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Tachysurus lani, a new catfish species (Teleostei: Bagridae) from the Pearl River basin, South China

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Tachysurus lani, a new bagrid catfish, is here described from the Liu-Jiang discharging into the Zhu-Jiang basin of Guangxi Province, South China. It belongs in a species group characterized by having a smooth anterior edge of the pectoral-fin spine, short maxillary barbels not extending to the base of the pectoral-fin spine, and a rounded, truncate or slightly emarginate caudal fin. This new species is distinguished from all other species of this group by having a unique combination of the following characters: a slightly serrated posterior margin of the dorsal-fin spine, a narrow interspace between the supraoccipital process and nuchal plate, a broadly rounded caudal fin with a wide white mark along the distal edge, pelvic fins inserted nearly midway from the snout tip to the caudal-fin base or slightly moved backwards, and nasal barbels extending not beyond the posterior edge of the eye. Comments on the identity of *T. albomarginatus* and *T. tenuis* are also provided.

Introduction

Two field surveys were conducted, respectively in April 2004 and May 2019 into the Liu-Jiang, tributary to the Qian-Jiang of the Pearl River (= Zhu-Jiang in Chinese) basin, at Jinxiu and Yongfu counties, Guangxi Province, South China. As a part of our ongoing work on the taxonomy of Chinese species of *Tachysurus*, these surveys yielded 30 specimens of bagrid catfishes referable to the genus, following Ng & Kottelat's (2010) generic diagnosis. These specimens, with a broad white or yellowish mark along the distal margin of the caudal fin, were initially identified as *T. albomarginatus*, a species originally described in *Leiocassis* by Rendahl (1928) from the lower Yangtze River (= Chang-Jiang in Chinese) basin of Anhui Province, China.

There is ongoing controversy over the validity of *Tachysurus albomarginatus*. Most researchers since Rendahl (1928) regarded it a valid name (Anonymous, 1976a–b; Chen, 1984; Ze, 1989; Gao, 1990; Xu, 1991), but a few workers have treated it as a junior synonym of *T. tenuis*, a species originally described by Günther (1873) from Shanghai, China (Gao et al., 1992; Zheng & Dai, 1999; Ni & Zhu, 2005). In agreement with the majority consensus, here we consider *T. albomarginatus* as a species distinct from *T. tenuis*. However, our analysis indicates that the aforementioned

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30 specimens from the Zhu-Jiang basin of the Guangxi Province, South China conform to neither *T. albomarginatus* nor *T. tenuis*, nor any remaining species of *Tachysurus*, and thus represent an unrecognized and undescribed taxon.

Prior to this study, 11 species of the bagrid catfish genus *Tachysurus* (sensu Ng & Kottelat, 2010) had been documented from the Guangxi Province of southern China: *T. albomarginatus*, *T. argentivittatus*, *T. crassilabris*, *T. fulvidraco*, *T. gracilis*, *T. intermedius*, *T. kyphus*, *T. pratti*, *T. tenuifurcatus* *T. vachellii*, and *T. virgatus* (Yue, 1981; Watanabe et al., 2002; Li et al., 2005; Yang & Zhang, 2006). However, ongoing studies of fish diversity in this region demonstrate that more thorough sampling and taxonomic examination of populations of *Tachysurus* will generate discoveries of new species and range extensions. Furthermore, a phylogenetic analysis based on DNA sequence data (Ku et al., 2007) suggested that the systematics of the East Asian bagrid fishes requires a thorough taxonomic revision. In this context, we report the discovery of this unrecognized species of *Tachysurus* from Guangxi Province, described and named further below.

Table 1. Species of *Tachysurus* with a smooth anterior edge of the pectoral-fin spine: haplotypes (T1–T25), collection sites, voucher specimens and GenBank accession numbers. Haplotypes marked with an asterisk were obtained from GenBank.

