

Betta kuehnei, a new species of fighting fish (Teleostei, Osphronemidae) from the Malay Peninsula

Betta kuehnei, eine neue Kampffischart (Teleostei, Osphronemidae)
von der Malaisischen Halbinsel

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Summary: *Betta kuehnei* sp. n. is described from the Malay Peninsula. The new species belongs to the *B. pugnax*-group and can be distinguished from the other species by a combination of the following characters: a round caudal fin both in males and females, absence of a second postorbital stripe and a comparatively short second central stripe (joined with central stripe above anterior part of anal fin).

Key words: *Betta kuehnei* sp. n., *Betta* sp. "Satun", fighting fishes, Malaysia, Thailand

Zusammenfassung: *Betta kuehnei* sp. n. wird von der malayischen Halbinsel beschrieben. Die neue Art gehört zur *B. pugnax*-Gruppe. Sie unterscheidet sich von den übrigen Arten durch die Kombination einer runden Schwanzflosse bei Weibchen und Männchen, dem Fehlen des zweiten Postorbitalstreifens und einem vergleichsweise kurzen zweiten Zentralstreifens, der sich mit dem Zentralstreifen in Höhe des vorderen Teil der Afterflosse verbindet.

Schlüsselwörter: *Betta kuehnei* sp. n., *Betta* sp. „Satun“, Kampffische, Malaysia, Thailand

1. Introduction

Fighting fishes of the genus *Betta* are widely distributed in Southeast Asia. With more than 60 valid species described the genus *Betta* has the highest number of species within the family Osphronemidae. According to their mode of parental care the genus is traditionally divided into mouthbrooding and bubble nesting species (SCHMIDT 1996). The mouthbrooding species from the Malay Peninsula were the subject of two recently published taxonomic studies (TAN & NG 2005a, SCHINDLER & SCHMIDT 2006). The aim of the present paper is to describe a new mouthbrooding species, not included as yet. It occurs in the most northern region of Malaysia (province Kelantan) and the most southern part of peninsular Thailand (province Narathiwat).

2. Material and methods

Methods for taking measurements follow SCHINDLER & SCHMIDT (2006). Measurements are taken as straight lines (to 0.1 mm accuracy) between two landmarks (see figure 1 in SCHINDLER & SCHMIDT 2006) with a digital caliper. Counts were made as described in WITTE & SCHMIDT (1992) except for the number of predorsal scales which were counted continuously. Numbers in brackets indicate the number of specimens examined. Terminology of color patterns follows TAN & NG (2005a) with modifications after SCHINDLER & SCHMIDT (2006; fig. 2). The description follows the general format used by TAN & NG (2005a) and SCHINDLER & SCHMIDT (2006). Beside the data obtained from material examined, data from previously described and redescribed species (KOTTELAT 1994, 1995a, KOTTELAT & NG 1994,

TAN & KOTTELAT 1998, TAN & NG 2005a, 2005b, TAN & TAN 1996, SCHINDLER & SCHMIDT 2004, 2006) were also used. The usage of the term “species group” follows TAN & KOTTELAT (1998). The observations of the reproductive behavior based on two pairs of specimens from the type locality which have been bred in captivity.

Abbreviations: CIS = personal collection of the authors, ZMB = Museum für Naturkunde der Humboldt-Universität zu Berlin, Fischsamm- lung; SL = standard length; TL = total length.

3. Results

Betta kuehnei sp. n.

Holotype: ZMB 33884, 37.0 mm SL, male, Malaysia, Kelantan, Kota Bharu, about 35 km south of Panjang (5° 48' 40" N, 101° 57' 20" E); leg. . KÜHNE, Aug. 2008.

Paratypes: ZMB 33885, 5 specimens, 34.9-39.6 mm SL; same data as for holotype.

Additional specimens (non-type): CIS, 1 specimen, 43.9 mm SL, Thailand, Narathiwat province, about 40 km south of Sungkai Kolok; J. KÜHNE, March 2007. CIS, 2 specimens 52.9-58.9 mm SL (kept in aquarium for almost two

years); same locality as for holotype; leg. J. KÜHNE, March 2006.

Diagnosis: The new species differs from the other species of the *B. pugnax* species group by a combination of (1) a rounded caudal-fin, (2) the absence of chin bar and second postorbital stripe, (3) male coloration with intensive blue or bluish-green iridescent (blackish when preserved) area on head sides and on throat from snout tip to posterior edge of opercle, and (4) the short second central stripe fused with the central stripe above anterior part of anal fin.

