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FIRST RECORD OF *THRISSINA SAMAM* (TELEOSTEI: CLUPEIFORMES: ENGRAULIDAE) FROM PHUKET, THAILAND, WITH A KEY TO THAI SPECIES OF *THRISSINA*

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ABSTRACT

A single specimen of *Thrissina samam* (Montrouzier, 1857), collected from Phuket, Andaman Sea coast of Thailand, was recently found in the fish collection of the Natural History Museum of Denmark, University of Copenhagen. Due to past taxonomic uncertainty, the distribution of the species, which had not previously been recorded from Thailand, remains unclear. The present specimen, which therefore represents the first record from coastal Thailand, is described in detail. In addition, a key to species of the genus *Thrissina* recorded from Thai waters is provided.

Keywords: Actinopterygii, Andaman Sea, Clupeomorpha, distribution, *Thryssa baelama*, taxonomy

INTRODUCTION

The Indo-Pacific engraulid genus *Thrissina* (previously regarded as *Thryssa*: KOTTELAT, 2013) includes at least 37 valid species (WONGRATANA, 1983, 1987; WHITEHEAD *ET AL.*, 1988; WONGRATANA *ET AL.*, 1999; GILL *ET AL.*, 2018; HATA & MOTOMURA, 2019; HATA *ET AL.*, 2020, 2021, 2022, 2023a, 2023b; HATA, 2022; HATA & LAVOUÉ, 2024), some of which are abundantly caught and consumed as food or used for fish bait (WONGRATANA, 1980b; MYERS, 1999; KIMURA, 2009; TAKI *ET AL.*, 2021). Among of them, specimens with a short maxilla (posteriorly not reaching to the preopercle posterior margin), fewer than 18 ventral scutes, and scutes absent anterior to the pectoral fin, had been regarded as a single, widely distributed Indo-Pacific species, *Thrissina baelama* (Fabricius, 1775) (e.g., WHITEHEAD *ET AL.*, 1988; WONGRATANA *ET AL.*, 1999). However, HATA *ET AL.'s* (2023a) re-evaluation of such specimens recognized at least five valid, allopatrically distributed species [true *T. baelama* (Red Sea), *Thrissina evermanni* (Jordan & Seale, 1906) (Fiji, Tonga, and Samoa), *Thrissina polynemoides* (Günther, 1868) (east coast of Africa and Madagascar), *Thrissina samam* (Montrouzier, 1857) (western Pacific from Ryukyu Archipelago, Japan to Papua New Guinea), and *Thrissina tuberculosa* (Lacepède 1803) (Mauritius)]. None, however, had been recorded from Thai waters. Recently, a specimen collected from Phuket, Andaman Sea coast of Thailand, was discovered in the fish collection of the Natural History Museum of Denmark, University of Copenhagen, and identified as *T. samam*. Because it represents the first record of the species from waters off Thailand, it is described in detail and an identification key to species of *Thrissina* recorded from Thailand provided.

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MATERIALS AND METHODS

Methods for counts and proportional measurements follow HATA & LAVOUÉ (2024), with an additional measurement "1SMX length" defined as the distance between the anterior and posterior tips of the first supramaxilla. All measurements were made with digital calipers to the nearest 0.01 mm. "Pelvic scute" refers to a scute associated with the pelvic girdle, and "prepelvic scute", "postpelvic scute" and "predorsal scute" to hard spine-like scutes anterior to the pelvic scute, posterior to the pelvic scute, and anterior to the dorsal-fin origin, respectively. Abbreviations are as follows: SL, standard length; D–P1, distance from dorsal-fin origin to pectoral-fin insertion; D–P2, distance from dorsal-fin origin to pelvic-fin insertion; D–A, distance between dorsal- and anal-fin origins; P1–P2, distance between pectoral- and pelvic-fin insertions; P2–A, distance from pelvic-fin insertion to anal-fin origin. Counts and measurements (expressed as percentages of SL) are given in Table 1. Institutional codes follow SABAJ (2020). Nomenclature and authorship of the genus *Thrissina* follows KOTTELAT (2013).

RESULTS

Thrissina samam (Montrouzier, 1857)

(Fig. 1; Table 1)

Material examined: ZMUC P.18625, 74.2 mm SL, Patong Beach, Phuket, Thailand, 18 Jan. 1972.

