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# *Barilius signicaudus*, a new species of cyprinid fish from Maeklong Basin, western Thailand (Cypriniformes: Cyprinidae)

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## Abstract

*Barilius signicaudus*, a new species of cyprinid fish from the Khwae Noi and Khwae Yai branches of the Maeklong River, western Thailand, is described. It is characterized by the combination of a large, elongated blotch at the caudal-fin base (blotch is formed by the fusion of the large caudal spot at the fleshy end of the caudal base and the last vertical bar on the flank) that extends about 1/3 of the distance from the caudal-fin origin beyond the last scale on the caudal base to the margin of the caudal fork; an anal-fin origin opposing the 2nd–4th branched dorsal-fin rays; eight scale rows above the lateral line; dark pigment on the dorsal fin concentrated mainly along the margins of the rays; 36 or more precaudal lateral-line scales; and small dentary tubercles. This species has previously been identified as *Barilius pulchellus* and *Barilius ornatus*. *Barilius pulchellus* has no, or a small caudal spot, a dorsal fin with dark pigments concentrated in the middle of the interradial regions, and much larger dentary tubercles. *Barilius ornatus* and similar species have an anal-fin position that opposes the 5th–7th branched dorsal-fin rays (rarely the 4th), or does not overlap with them at all, and have no, or small caudal spots.

**Key words:** *Barilius pulchellus*, *Barilius infrafasciatus*, *Barilius ornatus*, Maeklong, Khwae

## Introduction

Cyprinid fishes of the genus *Barilius* Hamilton (1822) are generally recognized by their relatively elongate, compressed bodies and round bellies, vertical bars on the flanks, 9–17 total anal-fin rays, and sublaterally placed lateral lines (Hamilton 1822; Howes 1980; Talwar & Jhingran 1991; Rainboth 1996). *Barilius* can be separated from barred species of *Devario* by the absence of a "danioin notch" and the lack of a pigmented, wide horizontal stripe (Fang 2001). Males of many species are colorful and have tubercles on various body parts (Fowler 1934; Talwar & Jhingran 1991; Tejavej 2010). Species of *Barilius* are generally found in small, clean, clear mountain streams, but some species live in large rivers as well (Smith 1945; Talwar & Jhingran 1991; Tejavej 2010). They are one of the dominant small fishes in the hill streams and upland rivers over a vast geographical range from Pakistan and India eastward to Myanmar and Indochina (Hamilton 1822; Günther 1868; Day 1878; Hora 1921; Smith 1931, 1945; Howes 1980; Chu 1984; Kottelat 1984, 2001; Talwar & Jhingran 1991; He & Chen 1994; Tejavej 2010).

As of 2010 there are at least six species of *Barilius* in the mainland region of Southeast Asia (Tejavej 2010). During various trips from 2003–2009, the author found and received *Barilius* specimens from the Khwae Noi branch of the Maeklong basin in Kanchanaburi Province that were determined to be distinct from other species of *Barilius* in Thailand, even though they show great similarity to *B. ornatus*. Similar specimens were collected by others from the Khwae Yai branch of the Maeklong basin. These were assigned to *Barilius ornatus* (Tejavej 2010), but after further study of these specimens and comparisons with other Species of *Barilius*, they have been found to be neither *B. ornatus* nor *B. pulchellus*, which has been reported from the Maeklong basin (Vidthayanon *et al.* 1997), but are a previously unrecognized species that is described here.

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## Materials and methods

Morphometric and meristic measurements were taken from preserved specimens with vernier calipers to 0.1 mm. Both meristic counts and morphometric measurements were based mainly on the methods of Hubbs and Lagler (1958) and Tejavej (2010). Dorsal-fin and anal-fin ray counts included branched rays only. For pectoral and pelvic fins, all rays were counted. Color pattern and tuberculation were recorded from live, fresh and preserved specimens. Barbel length was recorded whenever it was possible without damaging specimens. Scale rows below the lateral line were the number of scale rows beginning from the one at the origin of the anal-fin base up to the scale below the lateral line (excluding the lateral-line scale row). Scale rows above the lateral line were the number of scale rows beginning from the one right below the predorsal scale at the origin of the dorsal fin diagonally down to the scale above the lateral line (not including the lateral-line scale row). Pelvic-fin to dorsal-fin depth was the depth of the body from the origin of the pelvic-fin base upward diagonally to the origin of the dorsal-fin base. Pelvic-fin to anal-fin length was the distance from the midline between the origins of pelvic-fin bases backward to the origin of anal-fin base. Dorsal head length was the distance from the most anterior part of the snout backward to the most anterior part of the nape. Postorbital head depth was the depth of the head from the vertical line behind the posterior margin of the eye. Preorbital head depth was the depth of the head in front of the anterior margin of the eye perpendicular to the body in normal position. All vertebrae were counted, including the Weberian apparatus and posterior urostyle.

