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A new freshwater ricefish of genus *Oryzias* (Teleostei: Adrianichthyidae) from northern Taiwan

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Abstract

A new freshwater ricefish was collected recently from northern Taiwan, which has been identified as a species new to science. The new species, *Oryzias cabaranensis* **sp. nov.**, can be well distinguished from other congeners by the following unique combination of features: (1) fin-ray counts: dorsal-fin rays 6; anal-fin rays modally 17; pectoral-fin rays 9–10; (2) body compressed laterally, body depth at pelvic origin 20.9–23.3 (22.3), body depth at anal fin origin 17.2–20.1 (18.8); (3) the dorsal-fin origin inserted almost at the vertical of 12th anal-fin rays; and (4) specific coloration: Body translucent, light creamy yellowish, a dotted, longitudinal black line. Belly wall, peritoneum slivery, somewhat subrectangular. Operculum and pre-pectoral region slivery. Eye light bluish. Caudal fin unmarked. Pelvic and anal fins with tiny melanophores. The diagnostic characters and a comparison with related species will also be provided.

Key words: New species, fish fauna, *Oryzias*, fish taxonomy, Taiwan

Introduction

The ricefishes of the atherinomorph order Beloniformes consist of about 31 small nominal species till 2010 (Herder & Chapuis 2010; Magtoon 2010; Parenti & Hadiaty 2010). Taxonomists have summarised *Oryzias* with 24 species. They can be found from Central, East, and Southeast Asia and Indian subcontinent, as well as south along the Indo-Australian Archipelago across Wallace's line toward Timor and Sulawesi of Indonesia (Kottelat 1998, 2001, 2013).

After 2010, there were more discoveries of new rice-fishes coming to science, including during those 2012–2018 years, when six more species were published from Japan and mostly from Indonesia (Herder *et al.* 2012; Asai *et al.* 2012; Parenti *et al.* 2013; Mokodongan *et al.* 2014; Mandagi *et al.* 2018).

In Taiwan, the native freshwater ricefish had been discovered with a very limited distribution range in northeastern Taiwan, which was previously identified as either *Oryzias latipes* (Temminck and Schelegel, 1846) or *Oryzias latipes sinensis* Chen, Uwa & Chu, 1989 (Chen and Fang, 1999; Tzeng, *et al.* 2006; Chen 2009). However, the species has even been considered as a valid discrete species, *Oryzias sinensis* from southern China by other systematic ichthyologists (Kottelat 1998, 2001, 2013; Parenti 2008).

In a more detailed survey done by the Japanese medaka research team, Takehana *et al.* (2003, 2004) surveyed the geographic variation and mitogenomic diversity of the Cytochrome b gene in wild populations of the medaka (*Oryzias latipes*) complex throughout Korea, China, and even Taiwan and yielded several potential discrete species, especially on the Korean Peninsula. More recently, more mitogenetic or nuclear markers have been surveyed by both the Japanese and Taiwanese teams; the Taiwanese group may need to reclarify the type of *O. sinensis* from Kumming if it becomes available.

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Recently, Chen & Lai (2024) published a brackish endemic species—*O. chenglongensis*, from western Taiwan, which has become an important issue of wildlife conservation for the current conservation issue of wetlands in Taiwan.

In 2025, the Japanese Medaka specialists kindly sent us the very important topotypes of *O. sinensis* originating from Kunming to NTOU, Keelung, Taiwan. The very well-preserved specimens of true *O. sinensis*, as well as more mitogenetic differentiation evidence, revealed that the Taiwanese native group can be considered a distinct, discrete species directly from Kunming types of *O. sinensis*. Herein we describe a new species from northern Taiwan—the extreme eastern distribution of the so-called "*O. sinensis* complex". A morphological comparison of the new species with *O. sinensis* is also addressed.

Materials & Methods

Fish specimens of *Oryzias* species were preserved in 70% ethanol after fixation in 10% formalin except some fin-clips samples preserved directly in 95% ethanol for further mitogenetic analysis. Meristic counts and morphometric measurements generally follow Chen & Lai (2024). All measurements are either expressed as a range of percentage of standard length (SL) or head length (HL). Vertebral and fin-ray counts were made mainly from X-ray radiographs from fish specimens. The type and some comparative materials were deposited in the Pisces collection of National Taiwan Ocean University, Keelung (NTOUP).