Description.—Counts and measurements, expressed as percentages of SL, given in Table 1. Body laterally compressed, oblong, deepest at dorsal-fin origin. Dorsal profile of body gently rising from snout tip to dorsal-fin origin, thereafter gradually lowering to caudal-fin base. Ventral profile of body lowering from snout tip to point just below posterior tip of opercle, subsequently nearly straight and parallel with body axis to anal-fin origin. Ventral profile thereafter elevated to caudal-fin base. Abdomen somewhat rounded, covered with 7 and 8 spine-like posteriorly projecting scutes from region between pectoral fins to pelvic scute, and pelvic scute to anus, respectively. Anus located just anterior to anal-fin origin. No scutes present on ventral surface of body anterior to pectoral fins. Snout tip rounded, projecting; its length less than eye diameter. Mouth large, inferior, ventral to body axis, extending backward beyond posterior margin of eye. Maxilla comparatively short, its posterior tip pointed, slightly beyond anterior margin of preopercle. Lower jaw slender. Uniserial conical teeth on both jaws. Two or three rows of small conical teeth on palatine. Fine teeth densely present on pterygoid. Several small conical teeth on vomer. No teeth on dorsal surface of hyoid arch. Several rows of blunt conical teeth on dorsal surfaces of basihyal and basibranchial. Eye large, round, covered with thin adipose eyelid, positioned laterally on head dorsal to horizontal through pectoral-fin insertion, visible in dorsal view. Pupil round. Orbit longitudinally elliptical. Nostrils close to each other, anterior to orbit. Posterior margin of preopercle rounded, smooth. Subopercle and opercle with smoothly rounded posterior margins. Gill membrane without serrations. Interorbital space flat, width less than eye diameter. Pseudobranchial filaments present, not covered with skin; Longest filament shorter than eye diameter. Gill rakers long, slender, rough, visible from side of head when mouth opened. Small asperities on both surfaces and inner edge of

Figure 1. Preserved specimen of *Thrissina samam* collected from Phuket, Andaman Sea, Thailand (ZMUC P.18625, 74.2 mm standard length). Photographed by H. Carl (ZMUC).

gill rakers. Outer edge of gill rakers smooth. Isthmus muscle long, reaching anteriorly to posterior margin of gill membranes. Urohyal hidden by isthmus muscle (not visible without dissection). Gill membranes on each side joined distally, most of isthmus muscle exposed (not covered by gill membrane). Body scales cycloid, not deciduous (most scales remaining), with numerous vertical grooves. Predorsal scales in a single median row. Head scales absent. Fins scaleless, except for broad triangular sheath of scales on caudal fin. Elongated sheath-like scales on bases of dorsal and anal fins. Triangular axillary scales present on insertions of pectoral and pelvic fins. Pectoral fin triangular, dorsal, ventral, and posterior margins nearly straight; posterior tip pointed, not reaching to pelvic-fin insertion; fin insertion slightly anterior to posterior tip of opercle; dorsalmost fin ray unbranched, other rays branched. Pelvic fin shorter than pectoral fin, insertion anterior to dorsal-fin origin; posterior tip pointed, reaching to eighth dorsal-fin ray origin, but not to anus when depressed; anteriormost ray unbranched, other rays branched. Pelvic fin triangular, anterior, dorsal, and posterior margins almost linear. Dorsal fin triangular, anterior and posterior margins relatively straight; fin origin posterior to end of pelvic-fin base; posterior tip when depressed extending past anal-fin origin; three anteriormost rays unbranched, other rays branched. Single spine-like scute located just anterior to dorsal fin origin. Outer profile of anal fin lowering from fin origin to tip of fifth ray, thereafter gently rising to posterior tip of last ray; anterior and lower margin nearly straight; fin origin posterior to posteriormost point of dorsal-fin base. Caudal fin forked; posterior tips of both lobes pointed; dorsal and ventral margins of both lobes almost linear.

Color of preserved specimen.—Body uniformly light brown. Lateral surface of head silver. Melanophores densely scattered on dorsum and lateral surface of body, reaching to level of lower margin of eye. Narrow non-pigmented ring-like band surrounding anterior part of snout. All fins transparent. No melanophores on lateral surface of head, mouth roof, gill rakers, gill arch, gill filaments, and fin rays of pectoral, pelvic, and anal fins. Melanophores scattered along fin rays of dorsal and caudal fins, but absent on lower margin of caudal fin. Melanophores scattered on lateral surface of basibranchial and inner surfaces of hyoid arch and upper part of opercle.

Table 1. Meristics and measurements, expressed as percentages of standard length, of the specimen of *Thrissina samam* collected from Phuket, Thailand.