Museum abbreviations: RLIKU, Research Laboratory of Ichthyology, Kasetsart University, Bangkok, Thailand; NRM, Swedish Museum of Natural History, Stockholm, Sweden; BMNH, The Natural History Museum, London, England; UNMF, Ubonratchathani University Natural History Museum of Fisheries, Ubonratchathani, Thailand; THNHM, Thailand National History Museum, Pathumthani, Thailand; MJUFM, Maejo University Fisheries Museum Reference Collection, Chiang Mai, Thailand; CAS, California Academy of Sciences, San Francisco, U.S.A; ANSP, Academy of Natural Sciences, Philadelphia, U.S.A; KIZ, Kunming Institute of Zoology, Kunming, China. “UNCAT” is an abbreviation for “uncatalogued."

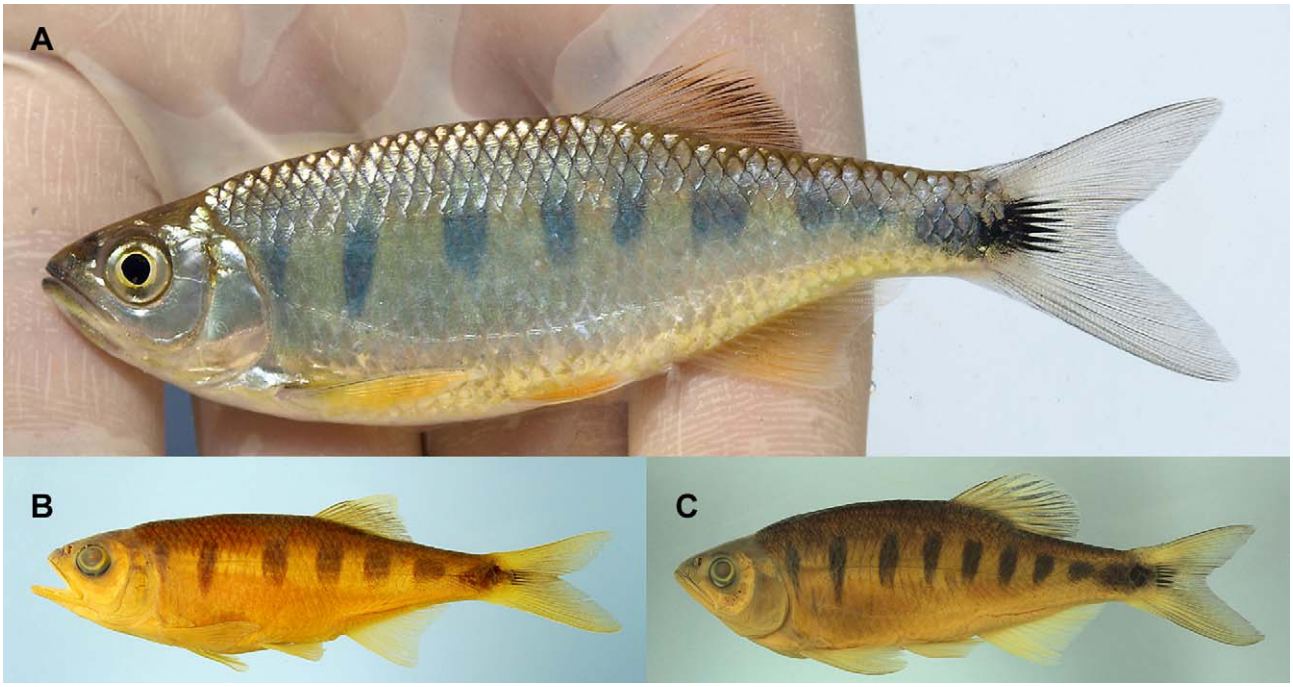


**FIGURE 1.** *Barilius signicaudus* (A) Live specimen ca. 80 mm SL, Sangklaburi District, Maeklong drainage, Kanchanaburi Province, Thailand. (B) THNHM UNCAT, 71.8 mm SL. Huai Mae La Mun, Dan Ta Chalab, Srisawat District, Kanchanaburi, Thailand. (C) UNMF 00575, paratype, 97 mm SL. Sangklaburi District, Maeklong basin, Kanchanaburi Province, Thailand; presumed developed male.

***Barilius signicaudus*** **new species**
(Figs. 1A–C, 2A, 3A, 6A)

*Barilius ornatus* Sauvage 1883: 153–154 (type locality: Menam, Siam).

**Holotype.** UNMF 07541, 80.1 mm SL, Sangklaburi District, Maeklong basin, Kanchanaburi Province, Thailand, 1 April 2004, A. Tejavej *et al.*

**Paratypes.** UNMF 00575 (10 specimens), 43.8–97 mm SL, same data as holotype. UNMF 00575 (11 specimens), 43.8–97 mm SL, Sangklaburi District, Maeklong basin, Kanchanaburi Province, Thailand, 1 April 2004, A. Tejavej *et al.* UNMF 0035 (7 specimens), 63–74.8 mm SL, Krung-Krai, Srisawat District, Maeklong basin, Kanchanaburi Province, Thailand, C. Grudpan *et al.* RLIKU 1372 (1 specimen), 88.5 mm SL, same locality; 11 April 2003, N. Panitvong. THNHM.F.00531, (3 specimens) 37.1–78.5 mm SL, Huai Maelamung, Umpang District, Maeklong basin, Tak Province, Thailand, 24–26 July 2002, Y. Vilasri.

