

The Mindoro Snake Eel *Lamnostoma mindorum*
(Jordan and Richardson) of the Hsiukuluan River in the
Eastern Taiwan

台灣東部秀姑巒溪民多羅龍口蛇鰻

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Abstract

The Mindoro snake eel *Lamnostoma mindorum* (Jordan and Richardson, 1908) in the Hsiukuluan River of the eastern Taiwan occurred in the winter and early spring seasons of low water flow, and had two age classes at the modes of 34-37 cm and 46-49 cm in total length (juvenile and immature adult). These provided additional evidences to its rarity in freshwater near the mouth of rivers that the Mindoro snake eel is a peripheral freshwater fish defined as one that lives and spawns in ocean but some of its individuals occasionally intrude into freshwater streams.

摘 要

台灣東部秀姑巒溪民多羅龍口蛇鰻(*Lamnostoma mindorum*)為周緣性淡水魚，於冬天至春天低流量時偶然進入淡水河口，體長分兩群34-37 cm及46-49 cm，代表兩年齡群，在河內覓食底棲魚蝦。

Key words: *Lamnostoma mindorum*, ecology

關鍵詞：民多羅龍口蛇鰻、生態學

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The Mindoro snake eel *Lamnostoma mindorum* (Jordan and Richardson, 1908) is one of the rare species in the West Pacific. Up to date only five specimens have been reported from five localities: Baco River of Mindoro (Jordan and Richardson 1908; Herre 1923) and Abra River of Luzon (Herre 1953), Philippines; Waiho River, New Guinea (Weber and de Beaufort 1916); and Hsiukuluan River (Hatooka and Yoshino 1998) and Limpen River (Chang and Tsai 2003), Taiwan. Chen and Fang (2001) mentioned the occurrence of the Mindoro snake eel in the eastern Taiwan, but no mention was made on the number of individuals collected and the localities of their collections. Except its taxonomy and distribution, there was almost no biological information available for this species.

The Mindoro snake eel was collected primarily in freshwater, so that it has been speculated as a catadromous fish that lives in freshwater but spawns in ocean (Chen and Fang 2001). Because of its rarity and most of its collection sites near mouths of rivers, it has been also speculated as a peripheral freshwater fish defined as a species that lives and spawns in ocean but some of its individuals occasionally or accidentally intrude into the freshwater portion of rivers (Chang and Tsai 2003).

According to local fishermen, the Mindoro snake eel has often been caught in the lower Hsiukuluan River in the Hualien County. The collection site of the first record of this species to Taiwan by Hatooka and Yoshino (1998) was also in this river. It is one of the few rivers in Taiwan that retains a fairly natural condition. We conducted a bimonthly survey with electric fishing (150-200 volts, DC) from December 2002 to September 2003 in the area about 1.5 km

from the mouth of the river and 0.5 km downstream from the Ch'ang-Hung Bridge of Rt. 11. As the river bed is higher than the sea level, the river water flows directly into sea without formation of the brackish water zone within the river. All Mindoro snake eels were collected in the freshwater zone with water conductivity between 388 $\mu\text{s}/\text{cm}$ and 443 $\mu\text{s}/\text{cm}$ (equivalent to salinity about 0.2 ppt).

A total of nine Mindoro snake eels were collected in the winter and spring months from December to April at water temperature of 21.5°C to 23.5°C. No eel was found in the summer months from July to September at 28.4°C and 29.6°C. Of them seven eels were collected in April (Table 1). In the Hsiukuluan River, the Mindoro snake eel occurred in correspondence with the season of low water flow (Fig. 1). In other words, the occurrence of the Mindoro snake eels in the Hsiukuluan River was not all the year round but seasonal.

