

Kokuraichthys tokuriki n. gen. and sp., Early Cretaceous osteoglossomorph fish in Kyushu, Japan

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ABSTRACT — *Kokuraichthys tokuriki* is described from the Early Cretaceous Dobaru Formation of the Wakino Subgroup, Kitakyushu in the northern part of Kyushu, Japan, as a new genus and species of Osteoglossomorpha. This new species is considered to be more closely related to Hiodontiformes or Lycoperteriformes than Osteoglossiformes because it has a single epural and no neural spine on the first ural centrum. Although it has significantly fewer vertebrae (36 or 37), *K. tokuriki* is tentatively assigned to Hiodontiformes because of the long anal fin base, the anterior position of the dorsal fin and the reduced neural spine on the first preural centrum.

KEY WORDS: Early Cretaceous, Hiodontiformes, Japan, Kyushu, Osteoglossomorpha, Wakino Subgroup

INTRODUCTION

The Early Cretaceous lacustrine beds forming the Wakino Subgroup of the Kanmon Group are distributed in the northern part of Kyushu, Japan (MATSUMOTO, 1951). The type locality of the Wakino Subgroup is Miyawaka, Wakamiya City, Fukuoka Prefecture. The Wakino Subgroup consists of the Sengoku, Nyoraida, Lower Wakamiya and Upper Wakamiya formations in ascending order, from where many mollusks have been found (OTA 1953, 1960). The equivalent of the Wakino Subgroup is distributed in Kitakyushu City (OTA, 1955, 1957, 1959). Nineteen species of freshwater fishes in eight genera and six families have been described from the subgroup in Kitakyushu (UYENO, 1979, YABUMOTO, 1994). In the present paper, a new osteoglossomorph fish from the Wakino Subgroup is described.

LOCALITY AND HORIZON

The fossil described herein was found from the Dobaru Formation of the Wakino Subgroup in Tokuriki, Kokuraminami ward, Kitakyushu, Fukuoka Prefecture, Japan. The Dobaru Formation is the lowest formation in the subgroup, which consists of the Dobaru, Takatsuo, Gamo, and Kumagai formations in ascending order (NAKAE *et al.*, 1988). The age of the formations have been considered as the Early Cretaceous, Valanginian to Barremian (OTA, 1981, MATSUMOTO *et al.*, 1982). The fossil fish assemblage from the Dobaru Formation is recog-

nized as the *Nipponamia - Aokiichthys* fauna (YABUMOTO, 1994), which consists of *Lepidotes macropterus*, *Nipponamia satoi*, *Chuhsiungichthys yanagidai*, and five species of the genus *Aokiichthys*.

METHODS

Preparation. —Any bone was removed from the specimens with a needle under a microscope. The bone impressions of fossils were then coated with a very thin synthetic resin, surrounded with a low clay wall. Latex was poured onto the fossil impression in a vacuum. The latex was allowed to dry for about an hour and then peeled from the fossil. The latex cast was scanned and the caudal part was drawn on a personal computer. Both the specimen and the latex peel were observed under a microscope.

Counts and Measurements. —Standard length measurement was made from the estimated tip of the snout to the posterior end of the hypural along the midline of the body. Body depth was measured from the origin of the dorsal fin to the estimated abdominal margin. Head length was measured from the estimated tip of the snout to the estimated posterior end of the opercle along the midline of the body. Fin ray and vertebral counts were made according to HILTON (2002).

Osteological Terminology. —Names of bones follow HILTON (2002; 2003).