**Other materials.** THNHM UNCAT (5 specimens), 71.8–92.2 mm SL, Huai Mae La Mun, Dan Ta Chalab, Srisawat District, Kanchanaburi, Thailand, 20 July 1999, Tanya Chan-Arb. THNHM UNCAT (4 specimens), 54.2–69.1 mm SL, Huai Sai Khao at Klong Kor (Huai Kae Kaeng), Maeklong basin, Thailand, 16 January 1999, Tyson Roberts *et al.*

**Diagnosis.** A species of *Barilius* reaching approximately 100 mm SL that is distinguished from all congeners by the combination of a large, elongated blotch at the caudal-fin base (blotch is formed by the fusion of the large caudal spot at the fleshy end of the caudal base and the last vertical bar on the flank) that extends about 1/3 of the distance from the caudal-fin origin beyond the last scale on the caudal base to the margin of the caudal fork (Fig. 2A); an anal-fin origin opposing the 2nd–4th branched dorsal-fin rays; eight scale rows above the lateral line; dark pigment on the dorsal fin concentrated mainly along the margins of the rays (Fig. 3A); 36 or more precaudal lateral-line scales; small dentary tubercles; and, if present, a short, small pair of rostral barbels.

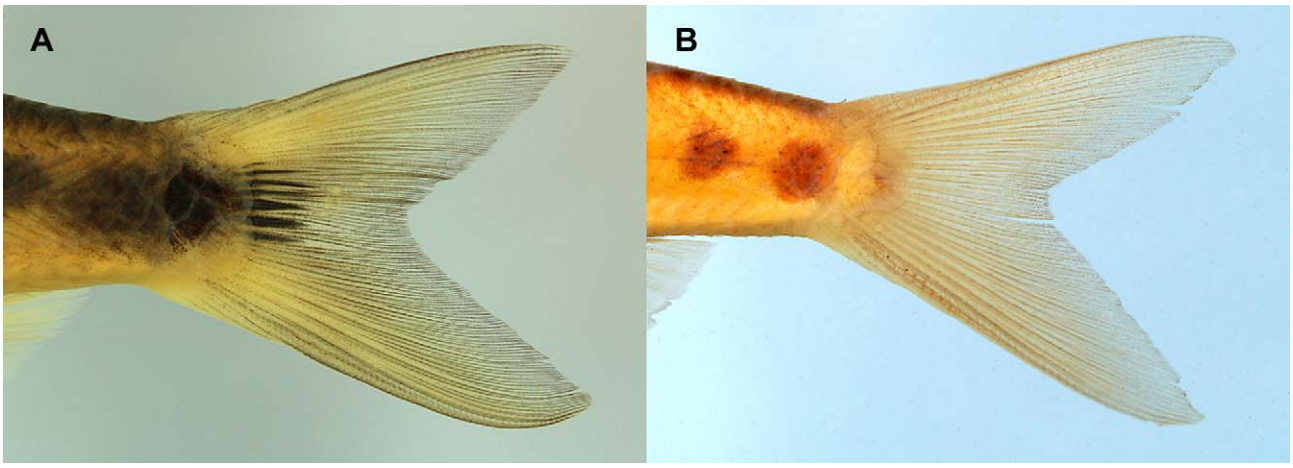


**FIGURE 2.** Caudal regions of preserved specimens. (A) *Barilius signicaudus* (UNMF 00575, paratype, 97 mm SL). (B) *Barilius pulchellus* (UNMF 00553, 55.7 mm SL).

All other Southeast Asian species of *Barilius* except *Barilius bernatziki* (Fig. 4A) and *B. dogarsinghi* (Fig. 4B) have a small, or no caudal spot (Fig. 2B). *Barilius ornatus* (Fig. 5) has an anal-fin origin opposing or behind the 5th (rarely 4th) branched dorsal-fin ray and has a small, or no caudal spot. *Barilius pulchellus* has dark pigment on the dorsal fin concentrated mainly at the middle of the interradial membranes forming a blotch (Fig. 3C), and large dentary tubercles even on nonbreeding specimens (Fig. 6B). *Barilius bernatziki*, with a large caudal blotch, has 33 lateral-line scales or less. *Barilius dogarsinghi* has a highly conspicuous, deep vertical blotch at the base of the caudal fin that barely extends onto the caudal fin, as well as a strong, submarginal pigment band on the dorsal fin (Fig. 4B), and long rostral and maxillary barbels that are generally equal to or more than 50% of the distance between the origin of the rostral barbels and the corner of the mouth.


