

*Clidoderma yamagataensis*, a New Middle Miocene Righteye  
Flatfish, from Yamagata Prefecture, Japan  
(Pisces: Pleuronectiformes: Pleuronectidae)

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**Abstract** A fossil of a righteye flatfish was found in the Middle Miocene Ginzan Formation, Yamagata Prefecture, Japan. It is designated as the holotype for a new species of the genus *Clidoderma* in the family Pleuronectidae, order Pleuronectiformes. The present species is characterized by having 13 abdominal and about 29 caudal vertebrae.

**Key words:** Miocene, Ginzan Formation, flatfish, Pleuronectiformes, Pleuronectidae, *Clidoderma yamagataensis* sp. nov.

### Introduction

A fossil of a righteye flatfish was collected from rock belonging to the Middle Miocene Ginzan Formation (see Saito, 1960) at Kaminohata, Obanazawa City, Yamagata Prefecture, Japan (Fig. 1A). It is described as a new species of the Pleuronectidae (sensu Sakamoto, 1984a), having distinct bony tubercles in the eyed side of the body and the number of vertebrae.

From the Ginzan Formation, planktonic foraminifera, radiolaria and marine molluscs such as *Miyagipecten matsumoriensis*, *Mizuhopecten paraplebejus*, *Chlamys miyatokoensis* have been reported (Amano, 1980; Ogasawara and Sato, 1986).

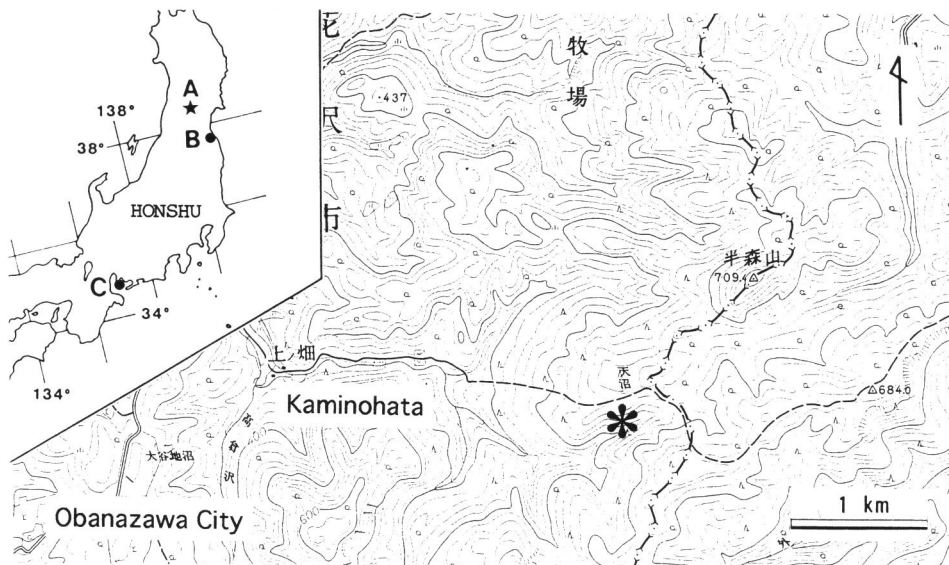


Fig. 1. Map showing the collection locality of a new Miocene righteye flatfish *Clidoderma yamagataensis* sp. nov. (from 1 : 50,000 map of “Yakuraisan”, published by the Geographical Survey Institute of Japan). Inset shows congeneric collection sites: A, *Clidoderma yamagataensis* sp. nov., Middle Miocene Ginzan Formation, Yamagata Prefecture. B, *C. asperrimum*, Pliocene Tatsunokuchi Formation, Fukushima Prefecture. C, *C. chitaensis*, Middle Miocene Yamami Formation, Aichi Prefecture.

### Systematic Paleontology

Class Osteichthyes Huxley, 1880

Order Pleuronectiformes Bleeker, 1859

Family Pleuronectidae Rafinesque, 1810 (sensu Sakamoto, 1984a)

Subfamily Pleuronectinae Rafinesque, 1810 (sensu Sakamoto, 1984a)

Genus *Clidoderma* Bleeker, 1862

***Clidoderma yamagataensis* sp. nov.**

(New Japanese name: Yamagata-samegarei)

(Fig. 2)

*Holotype*: Catalogue number NSM PV-20520, about 200 mm in estimated standard length.

*Etymology*: Named after the type locality, Yamagata Prefecture.

*Diagnosis*: A species of *Clidoderma* with 13 abdominal and about 29 caudal vertebrae.