	ZMUC P.18625		
Standard length (SL; mm)	74.2	As % of SL	
Dorsal-fin rays (unbranched)	3	Head length	26.8
Dorsal-fin rays (branched)	11	Body depth	24.4
Anal-fin rays (unbranched)	4	Predorsal-fin length	48.4
Anal-fin rays (branched)	29	Snout tip to pectoral-fin insertion	28.0
Pectoral-fin rays (unbranched)	1	Snout tip to pelvic-fin insertion	43.9
Pectoral-fin rays (branched)	13	Preanal-fin length	64.8
Pelvic-fin rays (unbranched)	1	Dorsal-fin base length	10.5
Pelvic-fin rays (branched)	6	Anal-fin base length	26.7
Caudal-fin rays	19	Caudal-peduncle length	10.0
Gill rakers on 1st gill arch (upper)	16	Caudal-peduncle depth	10.5
Gill rakers on 1st gill arch (lower)	20	D–P1	30.5
Gill rakers on 1st gill arch (total)	36	D–P2	24.1
Gill rakers on 2nd gill arch (upper)	13	D–A	28.1
Gill rakers on 2nd gill arch (lower)	21	P1–P2	17.4
Gill rakers on 2nd gill arch (total)	34	P2–A	21.3
Gill rakers on 3rd gill arch (upper)	11	Pectoral fin length	17.3
Gill rakers on 3rd gill arch (lower)	13	Pelvic fin length	13.0
Gill rakers on 3rd gill arch (total)	24	Maxilla length	21.3
Gill rakers on 4th gill arch (upper)	10	Mandibular length	19.4
Gill rakers on 4th gill arch (lower)	11	Supramaxilla end to maxilla end	2.6
Gill rakers on 4th gill arch (total)	21	Orbit diameter	7.4
Gill rakers on posterior face of 3rd gill arch	7	Eye diameter	6.1
Prepelvic scutes	7	Snout length	4.6
Postpelvic scutes	8	Interorbital width	6.5
Total ventral scutes	15	Postorbital length	15.8
Branchiostegal rays	12	1SMX	4.8
Longitudinal scales of scale rows	34	2SMX	6.8
Transverse scales	8		

Abbreviations: D–P1 (distance from dorsal-fin origin to pectoral-fin insertion); D–P2 (distance from dorsal-fin origin to pelvic-fin insertion); D–A (distance between origins of dorsal and anal fins); P1–P2 (distance between insertions of pectoral and pelvic fins); P2–A (distance between pelvic-fin insertion and anal-fin origin): 1SMX (first supramaxilla length); 2SMX (second supramaxilla length)

Distribution.—*Thrissina samam* is distributed in the eastern Indian Ocean (Andaman-Nicobar Islands, Phuket, and west coast of Sumatra) and western Pacific, from the Ogasawara Islands and Ryukyu Archipelago, Japan, to Palau and New Britain, Papua New Guinea (HATA *ET AL.*, 2023a; this study).

DISCUSSION

Identification

The specimen from Phuket is assignable to the genus *Thrissina*, determined by WHITEHEAD *ET AL.* (1988) and WONGRATANA *ET AL.* (1999: as *Thryssa*) due to the presence of sharply keeled pre-pelvic (7) and post-pelvic (7) scutes on the abdomen, the dorsal and anal fins with 14 and 33 soft rays, respectively, a predorsal scute, the pectoral fin without a filamentous extension, and small conical teeth on the jaws. Furthermore, the specimen closely matched the following diagnostic features of *T. samam* given by HATA *ET AL.* (2023a): short maxilla, 21.3% of SL, its posterior tip not reaching to posterior margin of preopercle; elongate first supramaxilla, its length 70.3% of second supramaxilla; lower jaw 19.4 % of SL; abdomen covered with 7 + 8 = 15 keeled scutes, but scutes absent anterior to pectoral fin; dorsal fin without distinct blotches; caudal-fin depth 10.5% of SL and length 10.0% of SL; predorsal-fin length 48.4% of SL; preanal-fin length 64.8% of SL; P2–A 21.3% of SL; pectoral fin 17.3% of SL; pelvic fin 13.0% of SL; and body depth 24.4% of SL. Other meristic and morphometric characters of the specimen, including gill-raker counts on each gill arch, closely matched those of *T. samam* given by HATA *ET AL.* (2023a).

Distributional Records of *T. samam*

Long regarded as a junior synonym of *T. baelama*, *T. samam* has previously been considered a widely distributed Indo-Pacific species (WHITEHEAD *ET AL.*, 1988; WONGRATANA *ET AL.*, 1999). Although generic revisions by WHITEHEAD *ET AL.* (1988) and WONGRATANA *ET AL.* (1999) included the Andaman Islands (probably based on BMNH 1870.6.7.11, collected from Port Blair and listed in WONGRATANA [1980a]), neither included Thai waters in the distribution of *T. baelama*. Moreover, WONGRATANA *ET AL.* (1999) stated that no record of *T. baelama* existed for Thailand. Although HATA *ET AL.* (2023a) redescribed *T. samam* as a valid species, he also omitted Thailand from its distributional range. Therefore, the present specimen represents the first record of *T. samam* from that region.

