590 mm SL, Aomori Pref., Japan, July 1987; D, NSM PV uncatalogued specimen, 360 mm SL, Wakayama Pref., Japan, Feb. 1998; E, ZUMT uncatalogued specimen, 197 mm SL. Scale indicates 10 mm.

Discussion

On the basis of comparison with figures of fish jaws (Uyeno & Yamazaki, in prep.) and a survey of the skeletal collections in both the Department of Geology, National Science Museum, Tokyo (NSM) and the Department of Zoology, University Museum, University of Tokyo (ZUMT), the fossil was definitely identified as the right dentary of the lefteye flatfish *Paralichthys olivaceus* (family Paralichthyidae, order Pleuronectiformes) because of the jaw's general shape and uniserial, strong canine-like teeth which are slightly curved mesially (Fig.2) (Amaoka, 1969).

In addition, the following similarities between the present fossil and Recent den-

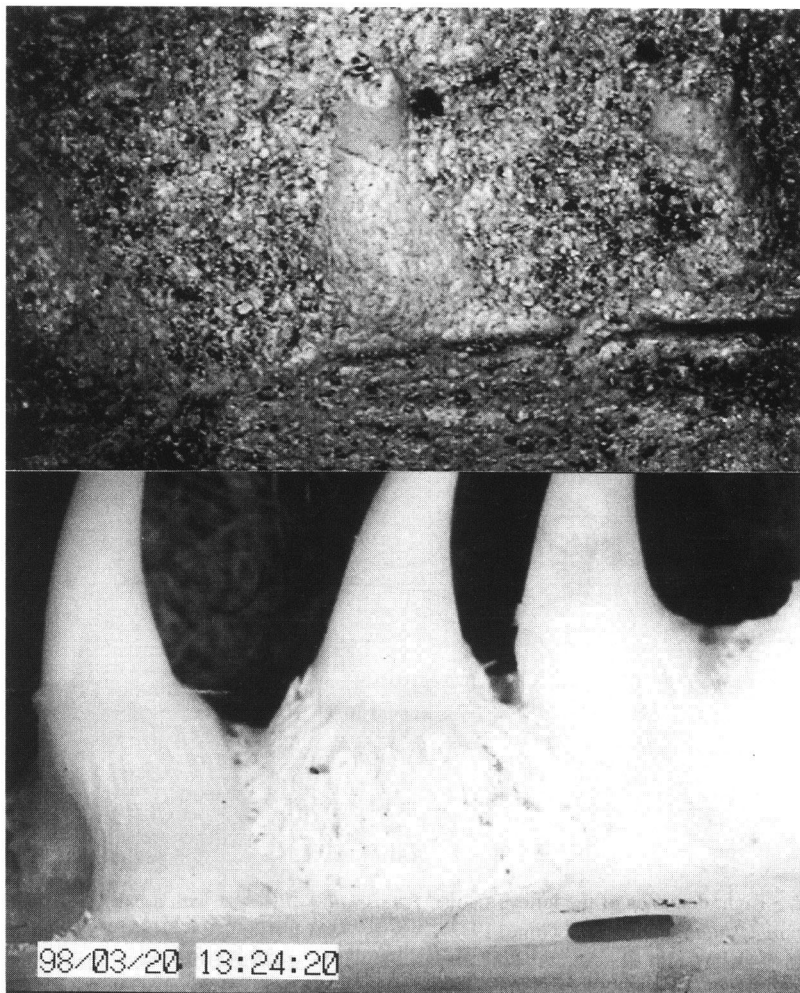


Fig. 3. Lingual aspect of teeth of the fossil and Recent specimens of *Paralichthys olivaceus*. Upper, NSM PV 20033; lower, NSM PV uncatalogued specimen, 360 mm SL, Wakayama Pref., Japan, Feb. 1998.

taries confirm this identification: the shape of the base of each tooth, an elongated opening below the third or fourth tooth present on the tube which runs beneath the dentigerous surface (Fig. 3), the shape of the dentigerous surface, the space for replacement teeth, the shape of the anteriormost margin of the bone, and the concave area running from behind the anterior margin to near the end of the ventral limb. Judging from the size of the dentary, this member came from a specimen roughly estimated as 45 cm in standard length (SL).

