Research paper

A New Record of the Freshwater Gobioid Genus, *Bunaka* Herre, 1927 (Pisces: Eleotridae) from Taiwan

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【Summary】

Bunaka Herre, 1927, a genus of freshwater sleeper from Taiwan is first reported here, which was previously found in the Pantropical region. This genus contains freshwater sleeper with a typical large body size. This new record, *Bunaka gyrinoides* (Bleeker, 1853), can be characterized by the following combination of features: (1) 2nd dorsal fin I/8; anal fin I/8; pectoral fins 19~20; (2) longitudinal scale rows 57~63; predorsal scale rows 38 or 39; (3) head lateral-line system lacking any canals or pores; infraobital with typical longitudinal rows *a*, *a*', *b*, *c*, and *d*; and transverse multiple series of row *f*; and (4) body with 10~12 rather-long parallel, longitudinal blackish-brown lines; pectoral fin base with 2 large blackish-brown blotches, and caudal fin base with a broad, vertical blackish-brown bar. The redescription, color image of *Bunaka gyrinoides* Bleeker, 1853 and a diagnostic key to related genera of inland-water sleepers of Taiwan are provided in this paper.

Key words: *Bunaka gyrinoides*, newly recorded genus, sleeper, freshwater fish, fish taxonomy, Taiwan.
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研究報告

記臺灣－新記錄屬之淡水塘鱧屬：丘塘鱧屬魚類 (*Bunaka* Herre, 1927)

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摘 要

本文係報告產於臺灣淡水溪流的一種新記錄魚屬及魚種之塘鱧科魚類，擬稱為：側帶丘塘鱧。本種*Bunaka gyrinoides* (Bleeker 1853)可以用下列鑑別特徵區分出來：(1)第二背鰭I/8；臀鰭I/8；胸鰭19~20；(2)縱列鱗57~63；背前鱗38~39；(3)頭部不具有任何感覺管以及開孔；眼下之頰部乳突為水平列包含有*a*, *a*', *b*, *c*, and *d*；以及具有多數聚集成橫列之*f*；(4)體側具有10~12條細長的水平列黑棕色線紋；胸鰭基部有2塊大型黑棕色斑塊；尾鰭基部具有略寬的垂直棕色斑塊。本文提供此魚種之重新描述及彩色照片，以及本省產淡水域產之相關塘鱧屬別之檢索表。

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INTRODUCTION

Freshwater fishes are important aquatic resources of forest river ecosystems. Among them, the highest species diversity is known in the members of the gobioid fauna (Chen and Fang 1999). Gobioid fishes comprise over 1/3 of species diversity among freshwater and estuarine species in Taiwan and are more abundant than cyprinoid fishes, typical primary freshwater fishes (Shen 1993, Chen and Fang 1999).

For gobioid fishes, freshwater sleepers seem to exist in lowland river systems of Taiwan. Here we first report a newly recorded gobioid genus, *Bunaka* Herre, 1927, from Taiwanese freshwaters, which is supposed to be a typical tropical genus of insular southeastern Asia. However, the genus lacks any good descriptive work of the head lateral-line system since the original description of the species and genus. We intended to redescribe the important discovery of the current species of the largest native sleeper of the inland water fauna of Taiwan and document this newly recorded genus. Color photos and a diagnostic key to all genera of inland-water sleepers in Taiwanese waters are also provided in the current work.

MATERIALS AND METHODS

All specimens of this new record were collected by hand-net and electro-fishing. Counts and measurements were made from specimens preserved in 70% ethanol. Morphometric methods follow Miller (1988), and meristic methods follow Chen and Shao (1996). Terminology of the cephalic sensory canals and free neuromast organ (sensory papillae) is from Wongrat and Miller (1991), based on Sanzo (1911). Meristic abbreviations used herein include: A, anal fin; C, caudal fin; D1 and D2, first and second dorsal fins, respectively; LR, longitudinal scale series; P, pectoral fin; PreD, predorsal scales; SDP, scale series from origin of first dorsal fin to upper pectoral origin; TR, transverse scale series from second dorsal to anal fins; and V, pelvic fin. Standard length (SL) is used throughout. Specimens are deposited at the Museum of Institute of Marine Biology, National Taiwan Ocean Univ. (NTOU P), Keelung, Taiwan.