**FIGURE 3.** Dorsal fins of preserved specimens. (A) *Barilius signicaudus* (UNMF 00575, paratype, 71.5 mm SL). (B) *Barilius infrafasciatus* (UNMF 00567, 68.3 mm SL, Huai Maelamao, Tak Province, Thailand). (C) *Barilius pulchellus* (UNMF 00553, 55.7 mm SL, tributary of Maelao River, Wiang Pa Pao District, Chiang Rai Province, Thailand).

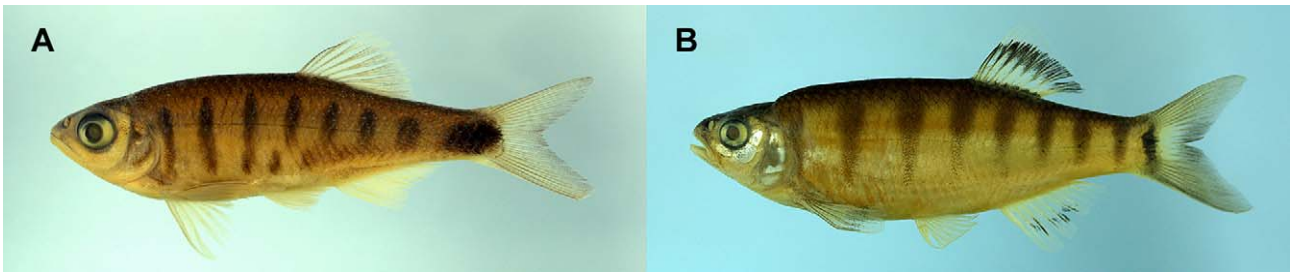


**FIGURE 4**. (A) *Barilius bernatziki*, RLIKU 1387, 58.2 mm SL, Kapong District, Phangnga Province, Thailand; presumed developed male. (B) *Barilius dogarsinghi*, UNMF 00580, 56 mm SL, aquarium specimens from Myanmar.

**FIGURE 5.** *Barilius ornatus*, MNHN B-2981, paralectotype, 91.1 mm SL, Menam, Thailand (photograph by Mr. Chaiwut Grudpan).

**Description.** Morphometric and meristic measurements in Tables 1 & 2 are based on 31 specimens (37.1–96.65 mm SL). Body shape and coloration are shown in Figs. 1A–C.

Body fusiform, deep and compressed with ventral profile more convex than dorsal profile. Head deep and compressed, snout slightly blunt to acute. Caudal peduncle long and narrow near base of caudal fin. Mouth large, oblique, terminal, with maxilla length varying from vertical line through anterior margin of eye to vertical line through anterior margin of pupil. Lower jaw with no or slight notch, with corresponding emargination in the upper jaw; in some specimens, lower jaw projects beyond upper jaw. Two pairs of barbels (often missing on either side): rostral and maxillary barbels generally short and tiny, often only rudimentary, with rostral barbel length generally far shorter than 50% of distance between origin of rostral barbel and corner of mouth. Rostral barbel often in rostral groove. Eye large, but size generally decreases with body length, from diameter longer than snout in small specimens to slightly shorter than snout in large specimens. Infraorbital bones large. Presumed developed male (Fig. 1C) with greatly enlarged chest.

**TABLE 1.** Morphometric measurements (as % SL unless marked % LHL) of *Barilius signicaudus*.

| Measurements (% SL) | *Barilius signicaudus* | | | |
|---|---|---|---|---|
| | holotype | range (N = 31 including holotype) | mean | SD |
| **Standard length (mm)** | 80.1 | 37.1–97 | - | - |
| **Body depth** | 30.2 | 25.4–31.5 | 29.1 | 1.7 |
| **Pelvic-fin to dorsal-fin depth** | 31.4 | 27.1–32.8 | 30.7 | 1.5 |
| **Caudal-peduncle depth** | 10.8 | 9.5–12.1 | 10.5 | 0.7 |
| **Caudal-peduncle length** | 19.4 | 15.7–20.2 | 18.3 | 1.2 |
| **Preanal length** | 67.4 | 62.8–71.2 | 67.1 | 1.7 |
| **Predorsal length** | 58.5 | 57.1–62 | 59.8 | 1.3 |
| **Prepelvic length** | 50.4 | 46.7–53.8 | 50.8 | 1.4 |
| **Pelvic-fin to anal-fin length** | 17.6 | 15.4–20.5 | 17.9 | 1.4 |
| **Dorsal-fin base length** | 15.1 | 13.3–17.3 | 14.7 | 1 |
| **Anal-fin base length** | 18.7 | 16–21.3 | 18.5 | 1 |
| **Lateral head length (LHL)** | 26.2 | 25.8–30 | 27.4 | 1.2 |
| **Dorsal head length** | 19 | 18.3–23.1 | 20.3 | 1.2 |
| **Head depth** | 21.2 | 20.1–23.5 | 21.5 | 0.9 |
| **Head width** | 12.6 | 10.1–13.8 | 12.2 | 1 |
| **Snout length** | 8.3 | 7.1–11.1 | 8.6 | 0.7 |
| **Preorbital head depth** | 11.9 | 10.3–15 | 12.6 | 1.1 |
| **Postorbital head depth** | 19.3 | 17–21.7 | 19.1 | 1.1 |
| **Postorbital length** | 11.9 | 11.9–17.6 | 13.5 | 1.2 |
| **Interorbital width** | 8.7 | 7.2–10.1 | 8.7 | 0.6 |
| **Eye diameter** | 7.2 | 6.0–10.8 | 7.9 | 1.1 |
| **Upper jaw length** | 11.9 | 11.1–13.7 | 12.3 | 0.6 |
| **Head depth (% LHL)** | 81 | 69.1–85.4 | 78.4 | 3.6 |
| **Snout length (% LHL)** | 31.7 | 26.6–34.8 | 31 | 2 |
| **Postorbital length (% LHL)** | 45.2 | 41.5–67.9 | 49.2 | 4.7 |
| **Interorbital width (% LHL)** | 33.1 | 24.7–36.5 | 31.8 | 2.4 |
| **Eye diameter (% LHL)** | 27.5 | 23.1–36.9 | 28.8 | 3.4 |
| **Upper jaw length (% LHL)** | 45.4 | 39.6–49.8 | 44.8 | 2.2 |

