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THREE NEWLY RECORDED GENERA AND SPECIES OF GOBIID FISHES (TELEOSTEI: GOBIIDAE) FROM THE DONGSHA ATOLL (PRATAS ISLANDS), SOUTH CHINA SEA

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Key words: Gobiidae, new records, fish taxonomy, fish fauna, Dongsha Atoll, Taiwan.

ABSTRACT

Three newly recorded gobiid genera of coral-reef gobies have been collected and examined by scuba diving in the Dongsha Atoll, also known as the Pratas Islands, South China Sea. They are *Feia* Smith, 1959; *Sueviota* Winterbottom and Hoese, 1988; and *Trimmatom* Winterbottom and Emery, 1981. These three genera were formerly unrecorded in the Dongsha Atoll and all Taiwanese waters before this paper. One representing species was found for each gobiid genus. The diagnosis for these three newly recorded species and genera will be provided in this paper.

I. INTRODUCTION

The generally small body-sized gobiid fishes in Family Gobiidae comprise the most diverse group among marine teleost fishes (Miller [7]). Among them, the tropical and subtropical coral-reef associated gobies are the most diverse group of the species component of gobioid fishes.

In order to investigate the species diversity of gobioid fishes in the South China Sea, our research team has surveyed the fish fauna during the 2011 marine biodiversity expedition to the Dongsha Atoll, also known as the Pratas Islands, especially in the northern and eastern outside slopes of the great lagoon of Dongsha Atoll.

More recently, Chen *et al*. [4] have published a colored fish ecology guide-book of the Dongsha Atoll, including underwater visual census data of fishes by scuba diving. In their fish checklist there were 24 genera and 74 species of gobiid fishes, but some of them still lack specimen evidence. In addition, we found three newly recorded genera and species of gobioid fishes that have never been reported in the Atoll and all Taiwanese waters.

The aim of this paper is to document these three newly recorded genera and species of gobiid fishes from the Dongsha Atoll. They are *Feia* Smith, 1959 [13]; *Sueviota* Winterbottom and Hoese, 1988 [23]; and *Trimmatom* Winterbottom and Emery, 1981 [22]. Fish photos are also provided in this paper.

II. MATERIALS AND METHODS

All specimens of the newly recorded species were collected by hand-net during scuba diving. All counts and measurements were made from specimens stored in 70% ethanol after 10% formalin preservation. Morphometric methods follow Miller [7] and meristic methods follow Akihito *et al*. [1], Chen and Shao [2], Chen *et al*. [3], and Suzuki *et al*. [15]. Terminology of cephalic sensory canals and free neuromast organs (sensory papillae) follow Wongrat and Miller [24], based on Sanzo [11]. All fish specimens are deposited at the Pisces collection of National Taiwan Ocean University (NTOUP), Keelung.

Abbreviations: A, anal fin; C, caudal fin; D1 and D2, 1st and 2nd dorsal fins respectively; LR, longitudinal scale rows; P, pectoral fin; PreD, predorsal scales; TR, transverse scale rows; V, pelvic fin. All fish lengths are standard length (SL).

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Fig. 1. ***Feia nympha,*** **NTOUP-2011-06-108, 14.3 mm SL, Dongsha Atoll (Pratas Islands), South China Sea. Photograph by K. T. Chen.**

III. TAXONOMY

Family GOBIIDAE
Feia Smith, 1959

Type species: *Feia nympha* Smith, 1959: 206 [13]
Diagnostic characters of genus: (1) five branchiostegal rays; (2) fin rays: D1 VI, D2 I/7-10, A I/7-9, P 14-18; (3) squamation: LR 18-27 (scales only on caudal peduncle varied to covered all lateral trunk); (4) gill-opening restricted, extending only about vertical line at posterior 2/3 region of opercle; and (5) head lateral-line system: no canal pore to reduced canal pattern; typically reduced, longitudinal papillae pattern.
Distribution: Indo-West Pacific.
Remarks: There are 4 nominal, valid species in the Indo-West Pacific including: the type species *Feia nympha* Smith, 1959 [13] as well as 3 other species: *Feia nota* Gill and Mooi, 1999 [5]; *Feia ranta* Winterbottom, 2003 [20]; and *Feia dabra* Winterbottom, 2005 [21]. The species of genus can exist from 2 m to 25 m water depth of ecological habitats of coral-reef debris, holes and sandy bottom [5, 13, 20, 21].