Paralichthys olivaceus, one of the common flatfishes in the western North Pacif-

ic, is distributed from the Kuril Islands to the South China Sea at depths 10–200 m, and attains 85 cm SL (Amaoka, 1997).

Flatfishes have been distributed in the western North Pacific at least from the Early Oligocene (Inoue & Uyeno, 1968; Sakamoto & Uyeno, 1997). To date, only two fossil paralichthyids have been yielded locally: *Pseudorhombus* sp. from the Neogene strata, Toyama, Japan (Uyeno *et al.*, 1990) and *Paralichthys yamanai* from the Middle Miocene Iwami Formation, Tottori, Japan (Sakamoto & Uyeno, 1993).

In the genus *Paralichthys*, 22 Recent species are known from the Pacific and Atlantic (Norman, 1934; Pequeno & Plaza, 1987). Only *Paralichthys olivaceus* is currently found in the western North Pacific. As a result of the present study, it was confirmed that this specimen represents the first fossil record of *P. olivaceus*, and that it has inhabited the waters around Japan at least since the early Pleistocene.

Acknowledgments

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References

- Amaoka, K., 1969. Studies of the sinistral flounders found in the waters around Japan. Taxonomy, anatomy and phylogeny. *J. Shimonoseki Univ. Fish.*, **18**(2): 65–340.
- Amaoka, K., 1997. Paralichthyidae, p. 670–671. In O. Okamura & K. Amaoka (eds.): Sea fishes of Japan. Tokyo, Yama to Keikokusha. (In Japanese.)
- Baba, K., 1990. Molluscan fossil assemblages of the Kazusa Group, South Kanto, central Japan. 445 pp. Tokyo, Keio Yochisha. (In Japanese.)
- Inoue, M. & T. Uyeno, 1968. Occurrence of two Paleogene fish fossils at Oyubari Coal Mine in Central Hokkaido, Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. C, **11**(3): 319–326, pl. 1.
- Norman, J. R., 1934. A systematic monograph of the flatfishes (Heterosomata). I. Psettodidae, Bothidae, Pleuronectidae. i–viii + 1–459 pp. London, British Museum.
- Pequeno, G. & R. Plaza, 1987. Description of *Paralichthys delfini* n. sp., with notes on other congeneric flounders from Chile (Pleuronectiformes, Bothidae). *Rev. Biol. Mar.*, **23**(2): 159–172. (In Spanish with English abstract.)
- Sakamoto, K. & T. Uyeno, 1993. *Paralichthys yamanai*, a new Middle Miocene lefteye flatfish from Tottori, Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. C, **19**(1): 1–9.
- Sakamoto, K. & T. Uyeno, 1997. An Oligocene record of a flatfish from the Kiwado Formation, Yamaguchi Prefecture, Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. C, **23**(1, 2): 51–59.
- Takano, S., 1994. Stratigraphy of the Lower Pleistocene Kazusa Group in the Tama Hills, central Japan. *Jour. Geol. Soc. Japan*, **100**(9): 675–691. (In Japanese with English abstract.)
- Tanaka, T. & K. Amano, 1997. Taxonomy and distribution of *Mizuhopecten planicostulatus* (Nomura and Niino). *Bull. Natn. Sci. Mus., Tokyo*, Ser. C, **23**(3, 4): 101–111.
- Uyeno, T. & K. Yamazaki, in prep. Jaws of fishes.
- Uyeno, T., K. Sakamoto & S. Fujii, 1990. Three fish fossils from the Neogene strata at Himi City, Toyama Prefecture, central Japan. *Bull. Natn. Sci. Mus., Tokyo*, Ser. C, **16**(4): 155–165.

