

## A giant mottled eel, *Anguilla marmorata* Quoy and Gaimard, 1824 (Anguilliformes: Anguillidae), from a small urban river in Shizuoka Prefecture, central Japan

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### ■ Abstract

A giant mottled eel, *Anguilla marmorata* Quoy and Gaimard, 1824, was collected in a small river in an urban area of Shizuoka City, a capital of Shizuoka Prefecture, central Japan. The eel was about 140 cm in total length. In Japan, the species has been collected in fresh and brackish waters in the subtropical and temperate regions influenced by a warm current, the Kuroshio. This current flows in the western North Pacific Ocean off the coast of Shizuoka Prefecture, and the eel caught is considered to have migrated from the ocean to the river as a juvenile and to have survived and grown there because the river maintains warm water temperatures by receiving the drainage from the urban area including a nearby factory throughout the year. Freshwater fishes and crustaceans were abundantly found in the river and were most probably preyed on by the eel.

### ■ Introduction

The giant mottled eel, *Anguilla marmorata* Quoy and Gaimard, 1824, occurs in the tropical and subtropical countries of the Indo-Pacific region, including Japan (Watanabe et al., 2009). Shizuoka Prefecture on the Pacific coast of central Japan is located near the north-eastern limit of the distribution of the species (Mizuno and Nagasawa, 2009), and currently, only some records exist of its occurrence in the prefecture (e.g., Itai et al., 2004, 2019; Arao et al., 2008; Aoshima, 2015;

Kanagawa et al., 2018). In 2017, we collected a single individual of the giant mottled eel in a small river in an urban area of Shizuoka City, a capital of Shizuoka Prefecture, which is reported herein.

### ■ Materials and Methods

The giant mottled eel was collected using rod and line in the late evening of 24 March 2017 in a small river (34°58'00"N, 138°24'54"E), a tributary of the Ohya River, at Ondabara, Suruga, Shizuoka City, Shizuoka Prefecture. The Ohya River empties into Suruga Bay, the western North Pacific Ocean. The river sampled is 5–6 m wide and about 10–40 cm in water depth. The lateral sides of the river are concrete-covered, and the bottom consisted of pebbles, gravel, and mud with some submerged and emergent plants. The bait used was a piece of flesh of a chub mackerel, *Scomber japonicus* Houttuyn, 1782 (Scombridae), purchased at a fish store. Before this collection, two of the present authors (TS and KS) watched a big eel-like fish swimming in the river during early evening. The collection was easy: the eel swallowed the bait immediately after the third author (KS) threw the bait into the water in front of the eel head. The hooked eel was retrieved from the water, photographed, measured for its total length (cm), and then released into the river.

### ■ Results

The fish collected was easily identified as *Anguilla marmorata* by its body size (ca. 140 cm in total length), nearly cylindrical body, large mouth, and body coloration (black mottled patterns on the pale-yellow dorsal and lateral sides, and the white belly) (Fig. 1). Its body weight was not measured, but the fish was not emaciated but really heavy and looked healthy.



Fig. 1. A giant mottled eel, *Anguilla marmorata*, ca. 140 cm in total length, from a small urban river, a tributary of the Ohya River, Shizuoka City, a capital of Shizuoka Prefecture, central Japan, on 24 March 2017. The eel was held by the third author (KS) of this paper.

### ■ Discussion

In Shizuoka Prefecture, the giant mottled eel is generally believed to widely occur in fresh waters of the coastal region, but the species is actually a rare species (Itai, 1982). Itai (1982) and his colleagues conducted an intensive survey of the freshwater fish fauna of Shizuoka Prefecture in the 1970s, but no individual of the species was collected. Nevertheless, recently, some records are present of the species from Shizuoka Prefecture (Itai et al., 2004, 2019; Arao et al., 2008; Aoshima, 2015; Shizuoka Prefectural Research Institute of Fishery, Fuji Trout Farm, 2017; Kanagawa et al., 2018). According to Itai et al. (2019), the species has been found from nine rivers and a lake in the prefecture.