Feia nympha Smith, 1959

Feia nympha Smith, 1959: 206 [13] (Pinda, Mozambique).
Feia nympha, Gill and Mooi, 1999: 369 [5]; Akihito *et al*. in Nakabo, 2002: 1249 [8]; Winterbottom, 2003: 101 [20].

Material examined:
NTOUP-2011-06-108, 14.3 mm SL, coll. K.T. Chen *et al*., June 20, 2011, GPS 20° 43' 52.93" N 116°42' 24.01" E, 15-20 m depth, northwestern region of lagoon, Dongsha Atoll (Pratas Islands), South China Sea, Taiwan.

Diagnosis. This species can be well distinguished from other congeners by the following unique combination of features:

(1) Fin rays: D1 VI; D2 I/9; A I/8; P 14; V I/5. D1 without filamentous rays.
(2) Squamation: LR 20; PreD 0. Scales extending anteriorly to middle of body. Head, predorsal region and anterior part of trunk naked.
(3) Gill-opening: restricted, extending only to vertical line at posterior 2/3 region of opercle.
(4) Body proportion: all morphometric data shown in Table 1.
(5) Head lateral-line system: Head canals: No head canal pores. **Sensory papillae:** Overall infraorbital papillae pattern. Rows *b* and *d* with densely set papillae. Row *f* as long longitudinal papilla row.
(6) Colouration: Body generally creamy yellow, with many tiny irregular brown spots. Dorsum with several brown cross-bars. Caudal fin base with a larger brown spot. Dorsal half of head with tiny rows of brown spots, ventral half of head yellowish. Second dorsal fin with many oblique brown spots. Pectoral fin base yellowish. Caudal fin translucent with many tiny brown spots.

Distribution:
Indo-West Pacific, including the Red Sea. This species was first found in Dongsha Atoll (Pratas Islands), South China Sea. However, it has not yet been found in Taiwanese waters.

Sueviota Winterbottom and Hoese, 1988

Type species: *Sueviota lachneri* Winterbottom and Hoese, 1988 [23]
Diagnostic characters of genus: (1) five branchiostegal rays; (2) fin rays: D1 VI, D2 I/8-10, A I/7-9, P 16-19; (3) squamation: LR 24-27 (scales covered all lateral trunk), predorsal region entirely naked; (4) gill-opening moderate, extending ventrally to about vertical line at midline of opercle; and (5) head lateral-line system: no canal pore to reduced canal pattern with presence of both anterior and posterior oculoscapular canals, but lacking preopercular canal; typically brief and reduced, longitudinal papillae pattern.
Distribution: Indo-West Pacific.
Remarks: There are 4 nominal, valid species in the Indo-West Pacific including: the type species: *Sueviota lachneri* Winterbottom and Hoese, 1988 [23] as well as 3 other species: *Sueviota aprica* Winterbottom and Hoese, 1988 [23], *Sueviota atrinasa* Winterbottom and Hoese, 1988 [23] as well as *Sueviota larsonae* Winterbottom and Hoese, 1988 [23]. The most species of genus can exist from 8 m to 48 m water depth of ecological habitats of coral-reef caves and holes except the deeper species, *S. larsonae* found from 40 m up to 82 m depth [23]. Sunobe and Shinomyia [14] have ever documented the reproduction behavior of *S. lachneri* as “the entire reproductive sequence consisted of nest preparation by a male, courtship behaviors, nest entry by a female, spawning, and paternal care until the hatching of eggs”.

Sueviota lachneri Winterbottom and Hoese, 1988

Sueviota lachneri Winterbottom and Hoese, 1988: 9 [23] (Drop-off on east side of Isle Poule, Salomon Atoll, Chagos Archipelago, central Indian Ocean).
Sueviota lachneri, Nakabo, 2000: 1184 [8]; Akihito *et al*. in

Fig. 2. ***Sueviota lachneri,*** **NTOUP-2011-07-222, 16.2 mm SL, Dongsha Atoll (Pratas Islands), South China Sea. Photograph by K. T. Chen.**

Fig. 3. ***Trimmatom nanus,*** **NTOUP-2011-07-203, 8.7 mm SL, Dongsha Atoll (Pratas Islands), South China Sea. Photograph by K. T. Chen.**

Nakabo, 2002: 1184 [8]; Randall, 2005: 552 [9]; Hoese and Larson, 2006: 1685 [6].