Systematics

***Oryzias cabaranensis* sp. nov.**
(噶瑪蘭青鱂)
(Fig. 1)

Material examined

Holotype. NTOUP-2024-09-231; 23.6 mm SL, coll. H.T. Lai; September 16, 2024; Shuanlianpi, Yilan County, Taiwan, R.O.C.

Paratypes. NTOUP-2024-09-232; 10 specimens, 22.0–31.7 mm SL,locality data and date same as holotype.

Diagnosis

The new species, *Oryzias cabaranensis* can be well distinguished from other congeners by the following unique combination of features:

(1) fin-ray counts: dorsal-fin rays 6 (6 seen in holotype); anal-fin rays modally 17; pelvic-fin rays 6 (6); pectoral-fin rays 9–10; (2) body compressed laterally, robust anteriorly and slender posteriorly, body depth at pelvic origin 20.9–23.3 (22.3), body depth at anal fin origin 17.2–20.1 (18.8); (3) the dorsal-fin origin inserted almost at the vertical of 12th anal-fin rays, membrane between dorsal-fin 5th and 6th rays with distinct notch in adult male; and (4) Body translucent, light creamy yellowish to light brown, a conspicuous, narrowly dotted, longitudinal black line along the middle forward to vertical above pelvic fin. Belly wall, peritoneum slivery, somewhat subrectangular. Operculum and pre-pectoral region slivery. No silvery scales on lateral body except central part of middle body. Eye light bluish silvery dorsally. All fins and belly translucent and colored pale white. Caudal fin unmarked. Pelvic and anal fin with widely scattered tiny melanophores.

Description

Body proportions as their detailed morphometry were summarized in Table 1. Dorsal-fin rays 6 (6 seen in holotype); anal-fin rays 17–18 (modally 17); pelvic-fin rays 6 (6); pectoral-fin rays 9–10 (modally 9); and vertebral counts 28–29 (modally 29).

Medium size species, with maximum size of available specimens examined as 31.7 mm SL seen in female. Head moderate large, with head length 21.4–24.1 (22.6) depressed dorsoventrally; eye very large, eye diameter 35.4–37.8 (36.3); snout rather short, snout length 21.1–26.2 (23.2). Body compressed laterally, robust anteriorly and

slender posteriorly, body depth at pelvic origin 20.9–23.3 (22.3), body depth at anal fin origin 17.2–20.1 (18.8). No greatly pronounced abdominal concavity between pelvic fins and anterior part of anal fin in female. Mouth terminal, up-turned; tip of upper lip about the horizontal line crossing the upper margin of pupil, lower jaw projecting forward beyond upper jaw, each jaws in having minute conical teeth; lips slightly fleshy.

Dorsal body profile relatively straight from head to mid-dorsum and curving from mid-dorsum to dorsal-fin origin without distinct hump; ventral profile as a gentle arch from head to anal-fin origin.

Dorsal profile of head concave. Cheek very limited by rather large eye. Orbit not projecting toward the dorsal profile. Gill slit opening to superior margin of pectoral-fin base; isthmus located inferior to posterior margin of eye. Scales relatively large and deciduous, cycloid. No scales on rostral zone. Cephalic lateral-line system absent on dorsal, lateral, jugular of head. Nostril opens upper jaw posterosuperior, and lachrymal in front of eye opens near anterior margin.

Dorsal fin situated for posteriorly, the dorsal-fin origin inserted almost at the vertical of 12th anal-fin rays. Membrane between dorsal-fin 5th and 6th rays with distinct notch in adult male. Dorsal fin rays may elongate with growth in male. Pelvic fin abdominal. Anal fin base rather long; membrane margin between each anal-fin ray indented in male, somewhat and slightly concave in female. Pectoral fin rays expended medially. Caudal fin truncate, median to posterior 1/3 part branched. Males with a short, tubular urogenital papilla; females with an enlarged bilobed fleshy, urogenital papilla.