**Scales.** 36–39 scales in lateral-line row to end of hypural plate (rarely 36), 1–3 more scales to base of caudal fin. Eight scale rows above lateral line (predorsal scale row not included); 2–3.5 rows below lateral line; 17–21 scales in predorsal row; 10–14 circumpeduncular scales. Axillary process at the anterior base of pectoral fin and axillary scale at the anterior base of pelvic fin well developed.

**Fins.** Dorsal fin in posterior half of body (not including caudal fin); origin far behind vertical through origin of pelvic fin; with 2–3 simple rays and 7–8 branched rays; straight to slightly concave in most specimens; convex with middle and posterior branched rays lengthened in presumed developed male, with posterior tip surpassing vertical through posterior base of anal fin. Anal-fin origin at vertical line through 2nd to 4th branched dorsal-fin rays. Anal fin with 2–3 simple rays and 9–11 branched rays; first 3–4 branched rays elongated, creating concave margin; straight margin in presumed developed male. Lower lobe of caudal fin longer than or equal to upper lobe. Pectoral fin large, with 12–13 rays; often reaching base of pelvic fin. Pelvic fin with 7–9 rays; origin far in front of dorsal-fin origin; tip not reaching origin of anal fin; posterior tip not reaching anterior origin of anal fin except in presumed developed male.

**TABLE 2.** Meristic counts and other characteristics of *Barilius signicaudus*.

| | holotype | range (N = 31 including holotype) |
|---|---|---|
| Origin of anal fin opposite branched dorsal-fin rays | 4th | 2nd (1), 3rd (13), 4th (17) |
| Rostral barbels | 2 short | 2 short |
| Maxillary barbels | 2 short | 2 short |
| Pectoral-fin rays | 12 | 12 (14), 13 (17) |
| Pelvic-fin rays | 8 | 7 (5), 8 (20), 9 (6) |
| Branched dorsal-fin rays | 7 | 7 (30), 8 (1) |
| Branched anal-fin rays | 10 | 9 (10), 10 (18), 11 (3) |
| Lateral-line scales | 37+2 | [36 (4), 37 (13), 38 (11), 39 (3)]+(1–3) |
| Scale rows above lateral line | 8 | 8 (31) |
| Scale rows below lateral line | 3.5 | 2 (1), 2.5 (11), 3 (9), 3.5 (10) |
| Predorsal scales | 21 | 17 (2), 18 (2), 19 (10), 20 (11), 21 (6) |
| Circumpeduncular scales | 12 | 12 (6), 13 (9), 14 (16) |

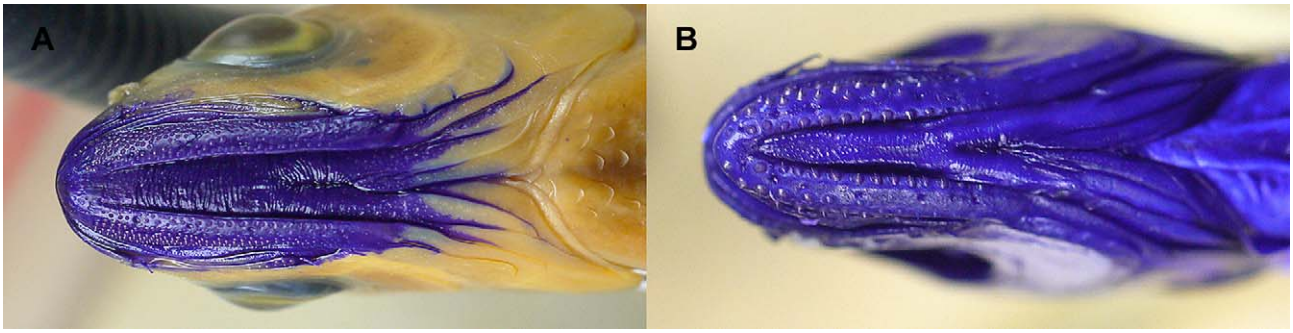


**FIGURE 6.** Dentary tubercles of preserved specimens. (A) *Barilius signicaudus* (UNMF 00575, paratype, 93.6 mm SL). (B) *Barilius pulchellus* (UNMF 00553, 47.4 mm SL).