The nine Mindoro snake eels collected ranged between 31 cm and 53.5 cm, and consisted of two size classes at the modes of 34-37 cm and 46-49 cm in the length frequency distribution (Fig. 2). These two size classes indicated the presence of two age classes of Mindoro snake eels in the river. When the lengths of a specimen reported from the Hsiukuluan River by Hatooka and Yoshino (1998) and of three specimens from other rivers in the West Pacific (Jordan and Richardson 1908; Weber and de Beaufort 1916; Herre 1923) were also added in the length frequency distribution (Fig. 2), the two size classes became more distinctive. Apparently, the size composition of the Mindoro snake eels in the Hsiukuluan River may also occur in other rivers.

Table 1. Number of Mindoro snake eels collected, and their total length and weight (mean; ranges in parentheses) from the Hsiukuluan River, eastern Taiwan, and concurrent water temperature, water conductivity

Date	Water temperature (°C)	Conductivity (μs/cm)	Specimen		
			Number	Total length (cm)	Weight (g)
5 Dec. 2002	22.8	389	1	53.5	134
13 Feb. 2003	21.5	412	1	47.0	77
1 Apr. 2003	23.5	443	7	42.8 (31-48)	72.5 (30-106)
8 Jul. 2003	28.4	400	0	-	-
30 Sep. 2003	29.6	388	0	-	-

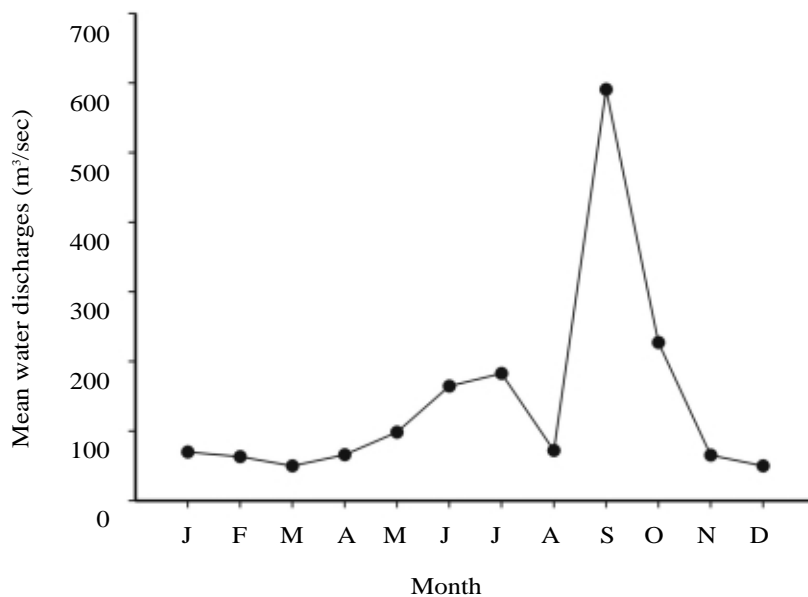


Fig. 1. Monthly mean water discharges (m³/sec) of the Hsiukuluan River measured at the Juisui Bridge, 2001 (data obtained from the Water Resources Agency of the Ministry of Economics, Taiwan).

Although their exact ages were unknown, based on their sizes they were estimated to be 2- or 3-year old juveniles and 3- or 4-year old immature adults. There were no specimens of the young year class with total length shorter than 31 cm.

Because the samples collected were still too small, a further collection was required for the age composition confirmation.