RESULTS AND DISCUSSION

Systematics
Bunaka Herre, 1927
Type species, *Bunaka pinguis* Herre, 1927

Bunaka gyrinoides (Bleeker, 1853)
(中文名：側帶丘塘鱧) (Figs. 1, 2)

Eleotris gyrinoides Bleeker 1853: 272. (Benculen, Priaman, Indonesia).
Bunaka pinguis Herre 1927: 61. (Dumaguete R., Oriental Negros, the Philippines).

Materials examined

Male (1), NTOU P 2007-02-884, 42.5 mm SL, coll. S.B. Huang, 20 Dec. 2005, Shinpi, Linban R., Pingtung Co., Taiwan.

Females (3), NTOU P 2007-02-885, 150.0 mm SL, coll. Y.M. Ju, 2002, lower reaches of Kaoping R., Kaohsiung Co., Taiwan.

Fig. 1. *Bunaka gyrinoides*. (A) NTOU P 2007-02-886, 206.3 mm SL, freshly preserved female, Ilan County, Taiwan; (B) NTOU P-2007-02-885, 150.0 mm SL, female, Kaohsiung County, Taiwan.

NTOU P2006-02-379, 45.8 mm SL, coll. S.B. Huang, 20 Dec. 2005, Shinpi, Linban R., Pingtung Co., Taiwan. NTOU P 2007-02-886, 206.3 mm SL, coll. J.H. Huang, 22 Jan. 2006, Don-Shan, Donshan R., Langyang R. basin, Ilan Co., Taiwan.

Diagnosis

The species can be characterized from other sleepers by the following features.

(1) Meristic features: D2 I/8; A I/8; P 19~20; LR 57~63; SDP 13~15; PreD 38 or 39; (2) head lateral-line system: head lacking any canals or pores; infraorbital with typical longitudinal rows *a*, *a*', *b*, *c*, and *d*; transverse multiple series of row *f*; and (3) coloration pattern: body with 10~12 rather-long parallel, longitudinal blackish-brown lines; pectoral fin base with 2 large blackish-brown blotches, and caudal fin base with a broad, vertical blackish-brown bar.

Redescription

Body elongate and cylindrical anteriorly and somewhat compressed posteriorly. Head depressed anteriorly. Eyes small, dorsolateral. Caudal peduncle rather long. Mouth oblique and rather large, extending to vertical of orbit. Both jaws with several rows of conical teeth, lower ones larger than upper ones. Gill-opening wide, ventrally extending beyond middle vertical of opercle. Morphometric data given in Table 1.

Scales: Body with moderately small ctenoid scales; LR 57~63; TR 18~20; SDP 13~15; PreD 38~39. Predorsal region with very small scales extending to posterior margin of orbit. Head including upper cheek,