Material examined:
NTOUP-2011-07-222, 3 specimens, 13.6-16.2 mm SL, coll. I-S. Chen *et al*., July 7, 2011, GPS 20°38' 30.21" N 116°54' 47.42" E, 10-15 m depth, eastern outside slope of great lagoon, Dongsha Atoll (Pratas Islands), South China Sea, Taiwan.

Diagnosis.
This species can be well distinguished from other congeners by the following unique combination of features:

(1) Fin rays: D1 VI; D2 I/9; A I/8; P 16; V I/5. Rear tips of D2 and A do not extend to procurrent rays of C.
(2) Squamation: LR 25-26; TR 6; PreD 0.
(3) Gill-opening: Moderate, extending ventrally to vertical line at midline of opercle.
(4) Body proportion: All morphometric data shown in Table 1.
(5) Head lateral-line system: **Head canals:** Anterior oculoscapular canal present with singular pore λ and κ, terminating at pore α but lacking pore β. Posterior oculoscapular canal with two terminal pores γ and ε. No preopercular canal. **Sensory papillae:** Rather brief infraorbital longitudinal papilla pattern. Both longitudinal papilla rows *a* and *b* with 2-4 papillae.
(6) Colouration: Body generally pale to light pinkish. Anterior nostrils orange red with distal black rim. Iris and both lips orange red. Cheek with several transverse orange red bars. Pectoral fin with two horizontal orange red bars. Seven inner transverse orange red bands from anal fin origin to caudal fin base. Dorsals with several rows of orange red spots. Caudal fin translucent with 4 main vertical rows of red spots. Anal fin grayish.

Distribution:
Indo-West Pacific. This species was first found in Dongsha Atoll (Pratas Islands), South China Sea.

Trimmatom Winterbottom and Emery, 1981

Type species: *Trimmatom nanus* Winterbottom and Emery, 1981 [22]

Diagnostic characters of genus: (1) five branchiostegal rays; (2) fin rays: D1 VI, D2 I/8-12, A I/7-11, P 15-19; (3) LR 0-27 (body no scales varied to body scales covered all lateral trunk), predorsal region entirely naked; (4) gill-opening rather wide, extending ventrally forward about vertical line slightly beyond preopercle; and (5) head lateral-line system: no any head canal and pore; typically brief and reduced, longitudinal papillae pattern.
Distribution: Indo-West Pacific.
Remarks: There are 7 nominal, valid species in the Indo-West Pacific including: the type species *Trimmatom nanus* Winterbottom and Emery, 1981 [22] as well as 6 other species:

Trimmatom macropodus Winterbottom, 1989 [16], *Trimmatom eviotops* (Schultz, 1943) [12], *Trimmatom offucius* Winterbottom and Emery, 1981 [22], *Trimmatom pharus* Winterbottom, 2001 [18], *Trimmatom sagma* Winterbottom, 1989 [16], and *Trimmatom zapotes* Winterbottom, 1989 [16]. The species member of genus (the type species) comprises a smallest coral-reef benthic fish in the World [22]. The species of genus mostly exist from 3 m to 50 m water depth of ecological habitats of coral-reef caves and holes [16, 18, 22].

Trimmatom nanus Winterbottom and Emery, 1981

Trimmatom nanus Winterbottom and Emery, 1981: 143 [22] (Salomon Atoll, Chagos Archipelago, northern Indian Ocean, 5°18'04" S, 72°15'44" E, depth 18-25 meters).
Trimmatom nanus, Winterbottom, 1989: 1405 [16]; Winterbottom, 1990: 254 [17]; Winterbottom, 2001: 20 [18]; Winterbottom, 2002: 49 [19]; Randall *et al*., 2002: 162 [10]; Randall, 2005: 555 [9]; Hoese and Larson, 2006: 1691 [6].

Material examined:
NTOUP-2011-07-203, 4 specimens, 7.1-8.7 mm SL, coll. I-S. Chen *et al*., July 7, 2011, GPS 20°38' 30.21" N 116°54' 47.42" E, 12-15 m depth, eastern outside slope of great lagoon, Dongsha Atoll (Pratas Islands), South China Sea, Taiwan.

Diagnosis.
This species can be well distinguished from other congeners by the following combination of features:

Table 1. Morphometry of three newly recorded gobiid fishes in Dongsha Atoll, South China Sea.

