

THRISSINA ENCRASICHOLOIDES (ACTINOPTERYGII: CLUPEIFORMES: ENGRAULIDAE): FIRST RECORD FROM TAIWAN AND NORTHERNMOST RECORD OF THE SPECIESHarutaka HATA^{1*} and Keita KOEDA^{2,3}¹Center for Molecular Biodiversity Research, National Museum of Nature and Science, Amakubo, Tsukuba, Ibaraki, Japan²National Museum of Marine Biology & Aquarium, Checheng, Pingtung, Taiwan³(Present affiliation) Kuroshio Biological Research Foundation, Nishidomari, Otsuki, Kochi, Japan

Hata H., Koeda K. 2020. *Thrissina encrasicholoides* (Actinopterygii: Clupeiformes: Engraulidae): first record from Taiwan and northernmost record of the species. *Acta Ichthyol. Piscat.* 50 (1): 107–111.

Abstract. Although four species of the engraulid genus *Thrissina* (often regarded as *Thryssa*) have previously been recorded from waters around Taiwan, *Thrissina encrasicholoides* (Bleeker, 1852), known from the eastern Indian and western Pacific Oceans (north to the Philippines), has not been to date. However, two specimens (100.1 and 100.6 mm standard length) of *T. encrasicholoides* were collected from south-western Taiwan. Their morphology and fresh coloration are described, the former being largely consistent with previous descriptions of the species: short maxilla, its posterior tip blunt, slightly beyond anterior margin of preopercle; 14 or 17 keeled scutes; and one scute weakly developed and lacking a ventral edge projection, immediately behind the isthmus. The specimens represent the first record of the species from Taiwanese waters and the northernmost record of the species.

Keywords: *Thrissina baelama*, distribution, morphology, taxonomy

INTRODUCTION

Thrissina Jordan et Seale, 1925, an Indo-Pacific genus of marine and/or brackish water anchovies (Engraulidae), comprises 26 valid species (Whitehead et al. 1988, Wongratana et al. 1999, Kottelat 2013, Hata and Motomura 2019). Although the genus has long been treated as *Thryssa* Cuvier, 1829 (e.g., Whitehead et al. 1988; Wongratana et al. 1999), Kottelat (2013) pointed out that *Thryssa* was an incorrect subsequent spelling of *Thrissa*, and gave precedence to *Thrissina* over other available names for the genus. That determination is followed here.

Four species, viz. *Thrissina chefuensis* (Günther, 1874), *Thrissina dussumieri* (Valenciennes, 1848), *Thrissina hamiltonii* (Gray, 1835), and *Thrissina setirostris* (Broussonet, 1782) have been reported from Taiwan (Young et al. 1999, Hata 2019), being locally named such as “thuh-phi-á” or “tshàu-bah-á” (Yang 2013, Chiang et al. 2014, Shao 2018). Recently, two specimens of *Thrissina encrasicholoides* (Bleeker, 1852) previously known from the Indo-West Pacific north to the Philippines were trawled in waters off Donggang, south-western Taiwan. Representing the northernmost distributional record of the species and first record from Taiwan, they are described herein.

MATERIALS AND METHODS

Counts and proportional measurements followed Hata and Motomura (2017). All measurements were made with digital callipers to the nearest 0.1 mm. Standard length is abbreviated as SL. Institutional codes follow Sabaj (2016).

Material examined. 2 specimens, 100.1–100.6 mm SL. KAUM–I. 113276, 100.1 mm SL, KAUM–I. 113277, 100.6 mm SL, off Donggang, Pingtung, south-western Taiwan (obtained at Donggang Fish Landing Port), trawl.

RESULTS

Family ENGRAULIDAE

***Thrissina encrasicholoides* (Bleeker, 1852)**

New Taiwanese name: 印尼稜鯷 (In-ni-ling-ti)

(Fig. 1; Tables 1, 2)

Description. Counts and measurements expressed as percentages of SL, given in Tables 1 and 2.

