

Tottoriblennius hiraoui, a New Genus and Species of Miocene Blennioid Fish from Tottori Prefecture, Japan

Yoshitaka Yabumoto¹ and Teruya Uyeno²

¹Kitakyushu Museum of Natural History and Human History, 2–4–1 Higashida, Yahatahigashi-ku, Kitakyushu 805–0071, Japan

²National Museum of Nature and Science, 3–23–1 Hyakunin-cho, Shinjuku-ku, Tokyo 169–0073, Japan

Abstract A blennioid fish, *Tottoriblennius hiraoui* gen. et sp. nov. is described on the basis of a single specimen from the Middle Miocene Iwami Formation, Tottori Prefecture, Japan. The new genus is assigned to the family Blenniidae, and distinguished from other genera by the following combination of characters: 13 dorsal spines and 14 soft rays, 17 pectoral fin rays, 9 precaudal vertebrae, 3 pelvic soft rays, and frontal densely ornamented, consisting of minute depressions. This is the first blennioid fossil record from the western Pacific Ocean, including Japan.

Key words: Fossil fish, Middle Miocene, Iwami Formation, Perciformes, Blenniidae, Tottori, *Tottoriblennius hiraoui* gen. et sp. nov.

Introduction

Six Miocene fish have been described from the Iwami Formation of the Tottori Group (Uemura *et al.*, 1979; Matsumoto, 1991) at Miyanoshita, Kokufu-cho, Tottori Prefecture, Japan. These are *Sardinella miyanoshitaensis* Sato and Uyeno, 1999; *Spirinchus akagii* Uyeno and Sakamoto, 1999; *Inabaperca taniurai* Yabumoto and Uyeno, 2000; *Scomberoides maruoi* Uyeno and Suda, 1991; *Leiognathus tottori* Yabumoto and Uyeno, 1994; and *Paralichthys yamanai* Sakamoto and Uyeno, 1993.

The excavation of fossils at Miyanoshita, where the Fuganji Mudstone Member of the Iwami Formation is distributed, was conducted each summer from 2002 to 2005 by the Tottori Prefectural Museum and yielded numerous fish fossils (Hirao *et al.*, 2005) and a passeriform bird (Kakegawa and Hirao, 2003). As the seventh account in a series describing the fossil fishes from this locality (see Uyeno and Suda, 1991, fig. 1), we describe a new genus and species of the blennioid fish family Blenniidae on the basis of the specimen with its counter part that we found among the specimens collected during the excavations.

Systematic Paleontology

Class Osteichthyes Huxley, 1880

Order Perciformes Bleeker, 1859

Suborder Blennioidei Bleeker, 1859

Family Blenniidae Rafinesque, 1810

Tottoriblennius gen. nov.

Type species: *Tottoriblennius hiraoui* sp. nov.

Etymology: *Tottori*, after the name of the locality where the specimen is found; *blennius*, Latin for fish and the type genus of the family Blenniidae.

Diagnosis: As for type species.

Tottoriblennius hiraoui sp. nov.

(New Japanese name: Tottori-mukashi-ginpo)

Holotype: TRPM (Tottori Prefectural Museum) 664-0192 is an almost complete specimen, along with the counter part in which the dorsal body and head are missing. The standard length is 24.3 mm.

Etymology: The species, *hiraoui*, is named of Mr. Kazuyuki Hirao who organized the excavation of fish fossils at the locality.

Locality and Horizon: The specimen was

collected from rock (marine sediments) belonging to the Fuganji Mudstone Member of the Middle Miocene Iwami Formation in the Tottori Group, during excavations from 2002 to 2005 at Miyanoshita, Kokufu-cho, Tottori City, Tottori Prefecture, Japan (Hirao *et al.*, 2005). The locality is discussed in Uyeno *et al.* (1999).

Diagnosis: This species differs from other members of the family Blenniidae in having the following combination of characters: frontal densely ornamented, consisting of minute depressions; 13 dorsal spines and 14 soft rays; 17 pectoral fin rays; 9 precaudal vertebrae; and 3 pelvic soft rays.