*Description*: The specimen, except for the absence of posteriormost portion of the body, is well-preserved. The body is oval in shape, its depth being greatest at the



Fig. 2. The holotype of *Clidoderma yamagataensis* sp. nov., NSM PV-20520, from the Middle Miocene Ginzan Formation, Yamagata Prefecture, Japan (top); enlargement of the abdominal region of the holotype (bottom). About 200 mm in estimated standard length.

middle part of the body, about 1.8 times head length. The eyed (=right) side is densely covered with close-set, rough, bony tubercles, some of them being arranged in definite longitudinal rows: two run in the dorsal part, one in the mid-lateral and two in the ventral of the caudal region, the dorsal- and ventralmost ones being most definite; rather large tubercles are also present at the bases of the dorsal and anal fins, between the fin rays.

The head region is preserved, but only a few elements are identifiable. Head length of the eyed side is about 50 mm; the mouth, moderate in size: upper jaw length about 18 mm, about 0.36 time head length, elements of both jaws not identifiable. The anterior part of the cranium is present, but its elements are not identifiable. Placement of the eyes can be recognized from the remnants of the orbital cavities on the right side of the body.

In the suspensorial and opercular regions, only the preopercle and hyomandibular remain, although their entire shapes are indistinct.

The dorsal fin originates just in front of the upper eye. Of the estimated 95 rays and 94 proximal pterygiophores, 85 and 73 respectively remain. In the anal fin, 67 of the approximate 70 and 60 of the about 62 proximal pterygiophores are observable. The anteriormost proximal pterygiophore is enlarged and elongated, and attached to the anterior surface of the first haemal spine. Its anteroventral end curves forward.

Of the shoulder girdle, only the cleithrum and well-developed postcleithra of both sides remain. The pelvic fin with six rays is located just under the cleithrum.

The abdominal vertebrae with neural spines 13 in number. Several fragments of ribs are observable at the posterodorsal corner of the body cavity. The space between the 13th and 14th neural spines are due to distortion. The caudal vertebrae with neural and haemal spines present 23 in number, but about posterior one is missing. About 5 of the vertebrae are obscured. No epipleurals are observable.

In the area just under the anterior portion of the abdominal vertebrae, there are regularly arranged, diamond-shaped structures which are not parts of the ophiuroids (Fujita, T., pers. comm.) and similar to those of the goniasterids (Kikuchi, Y., pers. comm.).

## Discussion

The present species is a member of the Pleuronectinae in the Pleuronectidae (both sensu Sakamoto, 1984a), because it has the following characters: both eyes are completely lateral and on the right side of the body, the postcleithrum is present, the first proximal pterygiophore of the anal fin is enlarged, ribs are present and the first neural spine is present and well developed (Norman, 1934; Hubbs, 1945; Ochiai, 1966; Amaoka, 1969; Sakamoto, 1984a). The eyed side of the body covered with close-set, rough, bony tubercles, some of them being arranged in definite longitudinal rows is very unique among pleuronectiforms and found only in members of the pleu-

ronectine genus *Clidoderma* (Norman, 1934; Sakamoto, 1984a).

Two species of *Clidoderma* have been described: *C. asperrimum* (Temminck and Schlegel, 1846) and *C. chitaensis* Ohe and Kawase, 1995. The former, both extant and fossil, is distributed from the East China Sea and Japan to British Columbia, Canada, usually inhabiting depths of 150–1000 m (Sakamoto, 1984b) and feeding intensively on ophiuroids (Echinodermata) (Fujita, 1996). A sole specimen has been found in the Pliocene Tatsunokuchi Formation at Soma City, Fukushima Prefecture, Japan (Fig. 1B) (Sakamoto and Uyeno, 1988). The latter species was reported from the Middle Miocene Yamami Formation, Morozaki Group at Mihama-cho, Chita-gun, Aichi Prefecture, Japan (Fig. 1C) (Ohe and Kawase, 1995).

The present species resembles these two species in general appearance, but differs from them in the number of vertebrae, 13 abdominal + about 29 caudal vertebrae vs. 14 (rarely 13) + 31–32 in *C. asperrimum* (data from Sakamoto, 1984b) and 15 + 28 in *C. chitaensis* (from Ohe and Kawase, 1995).

On the basis of these characters, the present specimen is described as a new species in the genus *Clidoderma*.

Although it appears that there are no differences among the three species in the shape, size and distribution of bony tubercles scattered on the eyed side of the body (see Sakamoto and Uyeno, 1988; Ohe and Kawase, 1995), further investigation is needed.

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