Body laterally compressed, rather elongate, deepest at dorsal-fin origin. Dorsal profile of head and body nearly straight, but gradually elevated from snout tip to dorsal-fin origin, thereafter gently lowering to uppermost point of caudal-fin base. Ventral profile of head and

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body slightly convex from lower-jaw tip to pelvic-fin insertion, nearly straight from pelvic-fin insertion to end of anal-fin base, slightly concave at caudal peduncle. Abdomen rounded, covered with incomplete series of scutes. One scute weakly developed, lacking ventral edge projection, immediately behind isthmus. Row of six or eight prepelvic scutes, each with sharp spine on ventral edge of body, anteriormost below mid-point of pectoral fin. Thereafter row of eight or nine postpelvic scutes, each with sharp spine, terminating just before anus. Anus just anterior to anal-fin origin. Caudal peduncle rather compressed. Snout tip pointed; snout length less than eye diameter. Mouth large, inferior, ventral to body axis, extending backward beyond posterior margin of eye. Lower jaw slender, shorter than upper jaw. Maxilla short, its posterior tip blunt, slightly beyond anterior margin of preopercle. Single row of small conical teeth on each jaw. Small conical teeth in patch on vomer. Teeth patches on palatines and endopterygoids. Small teeth patches on dorsal surface of hyoid bone. 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 elliptical. Nostrils close to each other, anterior to orbit. Posterior margins of preopercle and opercle smooth. Subopercle with rounded posterior margin. Opercular membrane without serrations. Interorbital space flat, width less than eye diameter. Pseudobranchial filaments present, exposed, length of longest filament less than eye diameter. Gill rakers long, slender, rough, visible from side of head when mouth opened. Size of each asperity on gill rakers even. Isthmus muscle long, reaching anteriorly to posterior margin of gill membranes. Urohyal hidden by isthmus muscle (not visible without dissection). Gill membrane on each side joined distally, isthmus muscle mostly exposed (not covered by gill membrane). Scales

cycloid, thin, deciduous except for ventral scutes, absent on head and fins. Scales on lateral surface of body with numerous vertical grooves. Lateral line absent. Dorsal-fin origin posterior to vertical through base of last pelvic-fin ray, slightly anterior to middle of body. Dorsal and anal fins each with minute first ray. Spine-like scute on dorsal-fin origin. Anal-fin origin posterior to posterior end of dorsal-fin base; posterior tip of depressed fin not reaching caudal-fin base. Uppermost pectoral-fin ray unbranched, not extended as filament. Pectoral fin inserted below lateral midline of body; posterior tip of fin not reaching vertical through pelvic-fin insertion. Pelvic fin shorter than pectoral fin, insertion anterior to vertical through dorsal-fin origin; posterior tip of depressed fin reaching to vertical through origin of tenth or eleventh dorsal-fin ray.

Coloration when fresh. Body uniformly whitish-silver, dorsum to upper part of lateral surface of body dark blue. Snout semi-transparent, melanophores scattered on dorsal surface. Fin rays of dorsal and caudal fins yellowish. Melanophores scattered on rays and membranes of dorsal and caudal fins. Pectoral, pelvic, and anal fins uniformly whitish, semi-transparent. Pupil and iris black and silver, respectively.

Coloration of preserved specimens. Body uniformly pale, upper part of body dark. Melanophores scattered on dorsal and caudal fins.

Distribution. *Thrissina encrasicholoides* has been recorded from Sri Lanka, south-eastern India (Vishakhapatnam), Andaman Islands, Indonesia, Papua New Guinea (Madang District), the Philippines and Queensland, Australia (Nelson 1981, Whitehead et al. 1988, Krishnan and Mishra 1994, Wongratana et al. 1999, Fricke et al. 2014). It is newly reported here from south-western Taiwan.