**Tuberculation.** In most specimens, small tubercles are restricted mainly to snout and dentary (Fig. 6A). On one presumed developed male tubercles present on dentary, end of maxilla, snout, region in front of, above, and below eye, and branchiostegal rays; scattered small tubercles on dorsal surface of head; dentary tubercles generally in 5–6 rows, anterior rows larger than posterior ones; large tubercles on side of snout, end of maxilla, front of eye, top of eye, small area below eye, and branchiostegal region; smallest tubercles on snout and dorsum.

**Coloration (Live and fresh specimens).** Dorsum greenish to grayish, sides green to silver depending on light angle, belly silver in most specimens. Some individuals with yellowish to slightly reddish-orange belly, generally not including lower jaw region. Some individuals with yellowish lower jaw. Side with 6–9 blue or green vertical bars (not including last bar that often fuses with caudal spot); each bar generally 1–2 scales wide; generally, only bars in front of pelvic fin reach or cross lateral line. Bars often broken into double bars both vertically and horizontally; number of bars on opposite sides of body often unequal. Last bar generally aligns, and often fuses with caudal spot at fleshy end of caudal base, forming elongated greenish, dark blue, or black blotch, about 1–4 exposed scales high and 3–7 exposed scales long. Large caudal spot extends deeply onto anterior region of interradial membranes of caudal-fin, reaching about 1/3 distance between origin of caudal-fin rays beyond the last scale on caudal base to end of fork, or beyond, of caudal fin. All bars may become indistinct, depending on light reflection and mood of specimen. Anal fin clear to yellowish-orange. Caudal fin with dark margins on principal rays, outer parts of peripheral branched rays, and entire branched rays in middle of fin; caudal-fin membranes clear to yellowish, upper and lower area of anterior part of fin opaque-white. Combination of opaque-white base of caudal fin and greenish, dark blue or black elongated caudal blotch creates a highly conspicuous eye-like mark. Dorsal fin clear, light orange or pink, with dark pigment on rays and membranes; pigment concentrated along margins of dorsal-fin rays. Dark pigment on first 3–5 branched dorsal rays does not reach tip of fin in most

specimens, leaving it clear to white, but in some individuals dark pigment expands into inter-membrane region of the dorsal fin, giving it a smoky appearance. In presumed developed male, dark pigment expands to the anterior tip of the dorsal fin. Coloration of presumed fully developed dominant male is not yet known.

**Coloration (Preserved).** Silvery, white, red, and green coloration usually disappears. Dorsum dark brown to dark gray; ventral areas lighter. All dark pigment in fins, body bars and caudal blotch turns dark brown to black. Dark, thin horizontal stripe occasionally appears midlaterally, from behind opercle to caudal base. Dark pigment of caudal blotch occasionally fades away, revealing last bar and caudal spot underneath.

**Distribution.** *Barilius signicaudus* is only known from the headwaters of the Khwae Yai Khwae Noi branches of the Maeklong River (Fig. 7). It is has not been found in the headwaters of the Pachee and Phetchaburi rivers, which are also part of Maeklong basin (Vidthayanon *et al.* 1997).