	Feia nympha	*Sueviota lachneri*	*Trimmatom nanus*
Cat. No.	NTOUP-2011-06-108	NTOUP-2011-07-222	NTOUP-2011-07-203
No. of specimen(s)	1	3	4
Standard length (SL)	14.3 mm	13.6-16.2 mm	7.1-8.7 mm
% in SL			
Head length	30.4	30.3-31.2 (30.8)	27.7-29.9 (28.7)
Predorsal length	42.0	37.7-38.3 (38.0)	42.5-441.(43.6)
Snout to 2nd dorsal length	62.4	59.4-61.2 (60.1)	61.4-63.1 (62.3)
Snout to anus	62.1	57.0-60.7 (58.8)	57.7-61.1 (59.2)
Snout to anal fin origin	68.8	63.9-65.7 (65.0)	61.2-64.4 (62.7)
Prepelvic length	30.2	30.6-32.1 (31.5)	28.5-32.4 (30.2)
Caudal peduncle length	13.8	16.5-20.9 (18.9)	13.4-16.0 (14.6)
Caudal peduncle depth	13.4	13.0-13.3 (13.2)	11.3-12.4 (11.8)
1st dorsal fin base	16.0	17.1-19.1 (18.0)	17.6-19.2 (18.7)
2nd dorsal fin base	24.6	22.7-26.0 (24.5)	24.7-30.0 (27.5)
Anal fin base	20.4	18.3-20.1 (19.2)	18.8-23.5 (22.1)
Caudal fin length	37.4	32.6-35.1 (33.8)	27.8-30.7 (28.7)
Pectoral fin length	28.8	29.1-36.2 (32.8)	21.1-28.2 (25.0)
Pelvic fin length	20.7	32.1-35.6 (34.4)	36.7-39.9 (37.7)
Body depth at pelvic fin origin	14.0	19.7-21.8 (20.8)	17.6-23.6 (19.2)
Body depth at anal fin origin	15.7	18.1-19.9 (18.9)	14.3-17.9 (15.7)
Body width at anal fin origin	10.7	8.7- 9.5 (9.1)	7.3- 9.0 (8.1)
Pelvic fin origin to anus	31.4	28.3-31.6 (29.9)	28.0-31.5 (30.1)
% in HL			
Snout length	32.0	25.1-25.7 (25.4)	20.8-22.8 (22.2)
Eye diameter	17.5	28.0-30.8 (29.8)	35.7-39.1 (37.0)
Cheek depth	31.1	32.2-35.1 (33.3)	31.5-35.0 (32.8)
Postorbital length	63.4	61.2-64.3 (62.4)	54.9-61.9 (57.6)
Head width at maximum	69.1	57.5-60.2 (59.3)	50.6-58.4 (53.7)
Head width at upper gill-opening	45.9	34.7-38.8 (36.3)	
Bony interorbital width	10.6	2.3-3.1 (2.8)	
Fleshy interorbital width	23.3	11.7-14.5 (13.3)	8.0-11.8 (9.6)
Lower jaw length	43.5	44.0-48.2 (46.2)	42.1-49.1 (46.4)

(1) Fin rays: D1 VI; D2 I/9; A I/9; P 16; V I/5.
(2) Squamation: LR 0; PreD 0. Entire head and body naked.
(3) Gill-opening: Rather wide, extending ventrally forward to vertical line slightly beyond preopercle.
(4) Body proportion: All morphometric data shown in Table 1.
(5) Head lateral-line system: Head canals: No head canal pores. **Sensory papillae:** Rather brief infraorbital longitudinal papilla pattern. Both longitudinal papillae rows *a* and *b* with 2-3 papillae. Row *p* surrounding orbit, toward dorsal side of snout.
(6) Colouration: Body with dense black melanophores on anterior body. Generally red in adults but purple black in young individuals. Some translucent marks arranged dorsally and ventrally. Iris bright red. Second dorsal, anal and anal fins translucent with red unbranched rays in adults.

Distribution:
Indo-West Pacific, including the Red Sea. This species was first found in Dongsha Atoll, South China Sea. However, it has not yet been found in Taiwanese waters.

Remarks:
This species is still one of the smallest, benthic, coral-reef associated fishes in the world (Winterbottom and Emery [22]). Our specimens collected here provide the northernmost record of this species.

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