Species of the Genus *Thrissina* in Thailand

WONGRATANA (1980b) listed six species of the genus [(as *Thryssa*) i.e., *Thrissina dussumieri* (Valenciennes, 1848), *Thrissina hamiltonii* (Grey, 1835), *Thrissina kammalensis* (Bleeker, 1849), *Thrissina mystax* (Bloch and Schneider, 1801), *Thrissina setirostris* (Broussonet, 1782), and *Thrissina spinidens* (Jordan and Seale, 1925)] without providing any registration numbers of voucher specimens or references. WHITEHEAD *ET AL.* (1988), a taxonomic revision of the genus, following WONGRATANA (1980b), stated that six species are distributed in Thai waters. However, in recent years, taxonomic research on the genus has progressed, the species-level classification and the correspondence between the species, and scientific

names, have been changed significantly. Therefore, in this study, Thai waters are divided into the Gulf of Thailand (Pacific coast) and the Andaman Sea (Indian Ocean coast), and distribution records of species of the genus based on specimens from each region are examined. As a result, nine species, including *T. samam*, are confirmed to be distributed in Thailand, and distributional records of each species in Thai waters are indicated. The distributional records of each species are shown below. In addition, *Thrissina valenciennesi* (Bleeker, 1866), a species previously regarded as a junior synonym of *T. mystax* (WHITEHEAD *ET AL.*, 1988; WONGRATANA *ET AL.*, 1999), has been recorded from Myanmar and Indonesian waters (HATA & LAVOUÉ, 2024), and likely occurs in Thai waters as well.

Thrissina aurora Hata, Lavoué, Chungthanawong and Motomura, 2023

Region: Andaman Sea
Remarks.—The species was described by HATA *ET AL.* (2023) based on a single specimen (THNHM-F 021939) collected from Phuket and molecular evidences from Ranong. It has not been recorded from anywhere else so far.

Thrissina dussumieri (Valenciennes, 1848)

Region: Andaman Sea (HATA *ET AL.*, 2024b); Gulf of Thailand (SIRIMONTAPORN, 1984; HATA *ET AL.*, 2024a)

Thrissina kammalensis (Bleeker, 1849)

Region: Gulf of Thailand (SIRIMONTAPORN, 1984; this study)
Remarks.—WHITEHEAD *ET AL.* (1988) stated that within the Indian Ocean, this species has only been recorded from Penang, Malaysia. Although WONGRATANA *ET AL.* (1999) and SATAPOOMIN (2011) stated that the species is distributed in Thai coast of Andaman Sea. However, they provided no literature or voucher specimens, it is unclear whether this species is distributed in that area.

Thrissina katana Hata, Lavoué and Motomura, 2022

Region: Gulf of Thailand (KIMURA, 2013 [as *Thryssa hamiltonii*]; HATA *ET AL.*, 2022)
Remarks.—HATA *ET AL.* (2022) indicated that the species previously regarded as *Thrissina hamiltonii* (Grey, 1835) (e.g., WHITEHEAD *ET AL.*, 1988; WONGRATANA *ET AL.*, 1999) includes two species, their new species *T. katana* distributed in the western Pacific including the Gulf of Thailand, and *T. hamiltonii* in the eastern Indian Ocean to Indonesia. Subsequently, HATA *ET AL.* (2023b) indicated that the applicable name for HATA *ET AL.'s* (2022) *T. hamiltonii* should be *T. malabarica* and the species previously treated as *T. malabarica* should, instead be treated as *Thrissina cuvieri* (Swainson, 1839).

Thrissina malabarica (Bloch, 1795)

Region: Andaman Sea (KIMURA, 2009; HATA *ET AL.*, 2022 [as *T. hamiltonii*])
Remarks.—See the Remarks of *T. katana*.

Thrissina porava (Bleeker, 1849)

Region: Andaman Sea; Gulf of Thailand (Hata & Lavoué, 2024; Hata *et al*., 2024a)
Remarks.—Hata & Lavoué (2024) showed that the Thai species previously regarded as *T. mystax* (e.g., Whitehead *et al*., 1988; Wongratana *et al*., 1999) should, in fact, be treated as *T. porava*.