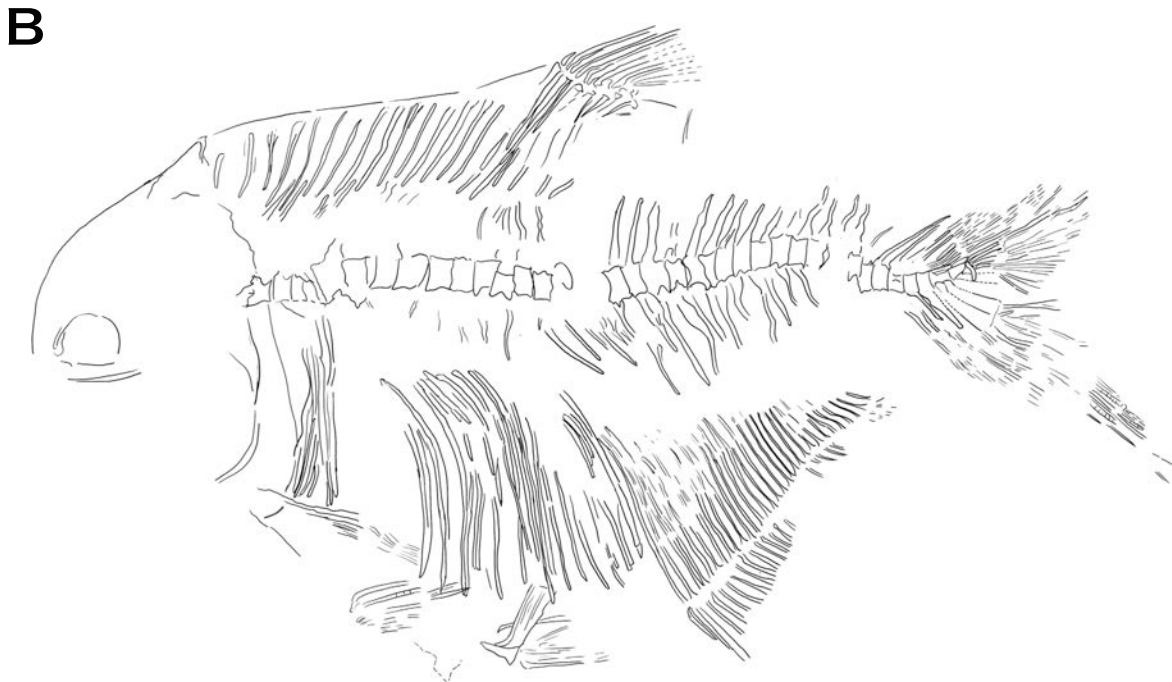


Fig. 1. *Kokuraichthys tokuriki* gen. et sp. nov., **A**. holotype, KMNH VP 100,326, **B**. drawing of A.

PALEONTOLOGICAL DESCRIPTION

Osteoglossomorpha GREENWOOD *et al.*, 1966

Order **Hiodontiformes** TAVERNE, 1979

Kokuraichthys gen. nov.

Type species. *Kokuraichthys tokuriki* sp. nov.

Etymology. *Kokura*, old name of the district of the locality, *ichthys*, fish in Greek.

Diagnosis. As for type species; monotypic.

Kokuraichthys tokuriki sp. nov.

Figs. 1–3.

Holotype. KMNH VP 100,326, left side exposed, almost complete, excepting the antero-ventral part of the head. This is the only known specimen of this new species.

Diagnosis. This new species is distinguished from other species of Hiodontiformes and Lycoperiformes by the following combination of characters: long anal-fin base about 3.2 times dorsal-fin base, 31 proximal anal-fin pterygiophores, 36 or 37 preural vertebrae.

Etymology. *tokuriki* after the locality of the type specimens.

Description of the holotype

The dorsal line from the snout to the origin of the dorsal fin is moderately convex. The ventral edge of the abdomen is strongly convex; the depth between the centra to the abdominal margin is about 1.4 times the depth between the dorsal margin and the centra. The dorsal-fin base is short and located slightly posterior from the middle of the body and anterior to the anal fin. There are nine proximal radials of the dorsal fin. The anal-fin base is very long and its origin is under the anterior end of the dorsal-fin base; the anal fin has 31 proximal radials. The basipterygium of the pelvic fin is short and located slightly anterior under the dorsal-fin origin. The pelvic fin is located at the middle of the body (Figs. 1 and 2).