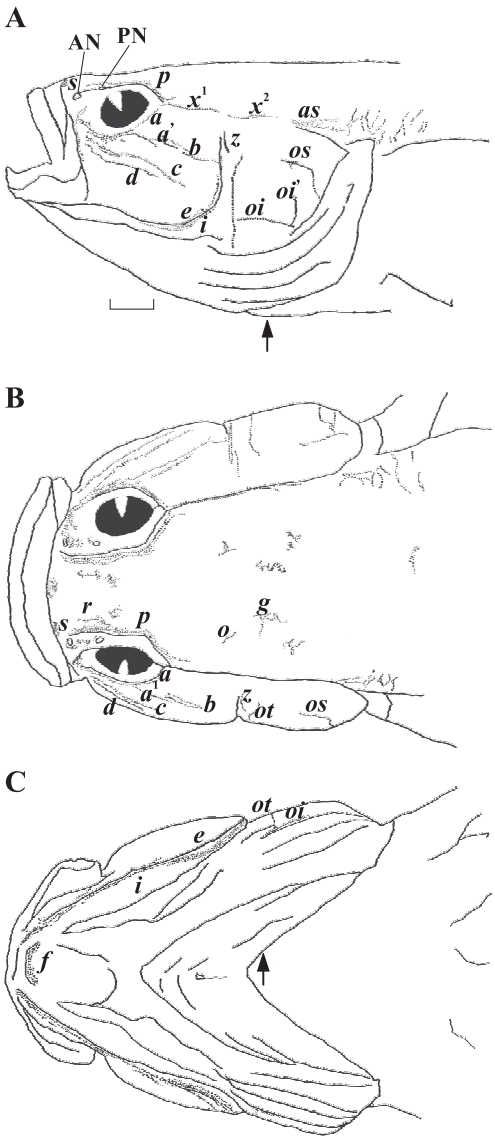

Fig. 2. Head papilla pattern of *Bunaka gyrinoides* in (A) lateral, (B) dorsal, and (C) ventral views of female (NTOU P 2007-02-885), 150.0 mm SL (scale bar = 5 mm).

opercle, and prepelvic region with small cycloid scales. All meristic data given in Table 2.

Fins: D1 VI; D2 I/8; A I/8; P 19~20; V I/5. D1 and D2 well separated; rear tip of D1 rays not extending to procurrent rays of C. P rounded, large, but rear tip not extending to vertical of anus. C rounded. V well separated, 4th branched ray longest, no frenum and also lacking a connecting membrane.

Head lateral-line and sensory papillae: Head without canal and also no canal pores. Head with very tiny papillae. Row *a* longitudinal, surrounding eye to snout. Row *a*' short and just above posterior part of row *b*. Row *b* rather long and extending to near rear margin of preopercle. Rows *c* and *d* long, and longitudinal with row *c* longer than row *d* posteriorly. Opercular rows *ot*, *oi*, and *os* present, transverse row *oi*' extending upward from rear of *oi*. Row *s* as paired patches of papillae on snout. Row *f* as condensed multiple transverse series on anterior chin.

Coloration when fresh

Body and head brown. Cheek with 2 creamy-white streaks and more-distinct, downward oblique blackish-brown bar. Snout with a blackish-brown bar. Opercle and branchiostegal membrane brown with irregularly shaped, somewhat rounded creamy-white bars. Lateral with 5 or 6 square, dark- brown blotches which are indistinct when preserved; and 10~12 rather-long parallel, longitudinal blackish-brown lines just behind pectoral fin base to caudal fin base. First dorsal fin dark brown with a medial white translucent band. Second dorsal fin brown with 4 or 5 longitudinal rows of light or gray spots. Caudal fin light brown with 3~5 vertical dark-brown bands. Caudal fin base with a broad, vertical blackish-brown bar. Anal fin light to yellowish-brown with 5 or 6 horizontal rows of dark-brown spots. Pectoral fin with 6 or 7 rows of somewhat vertical dark-brown spots. Pectoral fin base with 2 horizontal blackish-brown bars, 1 each on upper and lower 1/3 regions. Pelvic fin light brown with 6 or 7 rows of dark-brown spots.

Table 1. Morphometry of *Bunaka gyrinoides*

	Male	Female	
	n = 1	*n* = 3	
Stander length (SL) (mm)	42.5	45.8~206.3	
% SL		Range	average
Head length (HL)	29.6	31.5~35.1	31.5
Snout to 1st dorsal fin length	50.5	40.9~44.6	48.6
Snout to 2nd fin length	59.6	60.0~64.6	61.2
Snout to anus length	57.3	59.1~63.1	59.2
Snout to anal fin origin length	60.9	61.8~66.9	62.9
Prepelvic length	31.8	30.5~35.6	33.1
Caudal penduncle length	30.8	23.2~28.9	28.3
Caudal penduncle depth	12.3	23.7~14.5	12.8
1st dorsal fin base length	9.3	10.0~13.8	10.8
2nd dorsal fin base length	12.7	10.8~14.3	13.2
Anal fin base length	8.9	10.5~11.3	9.7
Caudal fin length	19.4	19.8~22.9	20.6
Pectoral fin length	21.8	20.1~22.0	21.9
Pelvic fin length	17.8	18.0~19.0	18.2
Body depth at pelvic fin origin	15.1	18.2~22.7	17.0
Body depth at anal fin origin	16.6	18.9~23.2	18.8
Body width at anal fin origin	10.7	11.4~17.8	12.8
Distance of pelvic fin origin to anus	24.6	26.2~28.5	25.9
% HL			
Snout length	22.9	21.4~27.7	24.4
Eye diameter	20.9	11.6~17.9	17.8
Cheek depth	10.3	12.4~25.4	12.0
Postorbital length	52.2	13.3~63.0	55.8
Maximum head width	48.4	53.5~73.1	51.6
Head width at upper margin of gill-opening	47.0	49.8~83.1	50.5
Bony interorbital width	12.6	11.0~25.0	14.6
Fleshy interorbital width	37.7	36.7~42.3	38.7
Lower jaw length	30.0	30.0~35.2	31.7