TABLE 1. Morphometry of *Oryzias cabaranensis* from Taiwan.

Type	Holotype	Paratype	Paratype	Paratype	Paratype
Sex	Male	Male	Female	Female	Female
Standard length (mm)	23.6	20.9	26.8	28.6	26.2
% in Standard length					
Head length	21.4	22.2	22.5	22.8	24.1
Body depth at pelvic fin origin	20.9	23.3	21.4	21	21.3
Body depth at anal fin origin	20.5	21.5	17.2	17.5	17.3
Body depth	20.1	24.1	24	21.1	22.1
Caudal peduncle depth	9.8	9.9	8.8	9.5	8.5
Caudal peduncle length	17.3	15.8	17.0	18.1	14.8
Height of dorsal fin	19.0	18.1	13.6	14.6	12.3
Dorsal-fin base	7.3	8.0	7.2	7.5	6.4
Height of anal fin	20.1	18.5	13.0	15.6	12.1
Anal-fin base	20	19.0	25.5	23.4	27.0
Pelvic fin length	9.9	10.3	11.1	11.8	11.2
Pectoral-fin length	15.9	16.5	14.7	20.3	18.2
Predorsal length	74.0	67.1	76.7	77.8	78.0
Preanal length	55.3	59.2	59.4	59.8	58.8
Prepelvic length	45.7	46.8	50.0	52.7	48.8
Length from Pectoral fin base to pelvic fin base	21.1	22.2	23.2	23.8	25.4
Length from dorsal fin base to caudal fin base	26.8	24.8	24.0	22.6	23.2
% in Head length Head width					
Eye diameter	35.5	36.1	37.8	36.6	35.4
Postorbital length	45.1	48.7	44.8	49.3	47.1
Snout length	21.1	22.4	24.9	26.2	21.5

Coloration while fresh

Body translucent, light creamy yellowish to light brown, scattered with minute melanophores can be seen alive and preservative, a conspicuous, narrowly dotted, longitudinal black line along the middle forward to vertical above pelvic fin.