The ribs are moved downward apart from the abdominal vertebrae. The anteriormost three ribs are preserved close to the shoulder girdle apart from the others. All ribs are long, moderately curved and reached near to the ventral margin of the abdomen. Fourteen pairs of ribs can be counted. The total number of preural vertebrae is 36 or 37, with 16 abdominal vertebrae (estimated based on association with the ribs) and the 20 or 21 caudal vertebrae. The length of the centrum is shorter than the depth. There are 16 supraneurals. The first and second supraneurals are short, whereas the length of the third and

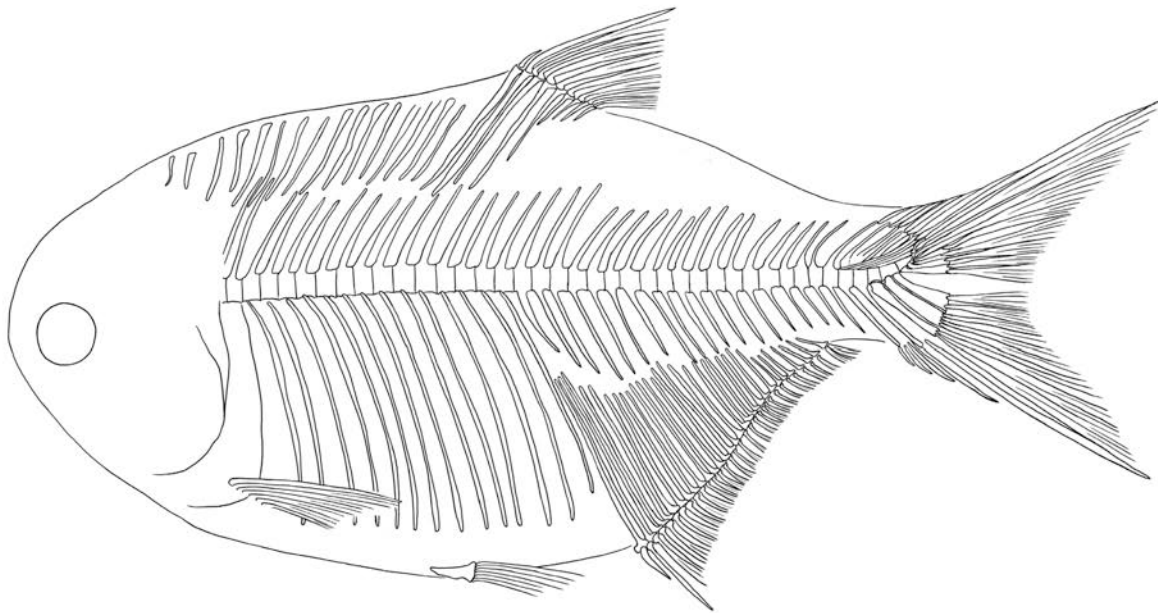


Fig. 2. *Kokuraichthys tokuriki* gen. et sp. nov., restoration of the skeleton.

fourth is almost the same or only slightly shorter than those of the posterior ones, which are equal in length (Figs. 1 and 2).

The neural arch and spine on the first preural centrum are not observed. Two ural centra and at least six hypurals are observed (probably more hypurals hidden by the base of fin rays). The first ural centrum is articulated with the first and second hypurals. The second ural centrum is articulated with the third to sixth hypurals. There is a diastema between the second and third hypurals. Four strap-like uroneurals are located above the ural centra and the preural centra, and do not cover widely the lateral side of these bones. There is the fifth uroneural that is a short angled bone located on the base of the third to sixth hypurals. The anterior ends of uroneurals reach the third preural centrum. There is a single long epural. The caudal fin is forked and has probably 16 fin rays (Fig. 3).