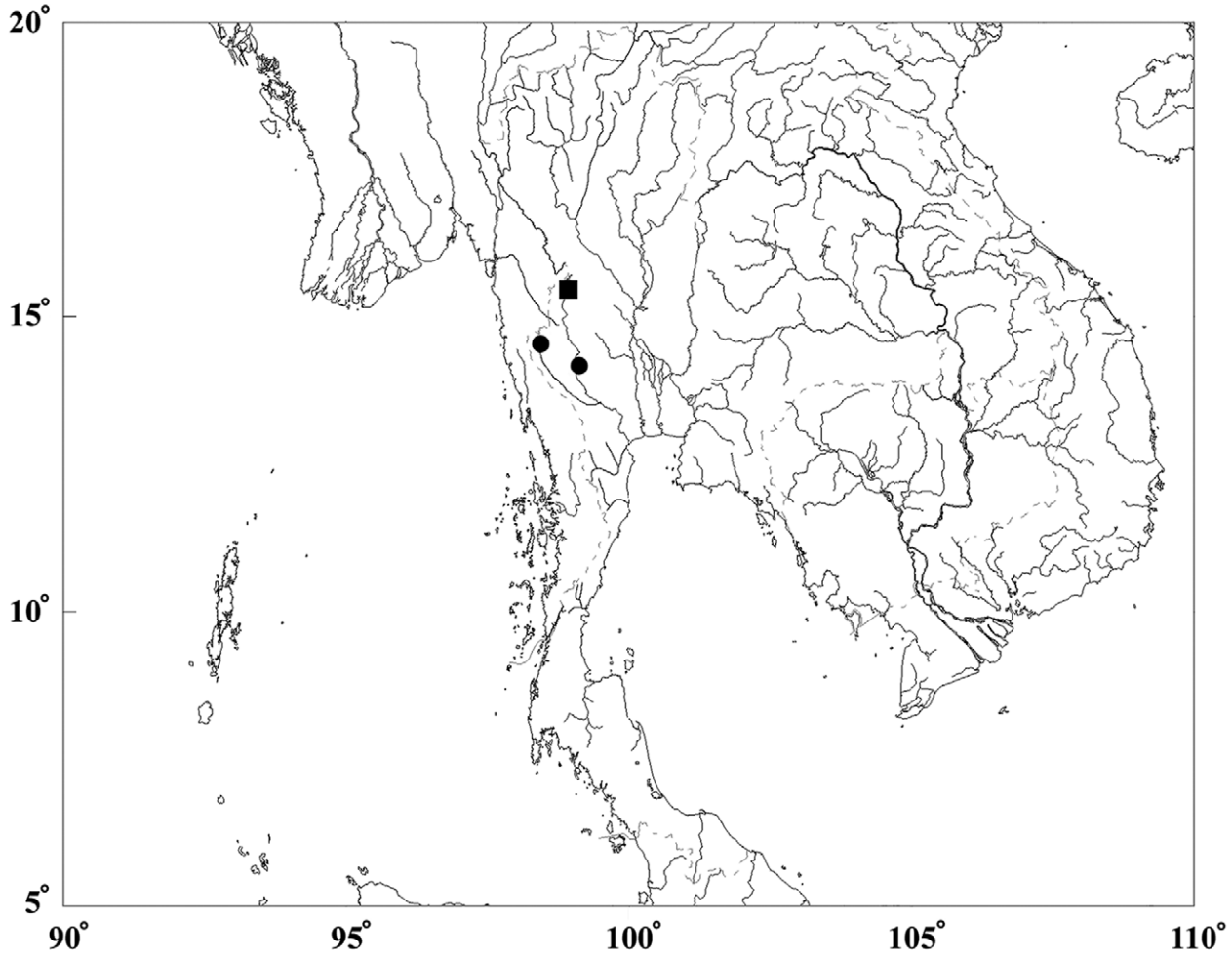


**FIGURE 7**. The localities of *B. signicaudus* specimens examined in this study. Square = type locality; dots = other collections.

**Habitat.** *Barilius signicaudus* is found in mountainous areas, in fast-flowing streams and small rivers with clear water and gravel or cobble bottoms. Juveniles are found near shallow shorelines and behind large rocks where the flow is slower. Fishes that were found together with *B. signicaudus* at Sangklaburi included *Barilius koratensis*, *Poropuntius melanogrammus*, *Mystacoleucus marginatus*, *Garra* spp., *Rasbora* cf. *rasbora*, *Rasbora paucisqualis*, *Microdevario kubotai*, *Crossocheilus siamensis*, *Labiobarbus* sp., *Acanthocobitis zonalternans*, *Schistura* spp., *Nemacheilus pallidus*, *Botia morleti*, *Glyptothorax* spp., *Batasio triginus*, *Xenenthodon* sp., *Parambassis siamensis*, *Tetraodon* sp.

**Etymology.** The specific epithet, *signicaudus*, a noun, is from the Latin *signum*, "flag or sign", and *cauda*, "tail".

## Discussion

Among Southeast Asian mainland *Barilius* there are three taxa with large and conspicuous marks on the caudal base region: *Barilius signicaudus*, *B. bernatziki*, and *B. dogarsinghi* (Smith 1931, 1945; Fowler 1934; Koumans 1937; Howes 1980, 1983; Kottelat 1984, 2001; Tejavej 2010). Only *B. signicaudus* and some specimens of *B. bernatziki* have a caudal spot that extends onto the basal to middle region of the caudal fin, and that is more or less fused with the last body bar. Many species such as *B. ornatus* and some individuals of *B. pulchellus* have a caudal spot, but it is generally restricted to the middle of the caudal-fin base, and the caudal spot is clearly separated from the last body bar. A conspicuous caudal mark is also present in *B. dogarsinghi* (Fig. 4B), but it does not fuse with the last body bar to become a large blotch. The caudal mark on *B. dogarsinghi* is unique among Southeast Asian *Barilius* in that it consists of a deep vertical blotch that does not extend deeply onto the caudal fin, but is instead followed by a clear to light region at the middle of the caudal-fin base. *Barilius canarensis* and *B. bakeri* have a more or less similar caudal blotch, but these species have rows of spots or blotches on the flank (Day 1878), more dorsal and anal-fin rays, and are endemic to southern India (Talwar & Jhingran 1991).