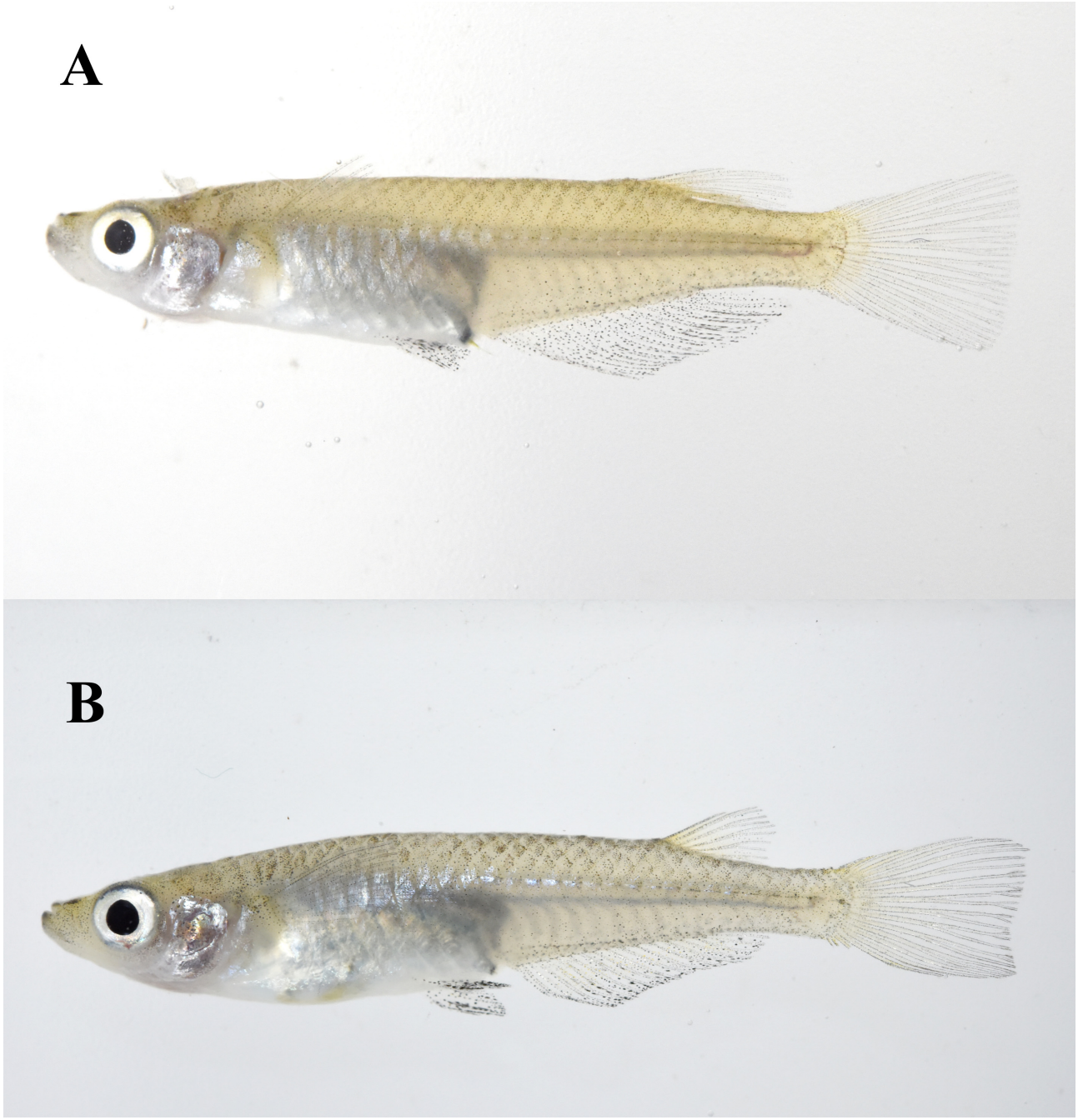

FIGURE 1. *Oryzias cabaranensis* **sp. nov.**, **A.** male, NTOUP-2024-09-231; 23.6 mm SL, **B.** female, 26.5 mm SL, coll. H.T. Lai; Spetember 16, 2024; Shuanlianpi, Yilan County, Taiwan, R.O.C.

Belly wall, peritoneum slivery, somewhat subrectangular in both sexes. Operculum and pre-pectoral region slivery. No silvery scales on lateral body except central part of middle body. Lip color grayish or somewhat creamy yellow. Eye light bluish silvery dorsally.

Generally, all fins and belly translucent and colored pale white. Caudal fin with yellowish but all unmarked. Pelvic and anal fin with widely scattered tiny melanophores.

Coloration while specimens in preservative similar above and all brilliant coloration and translucent part entirely faded, body generally light yellowish brown except the melanophores and some larger deep black marks still retained.