In Japan, the giant mottled eel has been collected in fresh and brackish waters in the subtropical and temperate regions influenced mainly by a warm current, the Kuroshio (Fig. 2, Mizuno and Nagasawa, 2009, 2010; Kanda et al., 2009; Yonezawa et al., 2010; Nomura, 2010; Chino and Arai, 2010; Kaji, 2011, 2014; Shimadzu, 2011, 2014; Kai and Kusuda, 2011, 2018; Kawase, H. 2013; Kaji and Nakata, 2013; Yoshigou, 2014; Katurahira and Nagasawa, 2014; Hibino and Kimura, 2015; Aoshima, 2015; Sato, 2016; Koeda et al., 2016; Motomura and Harazaki, 2017; Ike, 2017; Ogata et al., 2017; Kano et al., 2017; Nagasawa and Kan, 2017; Kimura et al., 2017; Kanagawa et al., 2018; Itai et al., 2019; Wakiya et al., 2019, see Mizuno and Nagasawa, 2009, for the earlier literature). One of the spawning areas of the species is found in the North Equatorial Current region of the western North Pacific Ocean (Miller et al., 2002; Kuroki et al., 2009), and the Kuroshio flows in the western North Pacific Ocean off the coast of Shizuoka Prefecture (Fig. 2). Thus, the giant mottled eel

caught is considered to have migrated first to southern Japanese waters in the current (Yamamoto et al., 2001), then, from the current through Suruga Bay to the river as a juvenile and to have grown there. The river sampled receives the drainage from the urban area and a nearby factory and maintains warm water temperatures throughout the year, which, most probably, enables the eel to have survived in the river.

In this study, the eel was collected in the early spring (late March) but was not emaciated, which suggests that it fed sufficiently even in the winter. In May 2013, using a hand net, one of the present authors (TS) collected various species of fishes [unidentified small fishes (most probably cyprinids); mosquitofish, *Gambusia affinis* (Baird and Girard, 1853) (Poeciliidae); trident goby, *Tridentiger brevispinis* Katsuyama, Arai and Nakamura, 1972 (Gobiidae)] and crustaceans [mitten crab, *Eriocheir japonica* (De Haan, 1835) (Grapsidae); red swamp crawfish, *Procambarus (Scapulicambarus) clarkii* (Girard, 1852) (Cambaridae); long-armed prawn, *Macrobrachium nipponense* (De Haan, 1849) (Palaemonidae); shrimp, *Caridina leucosticta* Stimpson, 1860 (Atyidae)] in the river, and mitten crabs were found abundant (unpublished data). These animals are very likely to have been preyed by the eel because this species is carnivorous, feeding on fishes, prawns, and frogs (Tabeta, 1989).

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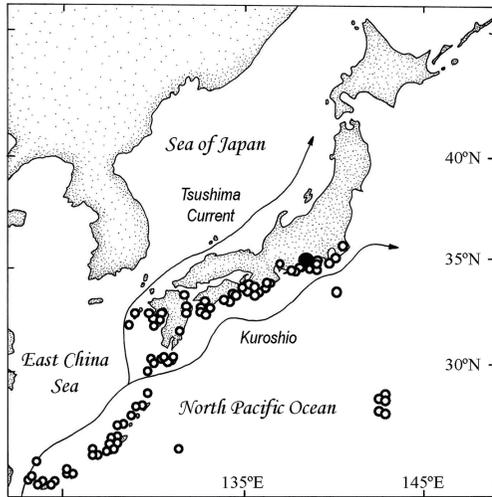


Fig. 2. A map of the Japanese Archipelago, showing the collection localities of the giant mottled eel, *Anguilla marmorata*, in the previous (open circles) and present (closed circle) studies. The previous collection localities are based on Mizuno and Nagasawa (2009) and the subsequent papers (Kanda et al., 2009; Mizuno and Nagasawa, 2010; Yonezawa et al., 2010; Nomura, 2010; Chino and Arai, 2010; Kaji, 2011, 2014; Shimadzu, 2011, 2014; Kai and Kusuda, 2011, 2018; Kawase, H. 2013; Kaji and Nakata, 2013; Yoshigou, 2014; Katahira and Nagasawa, 2014; Hibino and Kimura, 2015; Aoshima, 2015; Sato, 2016; Koeda et al., 2016; Motomura and Harazaki, 2017; Ike, 2017; Ogata et al., 2017; Kano et al., 2017; Nagasawa and Kan, 2017; Kimura et al., 2017; Kanagawa et al., 2018; Itai et al., 2019; Wakiya et al., 2019). The routes of a warm current, the Kuroshio, and its branch, Tsushima Current, are also shown.

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