

Late Cenozoic Gobiid Fish from Tôgô Formation in Kagoshima Prefecture, Japan

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Considerable number of fossil specimens belonging to the family Gobiidae were collected from Sankago Diatomite Member at the west margin of Tôgô Town located in the northwestern part of Kagoshima Prefecture. This member was first described by YAMASHITA (1966) who made geological survey of Tôgô Town, and named as Onobuchi Plant Fossil Member. He also found Tôgô Plant Fossil Member at the point about 2.5 km east of Onobuchi. IWAO (1974) preferred to call these two members as Tôgô Formation, for there is no unconformity between them. Tôgô Formation is composed of Torimaru Sandstone Member and Sankago Diatomite Member. Torimaru Sandstone Member corresponds to Tôgô Plant Fossil Member, and Sankago Diatomite Member corresponds to Onobuchi Plant Fossil Member.

Tôgô Formation yielded abundant plant fossils and insect fossils (IWAO, 1974; FUJIYAMA and IWAO, 1974). Here we report on fossils of gobiid fish collected at Taninokuchi in Sankago.

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Locality and Horizon

The fossil specimens of the gobiid fish were collected at Taninokuchi in Sankago, Satsuma District, Kagoshima Prefecture. The locality (latitude 31°53'47''N. and longitude 130°24'34''E.) is in the area between the Taumi River and Hiwatashi River, which

pour into the Sendai River. The fossil locality is at 0.5 km northwest of the central part of Tôgô Town which is located at the northwestern part of Kagoshima Prefecture, and 6 km northeast of Sendai City.

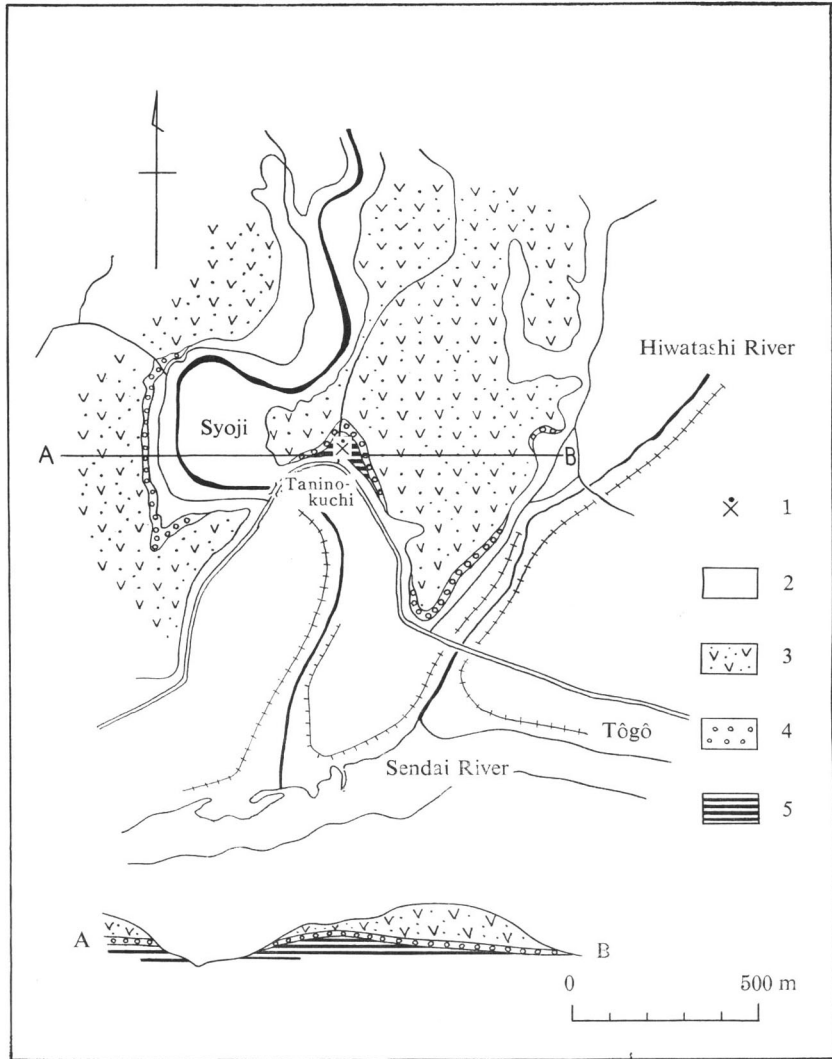


Fig. 1. Geological map of the fossil locality. 1, fossil locality; 2, alluvium; 3, Aira pumice flow; 4, Tsukasano gravel bed; 5, Sankago Diatomite Member (Tôgô Formation).