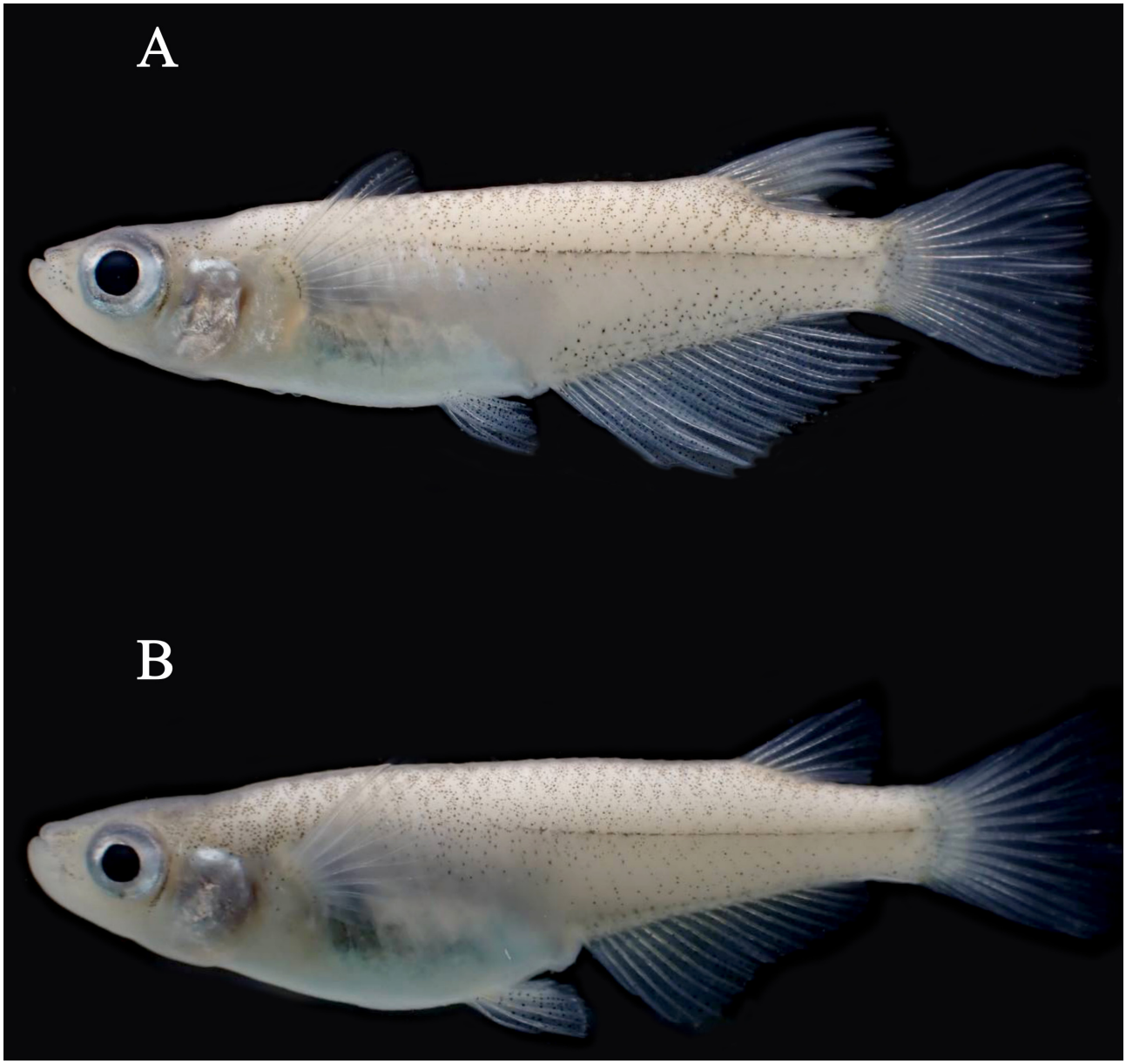

FIGURE 2. *Oryzias sinensis*, topotype, **A**. male, NTOUP-2025-10-325, 22.0 mm SL, **B**. female, 26.0mm SL, originate from type locality of Kunming, Yunnan Province, PRC, October 15, 2025.