Description of the holotype: Body is elongate, standard length being about four times body depth at the dorsal origin and about 3.5 times head length (Fig. 1). The large eye is preserved, and the orbit diameter is about one fourth of the head length. It is difficult to recognize the outline of each bone of the head, but the mouth is terminal, not oblique, and some relatively large canine-like teeth are preserved at the anterior end of the head. Lower canine-like teeth pointing upward are on the dentaries, but their positions on the bone are not clear. Upper canine-like teeth pointing downward are on the premaxillaries, but the positions are indeterminate. Upper jaw teeth are somewhat thinner than the lower jaw teeth (Fig. 2). The frontal with dense ornamentation consisting of minute depressions has a sensory canal at the anterior, narrow portion of the frontal and four ridges on the posterior wide portion (Fig. 3).

The dorsal fin consists of 13 spines and 14 soft rays, its origin being above and slightly behind the midpoint between the pelvic and pectoral insertions. Dorsal spines are long, almost the same size, about half maximum body depth, except the last two shorter spines.

The anal fin consists of two spines and 17 soft rays, the origin being below the base of the 11th dorsal spine.

The pelvic fin consists of a spine and three rays, and inserts in front of the pectoral fin base. The pectoral fin is large with 17 rays, which

reaches the origin of the anal fin. There are 4 radials, which are longer than deep.

The parhypural and hypurals 1 and 2 are fused to form a ventral plate. The dorsal hypural plate comprises hypurals 3 and 4 fused to each other, and to the urostyle fused with the uroneural 1. There are seven unbranched caudal rays on the dorsal hypural plate and six on the ventral plate (Fig. 4).

The number of precaudal vertebrae is 9, and the first vertebra is large, two times the second one. There are 22 caudal vertebrae.

Concluding Remarks

The following combination of characters indicates that this new genus *Tottoriblennius* is a member of the suborder Blennioidei: 1) the pelvic fin with one spine and three soft rays inserts in front of the pectoral fin base, 2) the pectoral radials being longer than deep, 3) two anal spines, 4) the parhypural and hypurals 1 and 2 being fused to form a plate, and the dorsal hypurals 3 and 4 fused to each other and to the urostyle fused with the uroneural 1, and 5) dorsal- and anal-fin spine pterygiophores are single elements (Nelson, 1994). This new genus has the following combination of characters that place it in the family Blenniidae: 1) single dorsal fin, 2) mouth terminal, 3) large lateral eye, and 4) number of dorsal spines fewer than that of dorsal soft rays (see Nelson, 1994).

Tottoriblennius hiraoui has dense frontal ornamentation consisting of minute depressions. An ornamented frontal has been recognized in the tribe Nemophini, not in other tribe (Springer, 1986; Springer and Smith-Vaniz, 1972), but this new genus differs from Nemophini by having 17 pectoral fin rays (10 to 16 in Nemophini), 9 precaudal vertebrae (11 to 16 in Nemophini), and a long pectoral fin reaching the anal fin origin.

Smith-Vaniz (1976 and 1987) recognized 48 species in five genera in Nemophini. The nemophin fish, *Xiphasia*, with 13 dorsal fin spines (the same number as *Tottoriblennius*), but has an extremely elongate body and numerous