Description: Based on specimens of the type series with notes on non-type specimens (meristic data are recorded for all available specimens). For general appearance see figures 1 and 2. Measurements for the holotype and paratypes are summarized in table 1. Maximum size 43.9 mm SL in wild caught specimens (maximum recorded size for specimens kept in aquarium is 58.9 mm SL). Body comparatively slender (body depth at dorsal-fin origin 27.4-29.2% of SL; more deep bodied in aquarium-specimens: 33.8-34.4% of SL), head long (head length 34.4-36.8% of SL), snout pointed. Dorsal- and anal fin pointed in males, caudal fin rounded in both sexes, in larger specimens slightly asymmetrical with elongated upper lobe

Tab. 1: Morphometric data (in percent of standard length; SL in mm) of *Betta kuehnei* (holotype and five paratypes). Mean = arithmetic mean, min = lowest value, max = highest value, sd = standard deviation.

Tab. 1: Morphometrische Daten (in Prozent der Standardlänge; SL in mm) von *Betta kuehnei* (Holotypus und fünf Paratypen). Mean = arithmetrischer Mittelwert, min = kleinster Wert, max = höchster Wert, sd = Standardabweichung.

	min	max	mean	sd
Standard length (mm)	34.9	39.5	37.5	1.87
Total length	135.3	140.4	137.4	1.88
Predorsal length	64.3	66.8	65.2	1.08
Postdorsal length	21.5	22.9	22.2	0.55
Preanal length	48.6	51.9	49.9	1.36
Body depth dorsal fin	27.3	29.2	28.6	0.76
Caudal peduncle depth	17.6	18.7	18.3	0.43
Head length	34.4	36.8	36.1	0.92
Orbit diameter	28.8	31.5	30.2	1.03
Postorbital length	45.0	48.5	46.6	1.24
Interorbital width	32.7	34.0	33.3	0.50
Dorsal-fin base length	11.9	13.2	12.7	0.46
Anal-fin base length	48.4	52.5	50.5	1.29
Pelvic fin length	32.7	36.4	34.3	1.55

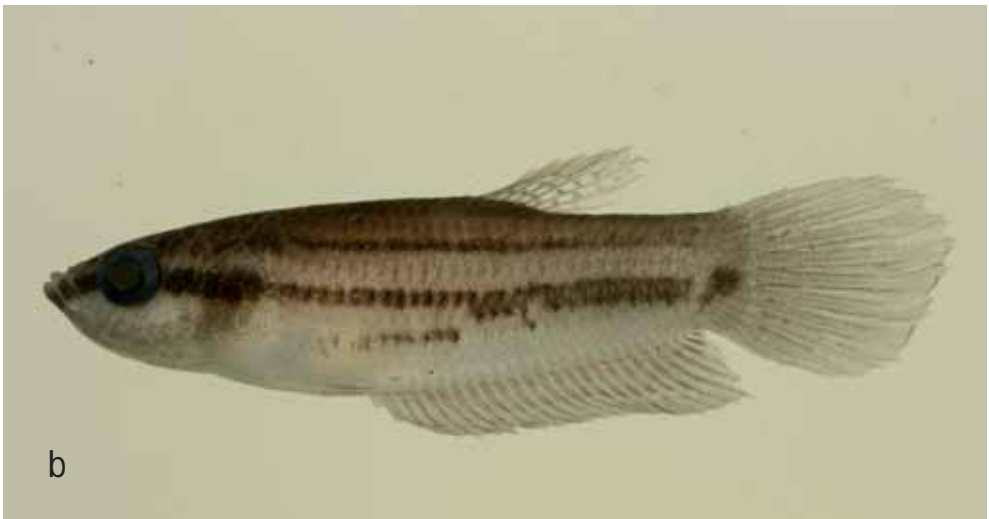


Fig. 1. *Betta kuehnei*. **a** Male (holotype); **b** female (paratype). Preserved.

Abb. 1. *Betta kuehnei*. **a** Männchen (Holotypus); **b** Weibchen (Paratypus). Konserviert.

(older males kept in aquaria may have short filaments, supported by single row of lepidotrichia). Dorsal-fin origin situated far posterior (predorsal length 64.4-66.8% of SL). Length of anal-fin base about half of standard length (anal-fin base length 48.4-52.5% of SL); dorsal-fin base length 11.9-13.2% of SL; filamentous second pelvic fin ray up to 36.4% of SL in males; pectoral fin round (length of pectoral fin 22-25% of SL). Dorsal fin rays 0,9(3), I,8(5) or I,9(1). Anal fin II,23(3) or

II,24(6). Pectoral fin rays 11 or 12. Pelvic fin rays I,1,4. Lateral scales 28(2), 29(4) or 30(3). Transversal scales at dorsal fin origin usually 9½. Predorsal scales 20(6) or 21(3); postdorsal scales 10(8) or 11(1).