Remarks

Several characters observed in the caudal skeleton of the new genus and species, *Kokuraichthys tokuriki* are considered to be plesiomorphic for osteoglossomorphs and basal teleostean fishes. These are: 16 branched caudal fin rays as in *Lycoptera*, hiodontids and mormyrids (see HILTON, 2003; HILTON and BRITZ, 2010); absence of the neural spine on the first ural centrum; five pairs of uroneurals, including four strap-like ones as seen in *Lycoptera*, Hiodontiformes, *Ostrariostoma*, *Kuntulunia*, and *Singida* within Osteoglossomorpha (HILTON and BRITZ, 2010); two hypurals supported by the first ural centrum; probably four hypurals supported by the second ural centrum; and the dorsal hypurals do not fused to the second ural centrum (HILTON and BRITZ, 2010). The presence of a single epural suggests that *K. tokuriki* gen. et sp. nov. belongs to Osteoglossomorpha, because it is considered a synapomorphy of the group (HILTON and BRITZ, 2010; WILSON and MURRAY, 2008). Two orders, Osteoglossiformes and Hiodontiformes, are generally recognized in Osteoglossomorpha (e. g. HILTON and BRITZ, 2010). NELSON (2006) accepted the order Lycoperiformes CHANG and CHOU, 1977 for Lycoperidae and includes the order Ichthyodectiformes in Osteoglossomorpha. However, NELSON (2006) was unique in including Ichthyodectiformes in Osteoglossomorpha, as PATTERSON and ROSEN (1977), TAVERNE (1979) and virtually all subsequent authors have found that Ichthyodectiformes is basal to crown teleosts (including Osteoglossomorpha). One of the characteristics of Ichthyodectiformes is having the lateral side of the ural centra and the preural centra covered by the uroneurals. *Kokuraichthys tokuriki* gen. et sp. nov. therefore does not belong to Ichthyodectiformes because the uroneurals do not cover the lateral side of the ural centra and the preural centra (Fig. 3).

Kokuraichthys tokuriki gen. et sp. nov. does not belong to Osteoglossidae + Notopteridae, because it lacks one of the synapomorphies of this group, having the neural spine on the first ural centrum fully developed (HILTON, 2003; HILTON and BRITZ, 2010). Furthermore, it does not belong to the order