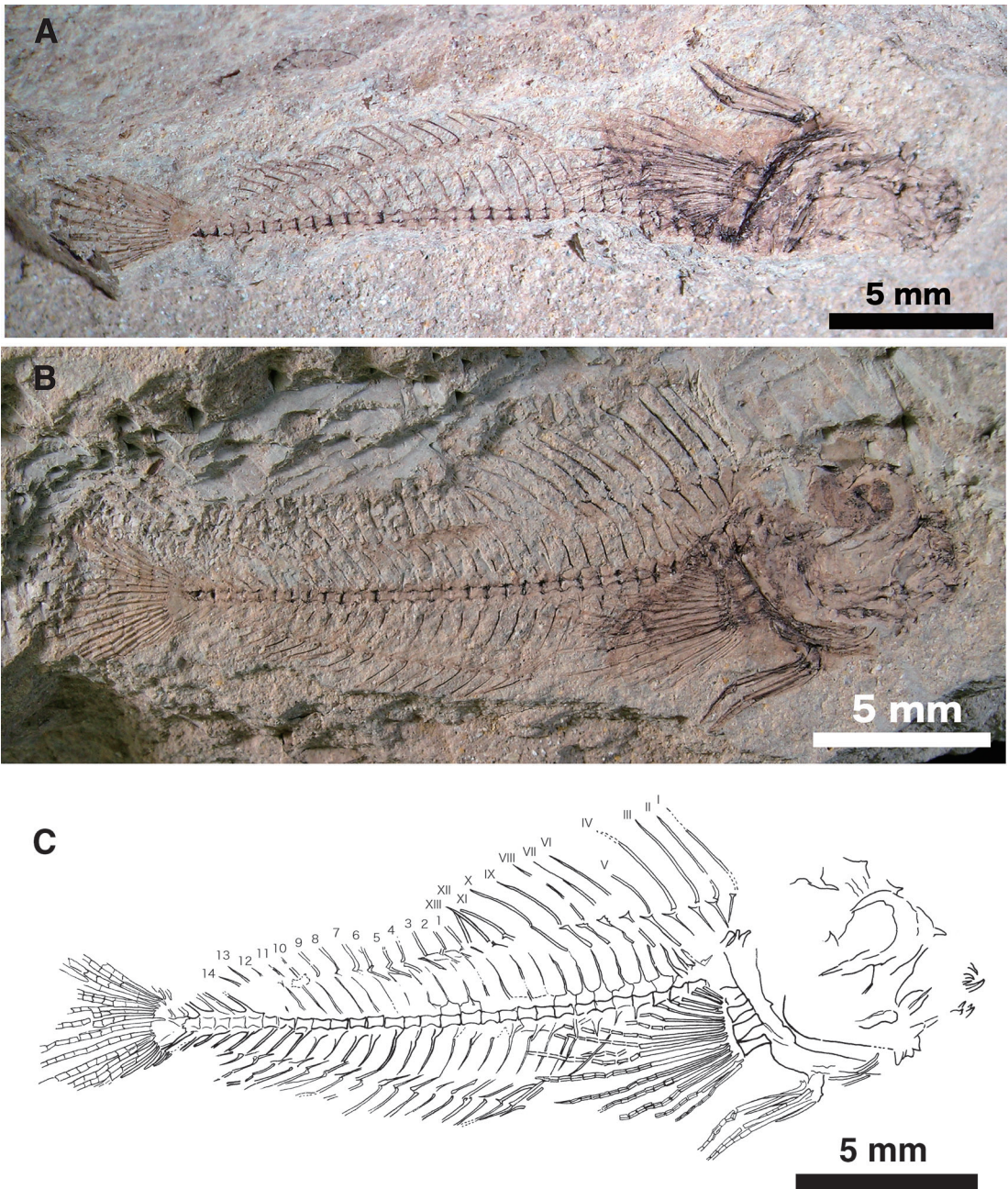


Fig. 1. Holotype (TRPM 664-0192) of *Tottoriblennius hiraoi* gen. et sp. nov. A and B, apart specimen and counter part; C, drawing of B.

soft rays (around 100). Short bodied nemophin fishes *Pteroscirtes* and *Meiacanthus* have a smaller number of dorsal fin spines (4 to 11) than *Tottoriblennius* (13). *Tottoriblennius* has a frontal with a narrow anterior portion (interorbital re-

gion), but most species of Nemophini have a broad one. The present new genus *Tottoriblennius* differs from other genera, tribes of the family Blenniidae as described above and is probably related to Nemophini in having the or-