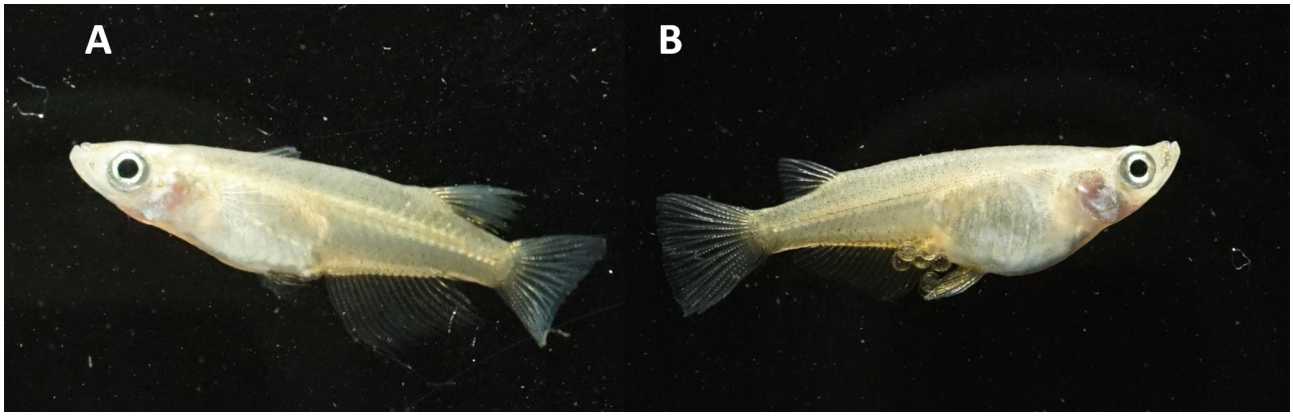

FIGURE 3. Alive fish of *Oryzias sinensis*, **A.** male, **B**. female, Kunming, Yunnan Province, China. (photo by the team of Dr. Kiyoshi Naruse).

Distribution

Although type specimens of *Oryzias cabaranensis* were designated from Shuanlianpi, Yilan County, in northern Taiwan, three or more localities have been discovered since the earliest populations of Shuanlianpi were claimed. In New Taipei City, the fragile habitats of both the Shuanshi River basin and Tanshuei River basin also ever been documented with the native freshwater rice-fish. However, some populations occurred in New Taipei City also faced the problem of the alien fish species (eg. Cichlids, guppes and snakeheads) invasion as well as local water pollution problem caused the great ecological threatening of rice-fish extinction.

Etymology

The specific name, *cabaranensis*, is referred to names of the fish holotype locality collected from the "Cabaran" (the classical name for Yilan County), Taiwan, ROC.

Remarks

The new freshwater rice fish, *Oryzias cabaranensis* from Yilan, Taiwan can be well distinguished from the mostly close related Chinese species, *Oryzias sinensis* from the topotypes of Kunming, Yunnan, China by the following several features: (1) anal fin ray insertion vertical to dorsal fin origin as 12th ray vs. 13th ray; (2) lower vertebral count as 28–29 (modally 29) vs. higher count as 30–31 (modally 31); (3) no distinct hump below dorsal fin in male vs. great hump below dorsal fin in male; slender caudal peduncle with lower caudal peduncle depth/length ratio (56.6–62.6%) in male vs. rather robust caudal peduncle with higher caudal peduncle depth/length ratio (91.2–93.5%) in male; (4) short extension of dorsal fin while depressed not reaching vertical of caudal fin base in male vs. relatively longer extension of dorsal fin while depressed extending beyond vertical of caudal fin base in male; (5) low extension of anal fin rays not reaching vertical of caudal fin base when depressed in male vs. rather long extension of anal rays always extending beyond vertical line of caudal fin base in male.

In our unpublished mitogenetic data, its molecular phylogeny was also shown the distinct mitogenetic differentiation for both *O. sinensis* from Kumning, Yunnan Province and *O. cabaranensis* from Yilan, Taiwan. Between the two extreme of Yunnan compared to Taiwan, the more detail survey of wide geographical range to define species boundary around *O. sinensis* species complex is very essential. The detailed phylogenetic relationship among the Chinese-Korean-Japanese region of freshwater rice-fishes would be discussed in near future while gathering more taxa and different locality samples of rice fishes for reconstructing their phylogenetic aspect among wide geographical continental Chinese and insular Taiwanese waters.

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Appendix I. Comnparative materials of *Oryzias* species

Oryzias sinensis

Topotypes. NTOUP-2025-10-325, 6 specimens, 20.7–26.0 mm SL, 3 males and 3 females, originally provided by Dr. Kiyoshi Naruse & Dr. Yusuke Takehana, October 15, 2025.

Oryzias chenglongensis

Holotype.—NTOUP-2018-06-310; 24.8 mm SL, coll. I-S. Chen; June 10, 2018; Chenglong wetland, Yunlin County, Taiwan, ROC.

Paratypes.—NTOUP-2018-06-311; 3 specimens, 23.5–26.6 mm SL, coll. I-S. Chen; June 10, 2018; Chenglong wetland, Yunlin County, Taiwan, ROC. NTOUP-2018-02-312, 15.2–24.5 mm SL, 20 specimens, coll. I-S. Chen; Feb. 25, 2018; Chenglong wetland, Yunlin County, Taiwan, ROC.