Sankago Diatomite Member is distributed along the Sendai River in Tôgô Town. The river flows from the central part of Kyushu to Sendai City which is situated at the mouth of the river. The type locality of Sankago Diatomite Member is Taninokuchi

in Sankago. The fossils were collected there with plant fossils. Sankago Diatomite Member covers Torimaru Sandstone Member which is about 60 m thick. Torimaru Sandstone Member lies with unconformity on Aragochi Tuff Breccia Member, which consists of alternation of siltstone, tuffaceous siltstone, and sandstone.

Sankago Diatomite Member is white or yellowish gray, and consists of siltstone and tuffaceous siltstone. Bedding plane is remarkable. This member is covered by Tsukasano Conglomerate Member with unconformity. Although it was reported that the age of Tôgô Formation is Plio-Pleistocene (IWAO, 1974), the recent study of plant fossils strongly indicates that Sankago Diatomite Member accumulated in a freshwater environment, in Pliocene time.

Description

Class Osteichthyes

Order Perciformes

Family Gobiidae

Rhinogobius giurinus (RUTTER)

Material: all specimens are deposited in the National Science Museum, Tokyo. Catalogue numbers of the Department of Paleontology are assigned to each of major specimens and a group of small fragments. Specimens were collected by Yushiro IWAO in 1972~3, and by IWAO, Yoshikazu HASEGAWA, and Teruya UYENO in 1974.

PV 15288, almost complete specimen with ventral side exposed lacking a part of head and left pectoral fin: standard length 47.5 mm and number of vertebrae 26. PV 15289, almost complete specimen with its lateral side exposed: standard length 52.0 mm and number of vertebrae 26. PV 15290, head region and vertebrae with some bones disarticulated. PV 15291, almost complete specimen with some disarticulated bones, and the vertebral column is twisted. PV 15292, head region. PV 15293, posterior half of the body. PV 15294, head region. PV 15295, head region and vertebrae. PV 15296, a part of head region. PV 15297, a part of head region. PV 15298, a specimen without head region. PV 15299, a part of head region. PV 15300, vertebrae. PV 15301, a part of head region and abdominal portion of the body. PV 15302, vertebrae.

On the basis of general appearance, skeletal characters, and size, these specimens appear to belong to a single species. Following characters indicate that the species is a member of the teleostean fish family Gobiidae of the order Perciformes: (1) the first dorsal fin consists of 6 spines and the second dorsal fin with a spine and 8 soft rays; (2) the first and second dorsal fins are not continuous; (3) both pelvic fins are close together and situated below the pectoral fin, and appears to form a sucking disk; (4) the body is covered with ctenoid scale; (5) the inter orbital space is narrow; (6) the number of vertebrae is 26; (7) the hypural bones are fused and simplified; (8) the dentary and premaxillary are bearing small conical teeth; (9) ribs are attached to well developed

transverse processes, and epipleural ribs are attached on pleural ribs.

Although the family Gobiidae are taxonomically a difficult group with a large number of species, there are comparatively few representatives in freshwater habitats in Japan. Since the bed from which the fossil specimens were collected is Pliocene in age, the fish is probably not too different from the Recent species (UYENO, 1966). According to NAKAMURA (1963), 24 species in 17 genera of gobiid fishes are found in freshwater or brackishwater in Japan. Among them, *Rhinogobius giurinus* has characters possessed by the fossil specimens from Tôgô Formation. Specific characters observable in the fossils are: (1) the second dorsal with 8 rays; (2) the anal fin with a spine and 8 rays; (3) the pelvic sucking disk is elliptical in shape; (4) spinous rays of the first dorsal fin are not extended as in *Rhinogobius brunneus*; (5) the space between 5th and 6th spines of the first dorsal fin is much wider than spaces between other spines of the fin; (4) outer row teeth of the upper and lower jaw are unicuspid.