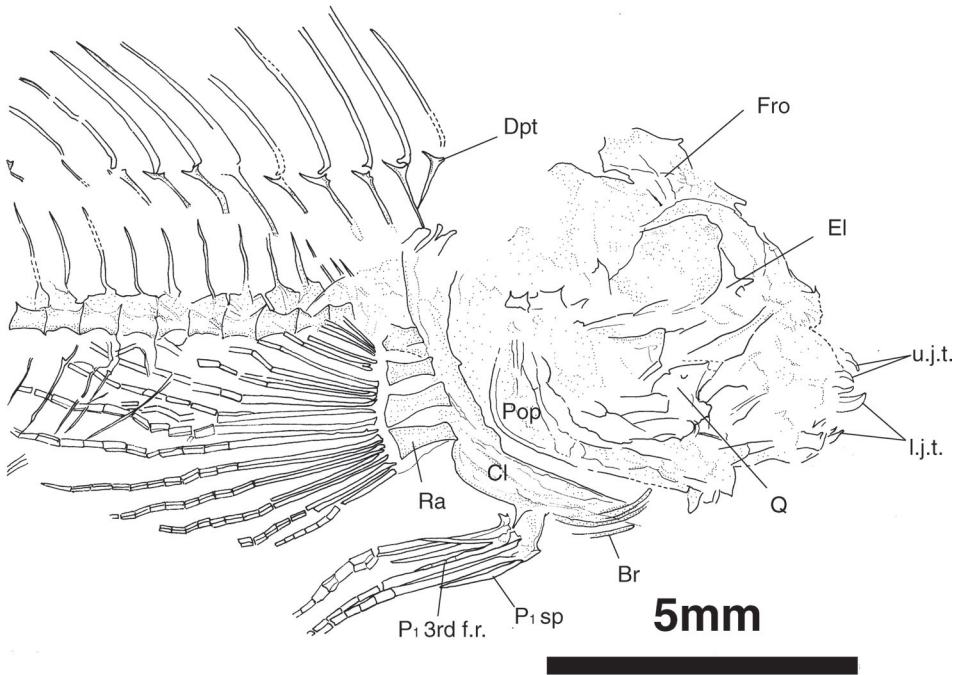
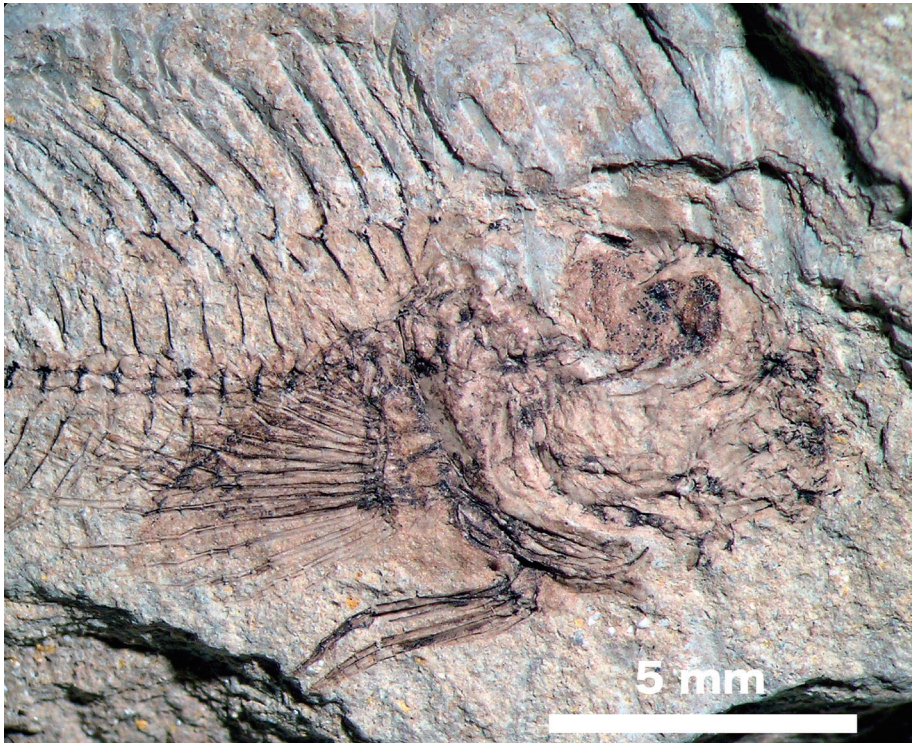


Fig. 2. Head region of the holotype (TRPM 664-0192) of *Tottoriblennius hiraoui* gen. et sp. nov. Abbreviations: Br=branchiostegals; Cl=cleithrum; Dpt=dorsal pterygiophore; El=lateral ethmoid; Fr=frontal; l.j.t.=lower jaw teeth; u.j.t.=upper jaw teeth; P₁3rd f.r.=3rd pectoral fin ray; P₁ sp.=pectoral spine; Pop=preopercle; Q=quadrate; Ra =radials.