We dissected the 53.5 cm specimen collected from the Hsiukuluan River and the

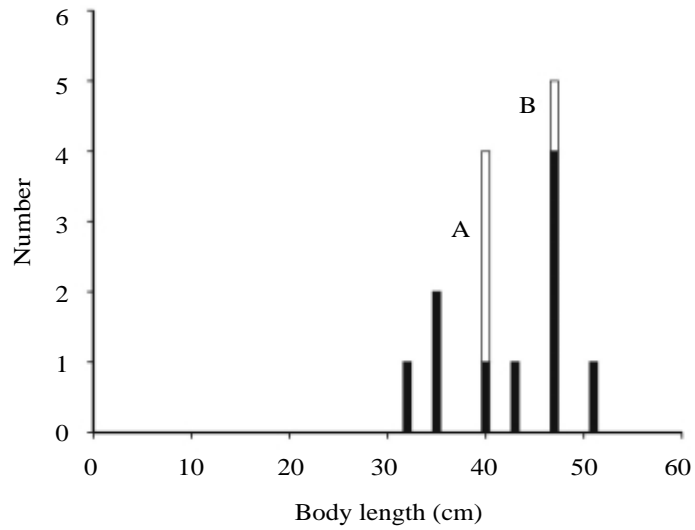


Fig. 2. A frequency distribution of total lengths of *Lamnostoma mindorum* collected from the Hsiukuluan River (solid columns) and other rivers [open column A, one specimen each from Jordan and Richardson (1908), Weber and de Beaufort (1916), and Herre (1923); open column B, one specimen from Hatooka and Yoshino (1998)].

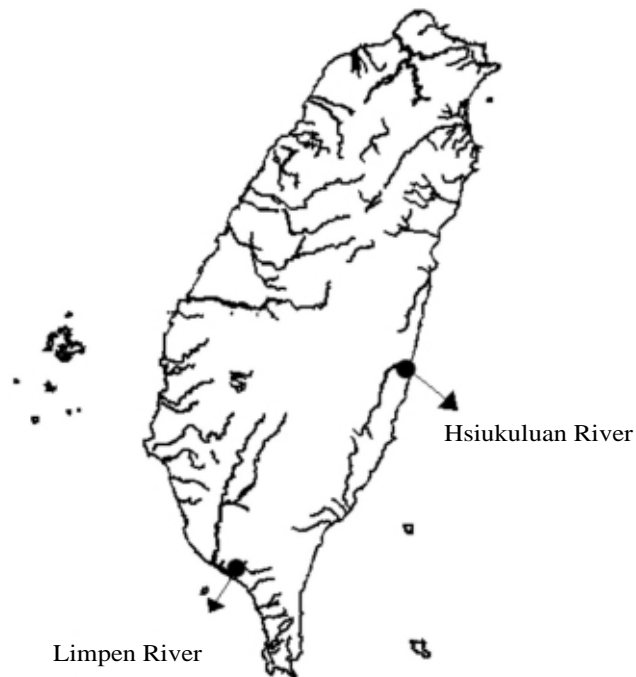


Fig. 3. Distribution of *Lamnostoma mindorum* (solid circles) in Taiwan.

40 cm specimen collected from the Limpun River (Chang and Tsai 2003) (Fig. 3). The gonads were small and string like. They were either at the immature or the resting stage of reproduction. The stomach contents were also examined. The large specimen had a partially digested goby (6.7 cm, 2.5g), and the small one had a well preserved shrimp (*Macrobranchium* sp., 5.63 cm, 2.9g). The tails of both preys in the stomachs pointed toward the eels' anus, suggesting that they were swallowed by the eels with their tails first.

Although the data collected in this study was limited, the Mindoro snake eels collected from the Hsiukuluan River showed a seasonal occurrence with two age classes of juveniles and immature adults. If we adopt the notion that the Mindoro snake eel is a catadromous fish as Chen and Fang (2001) speculated, we should have been able to find not only the two age classes (juvenile and immature adult) but also other younger classes all the year round. The seasonal occurrence of only two age classes in the Hsiukuluan River provided additional evidence for the alternative notion that the Mindoro snake eel was a peripheral freshwater fish and those individuals collected in the freshwater rivers were occasional intruders from the ocean (Chang and Tsai 2003). As the samples collected were still too small, further studies are required for confirmation of this notion.

We kept a Mindoro eel (47 cm) collected on 1 April 2003 from the Hsiukuluan River in aquarium for observation. The eel buried in sand bottom with its head or only its snout portion above the bottom surface in day time, and lay on the bottom surface in night. In the Hsiukuluan River, all specimens of the Mindoro snake eel

was collected from sand and clay bottom with an electric shocker. This bottom dwelling habit and habitat may be one of the reasons for its rarity to be found in fresh water, and also the reason that it has never been found in the sea.

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