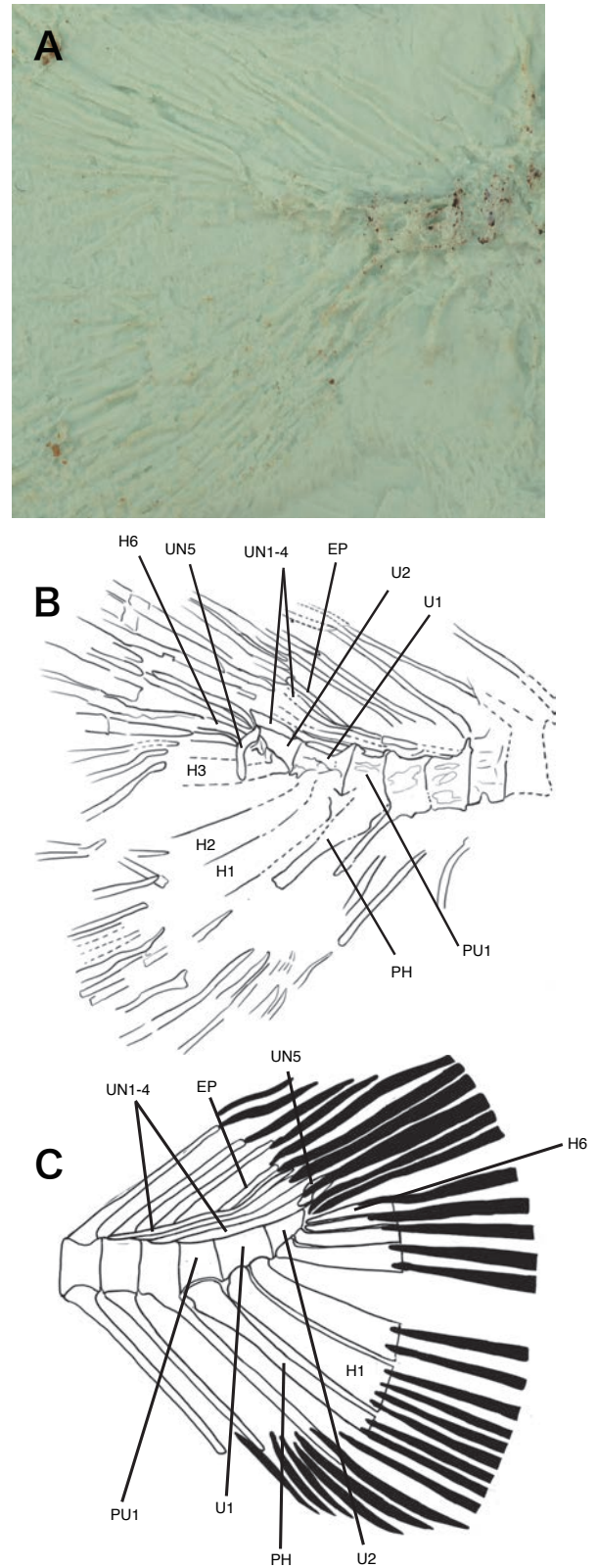


Fig. 3. *Kokuraichthys tokuriki* gen. et sp. nov., caudal region of the holotype, KMNH VP 100,326. A, peel of the caudal region, B, drawing of A, C, reconstructed drawing from B. Abbreviations: EP, epural; H1, first hypural; H2, second hypural; H3, third hypural; H6, sixth hypural; PH, parhypural; PU1, first preural centrum; U1, first ural centrum; U2, second uroneural; UN1-4, first to fourth uroneurals; UN5, fifth uroneural.

Osteoglossiformes, because the absence of epural is regarded as a synapomorphy of Osteoglossiformes (NELSON, 1969, HILTON, 2003, WILSON and MURRAY, 2008). The neural spine on the first preural centrum is not observed and is probably reduced. This condition is seen in most specimens of extant *Hiodon* (HILTON, 2003; HILTON and BRITZ, 2010) but not in *Lycoptera*, fossil *Hiodon* and other hiodontiformes such as *Yanbiania* LI 1987, which have a full neural spine of the first preural centrum (PATTERSON and ROSEN, 1977; HILTON and BRITZ, 2010; HILTON and GRANDE, 2008).

In summary, *Kokuraichthys tokuriki* gen. et sp. nov. is considered to be a member of Osteoglossomorpha, and it is closer to Hiodontiformes or Lycoperiformes than Osteoglossiformes, but it differs from all other genera of Hiodontiformes and Lycoperiformes in having the combination of the following characters: fewer vertebrae (36 to 37 in *Kokuraichthys*, 34 to 36 in *Aokiichthys*, and more than 40 in other genera); a long anal-fin base (3 times the dorsal-fin base in *Kokuraichthys*, 2 to 3 times in *Hiodon*, and almost the same or slightly larger than the dorsal-fin base in other genera); and having the dorsal fin anterior to the anal fin (it is also seen in *Hiodon tergisus* LESUEUR, 1818, *H. woodruffi* (WILSON, 1978) and *H. consteniorum* LI and WILSON, 1994). *Kokuraichthys tokuriki* may have some relationship to *Aokiichthys*, which is from the same formation and locality (the Dobaru Formation at Tokuriki), due to similarity in the number of vertebrae. In the present study, *K. tokuriki* is tentatively assigned to Hiodontiformes because it has the long anal-fin base, the position of the dorsal fin anterior to the anal fin and the reduced neural spine on the first preural centrum.

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