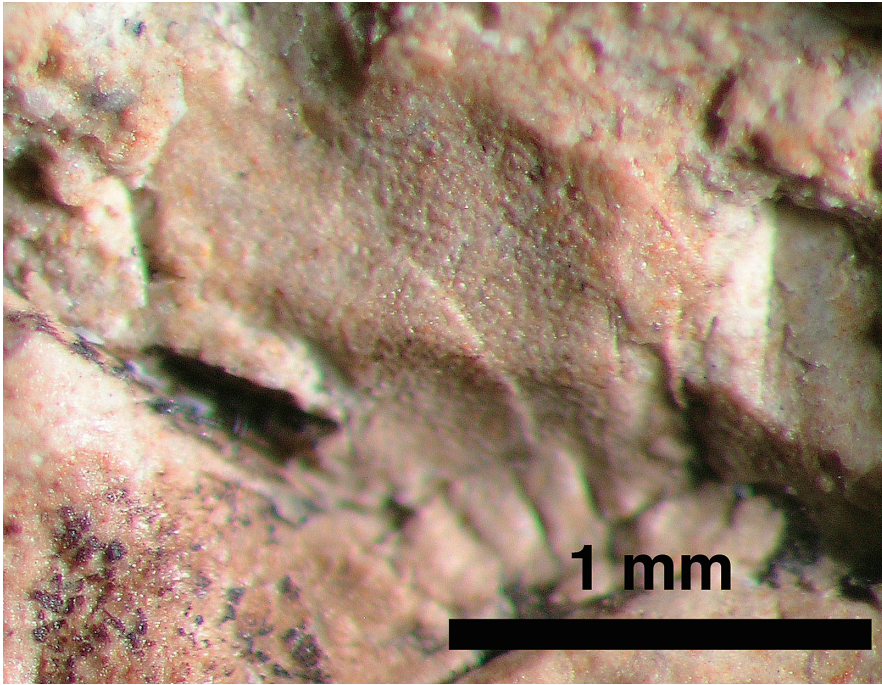


Fig. 3. Dense ornamentation consisting of minute depressions on the frontal of the holotype (TRPM 664-0192) of *Tottoriblennius hiraoui* gen. et sp. nov.

namented frontal, which is a derived blennioid character (see Smith-Vaniz, 1976).

Fossil blennioids, *Oncolepis isseli* from Eocene Monte Bolca, Italy (Bassani, 1989), *Blennidarum blondeaui* from Eocene France (Norlf and Lapierre, 1979), *Blennidarum bicipitis* from Lower Oligocene France (Steurbaut, 1984), *Blennius schwarzhansi* from Miocene Turkey (Ruckert-Ulkumen, 1996), *Blennius fossilis* from Upper Miocene Croatia (Karmberger, 1891), *Otolithus (Ophididarum) soldanii* from Pliocene Italy (Pieragnoli, 1919), and *Blennius fluviatillis* from Pleistocene Italy (Mastrorilli, 1965) have been described. Among these, *B. blondeaui*, *B. bicipitis*, *B. schwarzhansi*, and *O. (O.) soldanii* were described on the basis of otolithes. *T. hiraoui* has a smaller number of segmented dorsal fin rays (13) and precaudal vertebrae (9) than *O. isseli* (20 dorsal fin rays and 24 or 26 precaudal vertebrae). This new species differs from *B. fossilis* in having a large number of dorsal spines, 13 in *T. hiraoui* and 11 in *B. fossilis*. *T. hiraoui* has

smaller numbers of segmented dorsal fin rays (13) and caudal vertebrae (22) than *B. fluviatillis* (15 or 16 segmented dorsal fin rays and 25 or 26 caudal vertebrae). *Problennius* was cited as a genus of the family Blenniidae from Eocene western Asia by Romer (1966) and Carroll (1988).