Preserved coloration: Body greyish, dorsally darker, ventrally lighter, belly whitish. Lower lip black; chin bar and second postorbital stripe absent; pre- and postorbital stripes present. Sides of snout, throat and head to posterior edge of opercle blackish. Dorsal fin colorless



a



b

Fig. 2: *Betta kuehnei*. **a** Male in aquarium, **b** female in aquarium. Not conserved.

Abb. 2: *Betta kuehnei*. **a** Männchen im Aquarium, **b** Weibchen im Aquarium. Nicht konserviert.

with dots; caudal fin plain without transverse bars; anal fin with dark gray marginal band, without dots. Upper stripe continuously from upper margin of eye to dorsal part of caudal fin base; central stripe from upper pectoral fin base continuously to middle caudal fin base, not connected with caudal base spot; second central stripe (very faint or almost absent in males) from lower pectoral fin base straight to about above anterior part of anal fin, from there turn upward in a distinct angle to fused with central stripe.

Life coloration: See KÜHNE (2007) and figure 2 for color illustrations. Body light brownish or grayish. Scales on body with greenish-blue iridescent center. Dark lateral stripes faint. Sides of head, snout and throat turquoise iridescent. Dorsal fin with narrow light bluish to turquoise margin. Caudal fin brownish with distal bluish margin. Anal fin light brownish with broad bluish margin. Pectoral fin hyaline.



Fig. 3: Type locality of *Betta kuehnei*. Photo: J. Kühne.
Abb. 3: Typuslokalität von *Betta kuehnei*. Foto: J. Kühne.

Distribution: Currently known only from rivulets in the northeast of Malaysian state Kelantan, south of Kota Bharu and from the extreme south of peninsular Thailand in the vicinity of Sungkai Golok.

Habitat notes: The type locality (KÜHNE pers. comm.) is a creek strongly shaded by forest (fig. 3). The water was clear, colorless with a pH of 7, total hardness of 3 °dGH and a temperature of approx. 25 °C. The fighting fishes were caught in the shallow water between water plants (*Cryptocoryn cordata*) and leaf litter. Other labyrinth fishes collected with *B. kuehnei* were *Trichopsis vittata* and *Parosphromenus paludicola*.

Notes on reproductive behavior: *Betta kuehnei* is a mouthbrooding species. The reproductive behavior of *B. kuehnei* is similar to that of other species of the *B. pugnax*-group as described by SCHMIDT (1996). Males carry the eggs (usually between 40 to 80) in their mouth for about 12 days. The eggs are 1.0 to 1.4 mm in diameter. The offspring will leave the mouth with a length of approximately 7 mm. A particular color pattern during spawning was not observed.

Etymology: The species is named after JENS KÜHNE to honor his contributions to increase the knowledge about the fighting fishes. He was one of the first who recognized the species described herein as an undescribed species and made hard efforts to collect enough specimens to compose the type series.

Comparative notes: *Betta kuehnei* is distinguished from the other species of the *B. pugnax*-group by the absence of a chin bar and second postorbital stripe (versus present in *B. apollon*, *B. ferox* and *B. stigmosa*), caudal fin rounded in males (versus lanceolate in *B. apollon*, *B. breviobesus*, *B. lehi*, *B. pugnax*, *B. pulchra*, and *B. raja*), or pointed to slightly lanceolated in *B. cracens*, *B. ferox*, *B. lehi* and *B. stigmosa*), comparatively short pelvic fins (pelvic-fin length up to 36% of SL versus >36% of SL in *B. breviobesus*, *B. cracens*, *B. fusca*, *B. lehi*, *B. pulchra* and *B. raja*), second central stripe fused with central stripe above anterior fourth of anal fin (versus not fused or fused only above the posterior third of anal fin base in *B. apollon*, *B. ferox*, *B. fusca*, *B. schalleri*, *B. lehi*, *B. pugnax*, *B.*

stigmosa, *B. breviobesus*, *B. raja*), comparatively smaller size (usually < 50 mm SL in wild caught specimens versus > 49 mm SL in *B. apollon*, *B. ferox*, *B. cracens*, *B. fusca*, *B. pugnax*, *B. pulchra* and *B. raja*) and no distinct transverse bars on caudal fin (versus transverse bars present in *B. apollon*, *B. cracens*, *B. ferox*, *B. pugnax*, *B. pulchra* and *B. stigmosa*). It is superficially similar in habitus to *B. taeniata* and *B. enisae* (both treated as members of the *B. picta* group by SCHINDLER & SCHMIDT 2006), but differs by the absence of a broad dark distal border on anal- and ventral part of caudal fin (versus presence of prominent dark border in *B. taeniata* and *B. enisae*). It is distinguished from *B. pallida* and *B. prima* (treated as members of the *B. pugnax*-group by KOTTELAT (1994), TAN & NG (2005), but regarded as members of the *B. picta* group by SCHINDLER & SCHMIDT (2004, 2006) and SCHMIDT (1996)) by a higher number of lateral scales (usually >28 in *B. kuehnei* versus usually <29 in *B. prima* and *B. pallida*), a round caudal fin (versus lanceolate in *B. pallida*) and a bright bluish-green iridescent (blackish when preserved) area on head, snout and throat (versus faint iridescent area in *B. pallida* and *B. prima*), no second postorbital stripe (versus second postorbital stripe present in *B. pallida* and *B. prima*).