Fig. 1. Fresh specimen of *Thrissina encrasicholoides* from Donggang, south-western Taiwan (KAUM-I. 113277, 100.6 mm standard length)

DISCUSSION

The Taiwanese specimens were assignable to the genus *Thrissina*, defined by Whitehead et al. (1988) and Wongratana et al. (1999) (as *Thryssa*) as having strongly keeled prepelvic- and postpelvic scutes on the ventral edge, a spine-like scute on the dorsal-fin origin, dorsal and anal fins with 14, and 30–33 rays, respectively, the uppermost pectoral-fin ray not extended as a filament, and small conical teeth on both jaws. Moreover, the two specimens were identified on the basis of the following combination of characters, which closely matched the diagnostic features of *Thrissina encrasicholoides* given by Nelson (1981), Whitehead et al. (1988) and Wongratana et al. (1999): short upper jaw, its posterior tip blunt, slightly beyond the anterior preopercle margin; body without a distinct black blotch; 14 or 17 keeled scutes on the abdomen; and one weakly developed scute lacking a ventral edge projection, immediately behind the isthmus.

Although *T. encrasicholoides* is most similar to *Thrissina baelama* (Forsskål, 1775), in sharing fewer (four to nine) prepelvic scutes and a short upper jaw (posterior tip not beyond anterior margin of preopercle), the latter is characterized by a lack of scutes immediately behind the isthmus and the posterior tip of the maxilla pointed (Nelson 1981, Whitehead et al. 1988, Wongratana et al. 1999).

Thrissina encrasicholoides was described by Bleeker (1852) (as *Engraulis encrasicholoides*) based on specimens collected from Jakarta, Java, Indonesia.

Table 1
Meristics of specimens of *Thrissina encrasicholoides* collected from south-western Taiwan

Characters	KAUM-I.	
	113276	113277
Standard length [mm]	100.1	100.6
Dorsal-fin rays (unbranched)	3	3
Dorsal-fin rays (branched)	11	11
Anal-fin rays (unbranched)	4	4
Anal-fin rays (branched)	29	26
Pectoral-fin rays (unbranched)	1	1
Pectoral-fin rays (branched)	13	13
Pelvic-fin rays (unbranched)	1	1
Pelvic-fin rays (branched)	6	6
Gill rakers on 1st gill arch (upper)	15	15
Gill rakers on 1st gill arch (lower)	20	21
Gill rakers on 1st gill arch (total)	35	36
Gill rakers on 2nd gill arch (upper)	11	12
Gill rakers on 2nd gill arch (lower)	18	20
Gill rakers on 2nd gill arch (total)	29	32
Gill rakers on 3rd gill arch (upper)	10	11
Gill rakers on 3rd gill arch (lower)	11	12
Gill rakers on 3rd gill arch (total)	21	23
Gill rakers on 4th gill arch (upper)	9	11
Gill rakers on 4th gill arch (lower)	9	11
Gill rakers on 4th gill arch (total)	18	22
Gill rakers on posterior face of 3rd gill arch	4	7
Prepelvic keeled scutes#	8	6
Postpelvic keeled scutes	9	8
Total pelvic keeled scutes#	17	14
Scale rows in longitudinal series	36	38
Transverse scales	8	8
Branchiostegal rays	15	14
Pseudobranchial filaments	25	25

Scute immediately behind isthmus not included.

Table 2
Morphometrics of specimens of *Thrissina encrasicholoides* collected from south-western Taiwan

Characters	KAUM-I.	
	113276	113277
Standard length (SL) [mm]	100.1	100.6
As % SL		
Head length	31.7	32.7
Body depth	27.1	28.7
Predorsal-fin length	58.1	57.7
Snout tip to pectoral-fin insertion	33.5	34.3
Snout tip to pelvic-fin insertion	51.6	54.6
Snout to anal-fin origin	80.0	79.7
D–P1	35.8	36.8
D–P2	27.4	28.8
D–A	33.9	35.4
P1–P2	21.6	22.1
P2–A	27.7	26.1
Dorsal-fin base length	13.9	14.5
Anal-fin base length	30.5	29.4
Caudal-peduncle length	12.2	15.0
Caudal-peduncle depth	10.9	12.0
Pectoral-fin length	19.8	20.2
Pelvic-fin length	17.0	16.6
Interorbital width	7.5	7.9
Snout length	6.1	5.9
Upper-jaw length	24.6	25.2
Mandibular length	24.3	24.0
1st dorsal-fin ray length	3.0	3.5
2nd dorsal-fin ray length	11.8	11.3
3rd dorsal-fin ray length	24.2	broken
1st anal-fin ray length	0.5	1.1
2nd anal-fin ray length	1.2	2.2
3rd anal-fin ray length	3.8	4.6
1st pectoral-fin ray length	19.8	20.2
1st pelvic-fin ray length	17.0	broken
Orbit diameter	7.8	8.0
Eye diameter	6.7	6.5
Postorbital length of the head	18.9	19.2