This new genus and species, *T. hiraoui* is the first record of a blennioid fossil from the western Pacific region, specifically Japan.

Acknowledgments

The authors wish to express their sincere gratitude to Mr. Kazuyuki Hirao of Tottori Prefectural Museum, who organized the excavation of the fish fossils, Dr. Takao Yano of Tottori University and Mr. Tateyu Aoki for their help during the fieldwork. We are grateful to Dr. Kim R. Larsen for his help in obtaining rare literature. The study by the first author was supported by a Grant-in-Aid for Scientific Research (B), No. 15340179 to Makoto Manabe from Japan Society for the Pro-

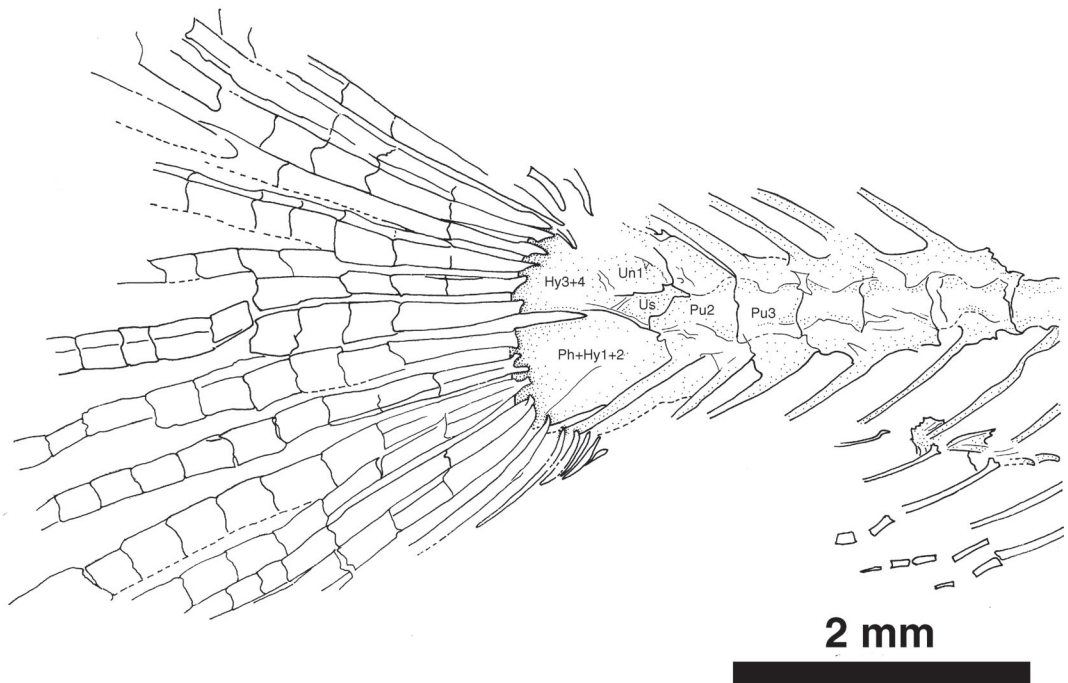
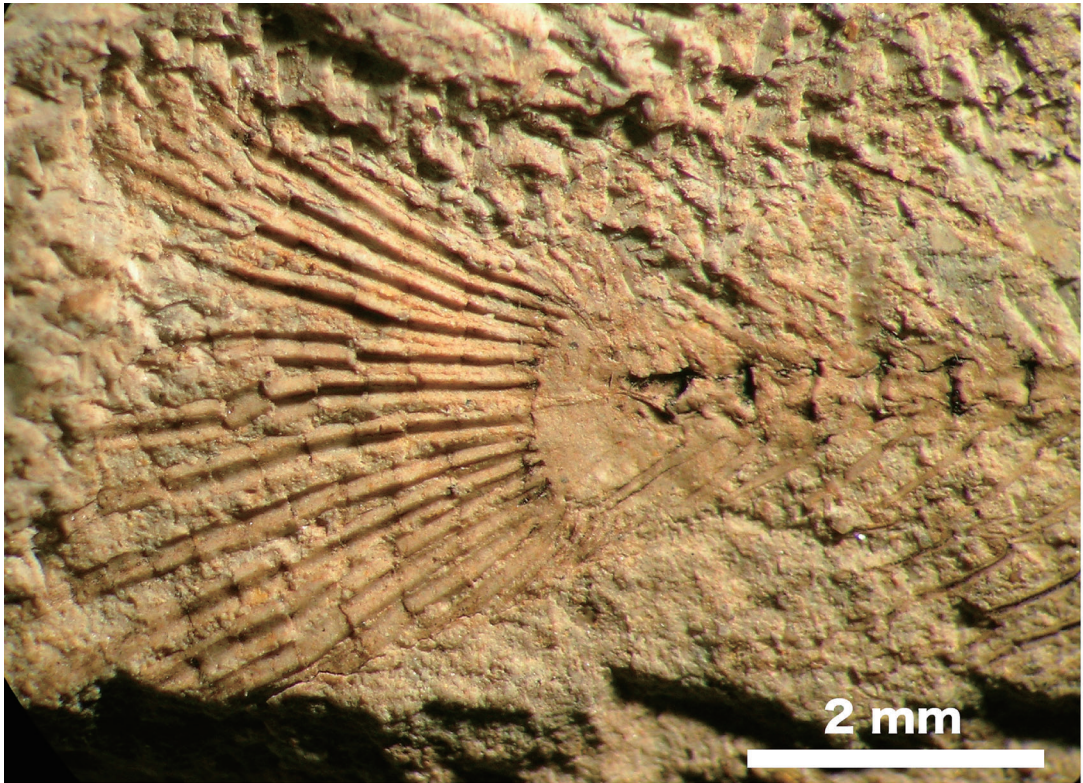