Thrissina setirostris (Broussonet, 1782)

Region: Andaman Sea (Hata *et al*., 2024b); Gulf of Thailand (Sirimontaporn, 1984; Matsunuma, 2013; Hata *et al*., 2024a)

Thrissina spinidens (Jordan and Seale, 1925)

Region: unknown (probably in Andaman Sea)
Remarks.—The species was described by Jordan & Seale (1925) based on the holotype collected from Thailand (MCZ 4413) and paratypes from Calcutta (currently Kolkata), India and Rangoon (currently Yangon), Myanmar. Since they did not provide a detailed locality of the holotype, the distribution of this species in Thailand is unknown. However, based on the localities of paratypes and other records from the northeastern Indian Ocean (Whitehead *et al*., 1988; Psomadakis *et al*., 2020), this species is thought to be distributed in the Andaman Sea.

Key to Species of *Thrissina* Recorded from Thailand and Adjacent Waters

1a. Maxilla short, posteriorly not extending beyond posterior margin of preopercle; ventral scutes < 17 ..... ***T. samam*** [a]
1b. Maxilla long, posteriorly extending at least beyond opercular margin; ventral scutes > 20 2

2a. Maxilla comparatively short, posteriorly not reaching to pectoral-fin insertion 3
2b. Maxilla long, posteriorly reaching at least to pectoral-fin insertion 7

3a. 1LGR > 25 (usually > 28); saddle-like black blotch on nape ..... ***T. kammalensis*** [b]
3b. 1LGR < 16; no saddle-like blotch on dorsum 4

4a. Ventral scutes 23; scale rows in longitudinal series 34; body depth > 38% of SL ..... ***T. aurora*** [c]
4b. Ventral scutes ≥ 25; scale rows in longitudinal series ≥ 40; body depth < 33% of SL 5
5a. No dark lines on dorsum; black blotch on cleithrum absent or indistinct; branched anal-fin rays ≥ 40; teeth on both jaws enlarged ..... ***T. spinidens*** [b]
5b. Paired dark lines on dorsum; distinct black blotch present on cleithrum; branched anal-fin rays ≤ 38; teeth on both jaws not enlarged 6

6a. 1TGR 20–25; vertebrae 45–47 (modally 46); body depth usually < 30% of SL; pectoral fin sometimes jet black ..... ***T. katana*** [d]
6b. 1TGR 18–22; vertebrae 44–46 (modally 45); body depth > 28% of SL; pectoral fin without melanophores (rarely black) ..... ***T. malabarica*** [d]

7a. Maxilla very long, posteriorly reaching to at least halfway along pectoral fin towards pelvic-fin insertion 8
7b. Maxilla comparatively long, just reaching or slightly short of posteriormost part of pectoral fin base 9
8a. 1LGR 10–12; ventral scutes 25–28; maxilla posteriorly well beyond pelvic-fin insertion in adults ..... ***T. setirostris*** [b]
8b. 1LGR 17–19; ventral scutes 21–24; maxilla just reaching to pelvic fin insertion in adults ..... ***T. dussumieri*** [b]

9a. 1TGR 21–25 (rarely 26); anal fin with 30–35 branched rays, its base 28.6–32.5% of SL; predorsal-fin length 53.2–56.7% of SL..... ***T. porava*** [e]
9b. 1TGR 27–32 (rarely 26); anal-fin with 34–40 branched rays, its base 35.0–39.9% of SL; predorsal-fin length 49.6–53.6% of SL..... ***T. valenciennesi*** (not yet recorded from Thailand) [e]

[a] Data based on HATA *ET AL*. (2023a); [b] WHITEHEAD *ET AL*. (1988) and WONGRATANA *ET AL*. (1999); [c] HATA *ET AL*. (2023b); [d] HATA *ET AL*. (2022; *T. malabarica* is shown as *T. hamiltonii*); [e] HATA & LAVOUÉ (2024). Abbreviations: 1LGR (lower gill rakers on 1st gill arch); 1TGR (total gill rakers on 1st gill arch).

Comparative material examined: *Thrissina kammalensis*: ANSP 87845, 3 specimens, 43.0–62.7 mm SL, Paknam, Gulf of Thailand, Thailand, 1935, coll. By R. M. de Schauensee; FRLM 58595, 74.3 mm SL, Songkhla, Thailand. *Thrissina samam*: NMW 1981, 80.1 mm SL, Port Blair, South Andaman Island, Andaman Nicobar Islands, India, 1886, coll. F. Day. NMW 15811, 89.8 mm SL, Padang, Sumatera Barat, Sumatra, Indonesia, 17 Jan. 1899. *Thrissina spinidens*: MCZ 4413, holotype of *Xetengraulis spinidens*, 170.8 mm SL, Thailand.

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