Abbreviations: D–P1 (distance between dorsal-fin origin to pectoral-fin insertion); D–P2 (distance between 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 to anal-fin origin).

Although treated as a junior synonym of *T. baelama* by some authors (e.g., Weber and de Beaufort 1913, Fowler 1941, Whitehead et al. 1966), Nelson (1981) confirmed the validity of the former after examining specimens collected from Sri Lanka, India (Vishakhapatnam), the Philippines, Indonesia, and Queensland. Nelson (1983) also regarded *Engraulis duodecim*, described by Cope (1867) from a specimen supposedly collected from Beasley's Point, New Jersey, USA, as a junior synonym of *T. encrasicholoides*, pointing out the erroneous collection locality. Thereafter, Krishnan and Mishra (1994) reported the species from the Andaman Islands (specimens deposited in the Marine Biological Station, Zoological Survey of India, Madras) and Fricke et al. (2014) reported a specimen (AMS I.16747-004) collected from Madang District, Papua New Guinea. Because there appear to be no further significant distribution records of *T. encrasicholoides*, the presently described specimens from south-western Taiwan are considered to represent the first record of the species from Taiwan and the northernmost records of the species.

ACKNOWLEDGEMENTS

We are especially grateful to H.-C. Ho, R.-R. Chen, J.-T. Lin, J.-F. Huang, and A. Koeda (National Museum of Marine Biology & Aquarium), H. Motomura (KAUM), N. Muto (Tokai University), and Y. Haraguchi and other volunteers, and students of KAUM for their curatorial assistance, as well as to G. Hardy (Ngunguru, New Zealand), for proofing an early version of the English manuscript. This study was supported in part by a Grant-in-Aid from the Japan Society for the Promotion of Science for JSPS Fellows (DC2: 29-6652); JSPS KAKENHI (19K236910001); the Sasakawa Scientific Research Grant from the Japan Science Society (28-745) to HH; JSPS Overseas Research Fellowships (29-304) granted to KK.