Fig. 4. Caudal region of the holotype (TRPM 664-0192) of *Tottoriblennius hiraoi* gen. et sp. nov. Abbreviations: Hy3+4=hypurals 3 and 4; Ph+Hy1+2=parhypural and hypurals 1 and 2; Pu2=second preuralcentrum; Pu3=third preuralcentrum; Un1=first uroneural; Us=urostyle.

motion of Science (JSPS).

References

- Bassani, F., 1898. Aggiunte all'ittiofauna eocenica dei Monti Bolca e Postale. *Palaeontogr. Ital.*, vol. 3: 77–88, 2 pls.
- Gorjanovic-Kramberger, Dragutin [=Karl], 1891. Palaeichthyologzki prilozhi (Collectae palaeoichthologiae) Dis II. Rad Jugoslav. Alcad., 1891, 106: 58–129, 8 pls.
- Carroll, R. L., 1988. Vertebrate Paleontology and Evolution. W. H. Freeman and Company, New York, xiv +698 pp.
- Hirao, K., T. Yano, T. Uyeno, Y. Yabumoto and T. Aoki, 2005. Stratigraphy and fossil fishes of the Fuganji Formation at Miyanoshta, Kokufu-cho, Tottori, Japan. *Bull. Tottori Pref. Mus.*, **42**: 3–20.
- Kakegawa, Y. and K. Hirao, 2003. A Miocene Passeriform bird from the Iwami Formation, Tottori Group, Tottori, Japan. *Bull. Natn. Sci. Mus. Tokyo, Ser. C*, **29**: 33–38.
- Mastrorilli, V. I., 1965. I fossili Quaternari del Bacino diatomitico di Riano (Roma) nella collezione del Museo Civico di scienze naturali 'G. Doria' in Genova. *Atti Ist. Geol. Univ. Genova* 3: 1–245, 36 pls.
- Matsumoto, T., 1991. Stratigraphy of the Miocene Series and the Middle Miocene volcanism in the area northeast of Tottori City, Southwest Japan. *Jour. Geol. Soc. Japan*, **97** (9): 697–712.
- Nolf, D. and H. Lapiere, 1979. Otolithes de poissons nouveaux ou peu connus du Calcaire Grossier et de la Formation d'Auvers (Éocène du bassin parisien). *Bull. Mus. natn. Hist. nat. Paris (Sci. Terre Paléont. Géol. Minér.)* (2): 79–125.
- Pieragnoli, L., 1919. Otoliti plioceniche della Toscana. *Riv. ital. paleont. Parma*, 25: 21–44, 2 pls.
- Romer, A. S., 1966. Vertebrate Paleontology 3rd ed. The University of Chicago Press, Chicago, viii+468 pp.
- Ruckert-Ulkumen, N., 1996. Weitere Beitrage zur Otolithenfauna von Avcilar W Kucukcekmece See (Thrakien, Turkei). *Mitteilunge der Bayerischen Staatssammlung fuer Palaeontologie und Historische Geologie* 36, 15 Dezember 1996: 117–133.
- Sakamoto, K. and 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.
- Sato, Y. and T. Uyeno, 1999. *Sardinella miyanoshitaensis*, a new clupeid fish from the Middle Miocene Tottori Group, Tottori Prefecture, Japan. *Bull. Natn. Sci. Mus. Tokyo, Ser. C*, **25** (3, 4): 129–141.