**FIGURE 8**. *Barilius infrafasciatus* (A) Live specimen, ca. 80 mm SL, stream flowing into Salween River, Maesamlab District, Maehongson Province, Thailand. (B) Live specimen (presumed fully developed dominant male), ca. 85 mm SL, same location. (C) UNMF 00567, 68.3 mm SL, Huai Maelamao, Tak Province, Thailand.

The presence of conspicuous caudal marks makes it easy to differentiate *B. signicaudus* from *B. ornatus* and other species that were previously regarded as synonyms (Tejavej 2010) such as *B. infrafasciatus* (Figs. 3B, 8A–C), which is otherwise morphometrically and meristically quite similar. *Barilius barnoides* from the Ayeyarwaddy basin and *B. infrafasciatus* from the headwaters of the Ping River and Salween basin were previously regarded as synonyms of *B. ornatus* due to overlapping morphometric and meristic characters (Tejavej 2010), but were recently separated from *B. ornatus* by Tejavej (this volume, p. xxxx). It should also be noted that *B. infrafasciatus* is found in the Kasa (Ataran), Suriya, and Salween rivers close to the headwaters of the Khwae Yai and Khwae Noi branches of the Maeklong River, but which are separated by mountain ranges (Tejavej 2010).

*Barilius pulchellus* (Figs. 2B, 3C, 6B, 9A–C), a taxon that may be confused with *B. signicaudus* (Vidthayanon *et al*. 1997), is a highly distinctive species of the genus *Barilius*. Presumed fully developed dominant males (Fig. 9B) are so different from normal individuals that they have been described as different species or different genera

(Fowler 1934; Fang 1938; Nguyen & Doan 1969). Apart from having blotches in the middle of the interradial region of the dorsal fin, this species is also unique among Southeast Asian *Barilius* in that even nonbreeding individuals have much larger dentary tubercles (Fig. 6B) than other species, such as *B. signicaudus* (Fig. 6A).


**FIGURE 9.** *Barilius pulchellus* (A) Live specimen, ca. 45 mm SL, tributary of Maelao River, Mae Kon County, Mae Lao District, Chiang Rai Province, Thailand. (B) Live specimen (presumed fully developed dominant male), ca. 75 mm SL, tributary of Maelao River, Wiang Pa Pao District, Chiang Rai Province, Thailand. (C) UNMF 00553, 55.7 mm SL.

## Comparative material

*Barilius bernatziki*: RLIKU 1387 (8 specimens), 52.08–61.2 mm SL, Kapong District, NW Phangnga Province, Thailand, 8 April 2004. UNMF 00573 (6 specimens), 34.75–69.45 mm SL, Huai Hinwoor, NW Ranong Province, Thailand, 3 May 2003. UNMF 00574 (1 specimen), 90.7 mm SL, Huai Hinwoor, NW Ranong Province, Thailand, 20 July 2004. UNMF 0050 (1 specimen), 23.35 mm SL, Malwe Mountain, Tavoy, Taninthayi Division, Myanmar, 20–30 November 2003, Mr. Tin Win.

*Barilius dogarsinghi:* ANSP 89754 (1 specimen), 65.63 mm SL, paratype, Etok stream near Chanderkhong, Naga Hills, India, 1921, Zoological Survey India. RLIKU 1366 (1 specimen), 51.95 mm SL, Pagan city market, Pagan, Myanmar, 14 August 1995, P. Musikasinthorn. RLIKU 1367 (9 specimens), 50.6–62.2 mm SL, Pang Lung River, on the road between Mandalay and Shan, August 1995, P. Musikasinthorn. UNMF 00580 (3 specimens), 53.43–58.05 mm SL, aquarium exported from Myanmar around July 2005. 27 February 2006.

*Barilius pulchellus:* RLIKU 1373 (10 specimens), 39.65–64.8 mm SL, Tributary of Ping River, Doi Saket District, Chiangmai Province, Thailand, 21 March 2003. RLIKU 393 (5 specimens), 45.9–65.3 mm SL, Tributary of Nan River, Ban Na Ku, Khun Nan County, Chaloem Phra Kiat District, Nan Province, Thailand, A. Lauthongkham. RLIKU 1374 (5 specimens), 48.15–54.9 mm SL, Tributary of Maelao River, Wiang Pa Pao District, Chiangrai Province, Thailand, 19 March 2003. UNMF 00552 (8 specimens), 27.55–65.8 mm SL, Tributary of Wang River, Wang Nuea District, Lampang Province, Thailand. 10 May 2003. UNMF 00553 (5 specimens), 41.2–55.65 mm SL, Tributary of Maelao River, Wiang Pa Pao District, Chiangrai Province, Thailand, 19 March 2003. UNMF 00579 (2 specimens), 47.4–50.15 mm SL, Nan Lei River, Meng Lian, Yunnan Province, China, 15 July 2006, H. Zhou. THNHM UNCAT (6 specimens), 37.65–45.79 mm SL, Mekong mainstream east of Chiang Khan, Loei Province, Thailand, 11–12 March 1990, Tyson Roberts. Also see Tejavej (this volume, p. xxxx).

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