REFERENCES

- Bleeker P.** 1852. Bijdrage tot de kennis der Haringachtige visschen van den Soenda-Molukschen Archipel. [Contribution to the knowledge of the Herring-like fishes of the Soenda-Moluccan Archipelago.] Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen **24** (8): 1–52. [In Dutch.]
- Chiang W.-C., Lin P.-L., Chen W.-Y., Liu D.-C.** 2014. [Marine fishes in eastern Taiwan.] Fisheries Research Institute, Council of Agriculture, Keelung, Taiwan. Special Publication No. 18. [In Chinese with English and scientific nomenclature.]
- Cope E.D.** 1867. Supplement on some new species of American and African fishes. Transaction of the American Philosophical Society (New Series) **13** (pt. 3) (art. 13): 400–407.
- Fowler H.W.** 1941. Contributions to biology of the Philippine Archipelago and adjacent regions. Bulletin of the United States National Museum No. 100 **13**: i–x + 1–879.
- Fricke R., Allen G.R., Andréfouët S., Chen W.-J., Hamel M.A., Laboute P., Mana R., Hui T.H., Uyeno D.** 2014. Checklist of the marine and estuarine fishes of Madang District, Papua New Guinea, western Pacific Ocean, with 820 new records. Zootaxa **3832** (1): 1–247. DOI: [10.11646/zootaxa.3832.1.1](https://doi.org/10.11646/zootaxa.3832.1.1)
- Hata H.** 2019. Family Engraulidae. Pp. 199–210. In: Koeda K., Ho H.-C. (eds.) Fishes of southern Taiwan. National Museum of Marine Biology & Aquarium, Pingtung, Taiwan.
- Hata H., Motomura H.** 2017. A new species of anchovy, *Encrasicholina auster* (Clupeiformes: Engraulidae), from Fiji, southwestern Pacific. New Zealand Journal of Zoology **44** (2): 122–128. DOI: [10.1080/03014223.2016.1268177](https://doi.org/10.1080/03014223.2016.1268177)
- Hata H., Motomura H.** 2019. Two new species of *Thrissina* (Clupeiformes: Engraulidae) from the northern Indian Ocean and redescription of *Thrissina vitrirostris* (Gilchrist and Thompson 1908). Ichthyological Research **67** (1): 155–166. DOI: [10.1007/s10228-019-00713-w](https://doi.org/10.1007/s10228-019-00713-w)
- Kottelat M.** 2013. The fishes of the inland waters of Southeast Asia. Raffles Bulletin of Zoology Supplement **27**: 1–663.
- Krishnan S., Mishra S.S.** 1994. On a collection of fish middle and south Andaman group of islands. Records of the Zoological Survey of India **94** (2–4): 265–306.
- Nelson G.** 1981. A second Indo-Pacific species of *Thrissina*. Japanese Journal of Ichthyology **29** (1): 99–101. DOI: [10.11369/jji1950.29.99](https://doi.org/10.11369/jji1950.29.99)
- Nelson G.** 1983. *Anchoa argentivittata*, with notes on other eastern Pacific anchovies and the Indo-Pacific genus *Encrasicholina*. Copeia **1983** (1): 48–54. DOI: [10.2307/1444697](https://doi.org/10.2307/1444697)
- Sabaj M.H.** 2016. Standard symbolic codes for institutional resource collections in herpetology and ichthyology: An online reference. Version 6.5 (16 August 2016). American Society of Ichthyologists and Herpetologists, Washington DC, USA. [Accessed on 19 March 2018.] <http://www.asih.org/resources/standard-symbolic-codes-institutionalresource-collections-herpetology-ichthyology>
- Shao K.T.** 2018. The Fish Database of Taiwan. [Accessed on 14 May 2019.] <http://fishdb.sinica.edu.tw>
- Weber M., de Beaufort L.F.** 1913. The fishes of the Indo-Australian Archipelago. II. Malacopterygii, Myctophoidea, Ostariophysi: I Siluroidea. E. J. Brill, Leiden, Netherlands.
- Whitehead P.J.P., Boeseman M., Wheeler A.C.** 1966. The types of Bleeker's Indo-Pacific elopoid and clupeoid fishes. Zoological Verhandelingen (Leiden) **84** (1): 1–152.
- Whitehead P.J.P., Nelson G.J., Wongratana T.** 1988. FAO species catalogue, Vol. 7. Clupeoid fishes of the world (suborder Clupeoidei). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part 2 – Engraulidae. FAO Fisheries Synopsis, No. 125 **7** (2): i–viii + 305–579.

- Wongratana T., Munroe T.A., Nizinski M.S.** 1999. Order Clupeiformes. Engraulidae, Anchovies. Pp. 1698–1753. *In*: Carpenter K.E., Niem V.H. (eds.) FAO species identification guide for fishery purposes. The living marine resources of the western central Pacific, Vol. 3. Batoid fishes, chimaeras and bony fishes Part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Yang H.-C.** 2013. [Seasonal food fishes in Taiwan (14).] [Fisherman] **423**: 34–37. [In Chinese.]
- Young S.-S., Chiu T.-S., Shen S.-C.** 1994. A revision of the family Engraulidae (Pisces) from Taiwan. *Zoological Studies* **33** (3): 217–227.

Received: 30 June 2019

Accepted: 7 October 2019

Published electronically: 1 March 2020