- Springer, V. G., 1968. Osteology and classification of the fishes of the family Blenniidae. *Bull. U. S. Natl. Mus.*, 284, 83 pp.
- Springer, V. G., 1972. Synopsis of the Tribe Omobranchini with descriptions of three new genera and two new species (Pisces: Blenniidae). *Smithsonian Contrib. Zool.*, **130**: 1–31.
- Springer, V. G., 1985. *Oman ypsilon*, a new genus and species of blennioid fish from the Indian Ocean. *Proc. Biol. Soc. Wash.*, **89** (1): 90–97.
- Springer, V. G. and W. F. Smith-Vanitz, 1972. A new tribe (Phenablennini) and genus (*Phenablennius*) of blennioid fishes based on *Petroscirtes heyligeri* Bleeker. *Copeia*, 1972 (1): 64–71.
- Smith-Vaniz, W. F., 1976. The saber-toothed blennies, tribe Nemophini (Pisces: Blenniidae). *Acad. Nat. Sci. Phila. Monog.*, 19, 196 pp.
- Smith-Vaniz, W. F., 1987. The saber-toothed blennies, tribe Nemophini (Pisces: Blenniidae): an update. *Proc. Aca. Nat. Sci. Phila.*, **139**: 1–52.
- Steurbaut, E., 1984. Les otolithes de Teleosteens de l'oligo-miocene d' Aquitaine (sud ouest de la France). *Palaeontographica (A)*, 186(1–6): 1–162.
- Uemura, F., T. Sakamoto and N. Yamada, 1979. Geology of the Wakasa District. Quadrangle series, Okayama 12 no. 22. Geological Survey of Japan, 91 pp., 8 pls., 1 map.
- Uyeno, T. and K. Sakamoto, 1999. *Spirinchus akagii*, a new Miocene smelt from Tottori Prefecture, Japan (Pisces: Osmeriformes: Osmeridae). *Bull. Natn. Sci. Mus. Tokyo, Ser. C*, **25** (3, 4): 143–150.
- Uyeno, T., K. Sakamoto, Y. Yabumoto, Y. Suda and K. Hirao, 1999. On three species of fossil fishes described from a Middle Miocene bed in Tottori Prefecture, Japan. *Bull. Tottori Pref. Mus.*, **36**: 1–23. (In Japanese.)
- Uyeno, T. and Y. Suda, 1991. A new Miocene queenfish of the genus *Scomberoides* (Pisces, Carangidae) from Tottori, Japan. *Bull. Natn. Sci. Mus. Tokyo, Ser. C*, **17** (2): 41–48.
- Yabumoto, Y. and T. Uyeno, 1994. A new Miocene ponyfish of the genus *Leiognathus* (Pisces, Leiognathidae) from Tottori Prefecture, Japan. *Bull. Natn. Sci. Mus., Tokyo, Ser. C*, **20** (2): 67–77.
- Yabumoto, Y. and T. Uyeno, 2000. *Inabaperca taniururai*, a new genus and species of Miocene percoid fish from Tottori Prefecture, Japan. *Bull. Natn. Sci. Mus., Tokyo, Ser. C*, **26** (3, 4): 93–106, pls. 1–7.