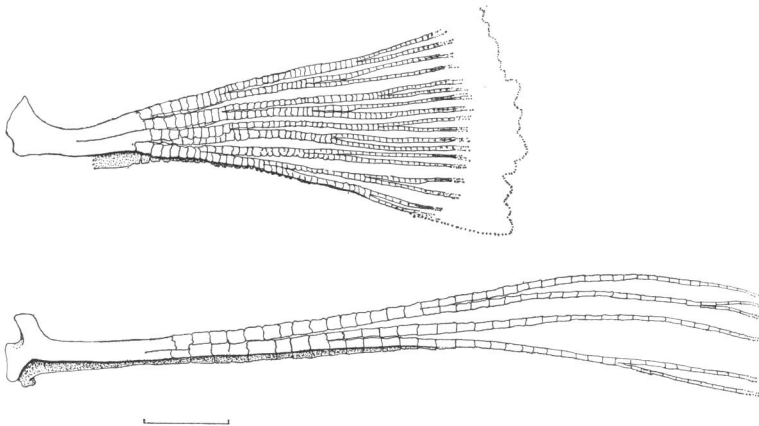


Fig. 2. Drawings of the innermost ray of the right pelvic fin.

A, *Rhinogobius brunneus*, the ray from a specimen of 57 mm in standard length; B, *R. giurinus*, the ray from a specimen of 52 mm. A scale indicates 1 mm. Both figures are drawn in the same magnification by Wild-7 binocular microscope with cameralucida.

Three species of *Rhinogobius* have been reported from Japan. The sucking disk of the pelvic fin in *R. brunneus* (TEMMINCK et SCHLEGEL) and *R. flumineus* (MIZUNO) is almost circular in shape, and the innermost ray is divided into 8 branches in a specimen of 27 mm in standard length, 12~13 in 40 mm, 18~26 in 57 mm. In *R. giurinus*, however, the sucking disk is elongated and elliptical, and the innermost ray is divided into only 6 branches in a specimen of 52 mm in standard length, and into 8~10 branches in 57 mm specimen. The forms of the pelvic fin rays indicate that the pelvic disc is much less specialized in *R. giurinus* than in other 2 species of the genus. The pelvic fin rays of the fossils are long and appear to be divided into less than 6 branches at 47.5 mm in standard length. Therefore we identified the fossils as *Rhinogobius giurinus*.

In Japan, *R. giurinus* is now distributed in the area westward from the Tone River, and southward from the Fukui Prefecture. It also lives in Shikoku, Kyushu, Ishigaki-jima, Miyako-jima, and Okinawa-jima. It is also distributed in Taiwan, Hainan Island, Kanan, and Korea (NAKAMURA, 1963). According to DOTSU (1961), this species inhabits in brackishwater in river mouths and freshwater above the mouths, and abundant on the gravel bottom.

Material used for comparison.

Rhinogobius giurinus: 2 specimens (52 and 57 mm in standard length) from the locality 4 km from the river mouth of the Iinoya River, Hosoe, Inasa-gun, Shizuoka Prefecture.

Rhinogobius brunneus: 3 specimens (27, 40, 57 mm in standard length) from Lake Ashinoko, Motohakone, Kanagawa Prefecture.

Rhinogobius flumineus: 3 specimens (28, 37, and 44 mm in standard length) from a tributary of Ina River at 409 Yamabe, Nose, Toyono-gun, Osaka Prefecture.

Names of Places and Localities

Aira	始 良	Satsuma	薩 摩
Aragochi	荒 川 内	Sendai	川 内
Hiwatashi	樋 渡	Taninokuchi	谷 之 口
Isa	伊 佐	Tarumi	田 海
Kushikino	串 木 野	Tôgô	東 郷
Onobuchi	斧 淵	Torimaru	鳥 丸
Sankago	三ヶ郷	Tsukasano	司 野

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Explanation of Plates 1–2

Plate 1

Photographs of the fossils of *Rhinogobius* cf. *R. giurinus* (RUTTER) from Kagoshima Prefecture. A, lateral view of the right side. (PV 15289). B, the counter part of the specimen in Figure A. C, ventral view (PV 15288).

Plate 2

Photographs of some parts of the fossils of *Rhinogobius* cf. *R. giurinus* (RUTTER) from Kagoshima Prefecture. A, the first dorsal fin showing 6th spine far from 5th a large gap between 5th and 6th spinous ray (PV 15289). B, head region showing conical teeth on dentary, narrow interorbital space, and other bones (PV 15289). C, head region showing pharyngeal teeth and other bones (PV 15289). D, ventral view of head region and pelvic fins (PV 15288). E, skeletons of caudal region (PV 15289).