Table 2. Meristic counts of 4 specimens of *Bunaka gyrinoides* from Taiwan

Cat. no.	D1	D2	A	P	V	LR	TR	SDP	PreD
NTOU P2006-02-379	VI	I/8	I/8	19	I/5	60	19	13	38
NTOU P2007-02-884	VI	I/8	I/8	19 (2)[2)]	I/5	60	18	13	38
NTOU P2007-02-885	VI	I/8	I/8	20 (2)[2)]	I/5	62	20	14	39
NTOU P2007-02-886	VI	I/8	I/8	20 (2)[2)]	I/5	57	18	13	39

[1)] D1, first doesal fins; D2, 2nd dorsal fins; A, anal fin; P, pectoral fin; V, pelvic fin; LR, longitudinal scale series; TR, transverse scale series from second dorsal to anal fins; SDP, scale series from origin of first dorsal fin to upper pectoral origin; PreD, predorsal scales.

[2)] Counting from both sides of fins.

Distribution

The species has been recorded in rivers of Asia and Oceania including the tropical to subtropical Indo-Pacific regions: Sri Lanka, Indonesia, the Philippines, Malaysia, Palau, New Guinea, Admiralty Islands, Micronesia (Pohnpei, Caroline Islands), New Caledonia, and Australia (Herre 1927, Koumans 1940, Allen and Coates 1990, Kottelat et al. 1993, Randall and Lim 2000, Larson and Murdy 2001, Larson and Pidgeon 2004).

In Taiwan, the specimens of this species were first collected and reported herein from several basins including: the Kaoping River (Kaohsiung and Pingtung Counties), Linban River (Pingtung County), Don-Shan River in the Langyang River basin (Ilan County), Kankou River (Pingtung County), and Hwalian River (Hwalian County). Although the specimens in the last 2 rivers are not listed here, they have been proven to be the same species by the authors. These uncatalogued specimens have been sent to overseas ichthyologists as exchange gifts.

Remarks

The species may possibly be found in the Ryukyu Islands due to the great similarity of the amphidromous gobioid fish fauna between Taiwan and the Ryukyus except for the endemicity of the genus *Rhinogobius* species group and other gobioid fauna. Although this sleeper genus, *Bunaka*, has just been found in Taiwan, it may have previously been misidentified and overlooked as *Eleotris* spp. due to the very similar dark color pattern in field surveys if a detailed examination of the infraorbital sensory papillae was not carried out. The fish population seems to be very rare because no such large species of sleeper have been recorded to the present.

Key to 7 valid genera of inland water sleeper genera (Eleotridae) from Taiwan:

1a. No head canal 2
1b. Head canals present 3
2a. Infraorbital papillae with tranverse rows of papillae ..... *Eleotris*
2b. Infraorbital papillae with only longitudinal rows of papillae ..... *Bunaka*
3a. Head without anterior oculoscapular canal ..... *Ophieleotris*
3b. Head with anterior oculoscapular canal 4
4a. Head with a pair of interoribtal pores λ ... 5
4b. Head with a single interorbital pore λ 6
5a. Head lacking nasal pore σ, and with longitudinal rows of papillae ..... *Hypseleotris*
5b. Head with nasal pore σ, and with transverse rows of papillae ..... *Butis*
6a. Head with lateral pore β, and long anterior nasal tube extending to upper lip ..... *Bostrychus*
6b. Head without lateral pore β, and short nasal tube not extending to upper lip ..... *Guiris*

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