Remarks: This species was introduced in the aquarium literature as *Betta* sp. aff. *pugnax* “Blaukehlfish” (KÜHNE 2007) or known as “Blaukehlchen-Kampffisch” [= Blue Throat Fighting Fish]. It is possible that *Betta* sp. “Satun” is conspecific with *B. kuehnei* (see discussion).

4. Discussion

Although we agree with MAYDEN (1997), who emphasizes the importance of the evolutionary species concept in the sense of WILEY (1978), we adopted here the more pragmatic approach described and discussed by KOTTELAT (1995b, 1997) for practical reasons and delimit species on divergent diagnostic character states (or on a specific combination of different character states). *Betta kuehnei* spec. nov. is reliable

characterized and distinguished from all the other *Betta* species by the morphological attributes described in the diagnosis and in the comparative notes (see above). Further it differs from the other species (for which the reproductive behavior is described) of the *B. pugnax*-group by the lack of a particular specific color pattern during mating and spawning (versus color pattern differing from the neutral one). A comparative description of the ethology of *B. kuehnei* will be part of a forthcoming paper about the reproductive behavior of the mouthbrooding species from Thailand.

In 2004 a new mouthbrooding fighting fish species was imported and introduced as *Betta* sp. “Satun” by LINKE (2007, 2008). According to Kubota (in LINKE 2008) it was collected near to the city of Satun (west coast of peninsular Thailand). KÜHNE (2008), however, made repeated attempts to verify the collecting site by searching many habitats between Trang and Satun, but failed to find it there. This is why, he (KÜHNE pers. comm.) believes that the origin of the imported specimens is really the southern part of the east coast of peninsular Thailand. Anyway, photographs of *B.* sp. “Satun” published by LINKE (2007, 2008) suggest that this fighting fish is conspecific with *B. kuehnei* sp. n.

The number of species groups recognized and the arrangement of taxa in these groups are under discussion and differ from author to another (see e.g. KOTTELAT & NG 1994, SCHINDLER & SCHMIDT 2006, SCHMIDT 1996, TAN & NG 2005a, WITTE & SCHMIDT 1992). Following TAN & KOTTELAT (1998a: 42) a ‘species group’ is “an assemblage of species sharing a set of diagnostic characters which may or may not a monophyletic lineage”. In contrast to the evolutionary definition (MAYR & ASHLOCK 1991: 48: “a species group is a group of closely related and presumably recently evolved species”) the concept applied to the genus *Betta* is a phenetic instead of a phylogenetic application. Therefore it depends only on the respective definition and not on the genealogical relationships of their members. A diagnostic character (among others) of the *pugnax*-group defined by TAN & KOTTELAT

1998a and TAN & NG 2005a is a lanceolate caudal fin in males. Nevertheless usually there are species included which have only a slightly pointed caudal fin (*B. prima* KOTTELAT 1994), a slightly lanceolate or even rounded caudal fin (*B. schalleri* KOTTELAT & NG 1994). This is why the character 'caudal fin shape' is replaced here both by the number of lateral scales (SCHINDLER & SCHMIDT 2006) and by ethological characters (SCHMIDT 1996). *Betta kuehnei* spec. nov. is considered here as a member of the *B. pugnax*-group, because it shares (with the exception of caudal fin shape) the diagnostic character states mentioned by TAN & KOTTELAT (1994, TAN & NG 2005a) and usually has >28 lateral scales. However, since presently there is no robust phylogenetic analysis available (which should be based on diverse character complexes), the placements of species taxa in a species group has to be preliminary. Hence, we consider the number of different species groups and the placements of the species in these groups not as conclusive taxonomic acts, but as informal means employed for practical reasons to handle subsets of the genus (see TAN & KOTTELAT 1994).

Acknowledgements

We are grateful both to J. KÜHNE (Titting, Germany) for sending us the type specimens and for information on the habitat of the new species, and to H. LINKE (Schwarzenbach, Germany) for providing photographs and additional information. We thank W. STAECK (Berlin, Germany) for critical review of the manuscript and his helpful suggestions, which improved the manuscript.

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Received: 03.11.2008

Accepted: 04.12.2008