Species	Haplotype	Voucher specimen	GenBank no.	Locality
T. lani	T1	IHB 04050200	MT271007	Jinxiu, Guangxi Province
	T2	IHB 04050196	MT271008	
	T2	IHB 04050182	MT271009	
	T2	IHB 04050184	MT271010	
	T3	IHB 04050193	MT271011	
	T2	IHB 04050189	MT271012	
	T2	IHB 190510001	MT271013	Yongfu, Guangxi Province
	T3	IHB 190510002	MT271014	
	T2	IHB 190510003	MT271015	
	T3	IHB 190510004	MT271016	
	T2	IHB 190510005	MT271017	
	T4	IHB 190510006	MT271018	
T. albomarginatus	T5	IHB 20080900002	MT330331	Dangtu, Anhui Province
	T6	IHB 20080900003	MT330332	
	T7	IHB 20080900004	MT330333	
	T8	IHB 20181009001	MT330334	Jiande, Zhejiang Province
	T9	IHB 20181009002	MT330335	
	T9	IHB 20181009003	MT330336	
	T10	IHB 20190610001	MT330337	Qingtian, Zhejiang Province
	T11	IHB 20190610002	MT330338	
T. dumerili	T12	IHB 20190805116	MT330327	Qianwei, Sichuan Province
T. vachellii	T13	IHB 20180903411	MT330328	Wuhan, Hubei Province
T. truncatus	T14	IHB 20180903202	MT330329	Leshan, Sichuan Province
T. gracilis	T15	IHB 20180903117	MT330330	Guilin, Guangxi Province
T. sinensis	T16*	IHB 0305175	AY912313.1	Biliuhe, Liaoning Province
T. emarginatus	T17*	IHB 0404225	AY912438.1	Hejiang, Sichuan Province
T. nitidus	T18*	IHB 0404296	AY912357.1	Hejiang, Sichuan Province
T. ussuriensis	T19*	IHB 001108007	AY912400.1	Jian'ou, Fujian Province
T. brachyrhabdion	T20*	IHB 2003134	AY912411.1	Taoyuan, Hunan Province
T. ondon	T21*	IHB 001101005	AY912378.1	Fuchunjiang, Zhejiang Province
T. pratti	T22*	Unknown	39697704	Unknown
T. intermedius	T23*	Unknown	35996709	Unknown
T. argentivittatus	T24*	IHB 0305241	AY912445.1	Jinkou, Hubei Province
T. kyphus	T25*	Unknown	AB085622.1	Fangchenggang, Guangxi Province

Material and methods

Specimens sampling and preservation. Thirty specimens of the new species were caught during two field surveys conducted, respectively in April 2004 and May 2019 into the Liu-Jiang flowing into the Zhu-Jiang basin in the Guangxi Province of South China. Among them, twelve specimens were fixed in 10 % formalin after removal of right-side pelvic-fin clips. These fin clips were stored in 95 % ethyl alcohol and utilized for molecular analysis. The remaining caught specimens were directly preserved in 10 % formalin preservative for morphological examination. One mitochondrial cytochrome b (Cyt b) gene was chosen as the genetic marker. Twelve samples from five species of *Tachysurus* (*T. albomarginatus*, *T. dumerili*, *T. gracilis*, *T. truncatus* and *T. vachellii*), collected from other field surveys, were included for comparison (Table 1). In addition, 10 Cyt b gene sequences from other 10 species of *Tachysurus* were retrieved from GenBank. All sequences amplified in this study were submitted to GenBank. Their voucher specimens are deposited in the Museum of Aquatic Organisms of the Institute of Hydrobiology (IHB), Chinese Academy of Sciences, Wuhan. See Table 1 for specimen catalogue numbers and GenBank accession numbers.

DNA extraction, amplification and sequencing. Total genomic DNA was extracted from small pieces of alcohol-preserved fin tissues, utilizing TIANamp Genomic DNA Kit (Tiangen Biotech, Beijing) according to the manufacturer's instructions. The Cyt b gene was determined by the polymerase chain reaction, with primers L14724 and H15915 adopted from Xiao et al. (2001). This gene was performed in 25 µl volumes including 12.5 µl Master mix Taq (Beijing TsingKe Biotech Co., Ltd.), 1 µl of each primer and 1µl template DNA, adding double distilled water (dd H_2O) to supply the volume. The thermocycling conditions were as follows: initial pre-denaturing for 4 min at 94 °C, denaturing for 50 s at 94 °C, annealing for 50 s at 55 °C, and extension for 1 min, according to the product length at 72 °C. After 34–35 cycles, the final extension was done at 72 °C for 10 min. Amplified product was stored at 4 °C, subsequently purified and utilized for direct cycle sequencing finished by Tianyihuiyuan Biotechnology Company.

Phylogenetic analysis. The 24 Cyt b gene sequences here amplified from six species of *Tachysurus* were used for molecular phylogenetic analysis. Other 10 sequences, from other 10 congeneric species, were downloaded from GenBank, five of which (*T. argentivittatus*, *T. intermedius*, *T. kyphus*, *T. ondon*, and *T. sinensis*) were used as the outgroup. Detailed information about samples is presented in Table 1. Multiple alignments were prepared for all sequences using MEGA 7.0 (Kumar et al., 2016), based on the amino acid sequences applying the program MUSCLE (Edgar, 2004) with the default setting. The genetic distance based on K2P (Kimura 2-parameter) modal (Kimura, 1980) was calculated with MEGA 7.0. DNASP v5 was used to filter the haplotype (Librado & Rozas, 2009). DAMBE was used to measure the substitution saturation for the Cyt b gene to test if it could be used for phylogenetic analysis (Xia & Xie, 2001). Different data format conversion was operated by AliView (Larsson, 2014).

Bayesian consensus trees were estimated with the following model: HKY+I. The model was selected by Akaike's information criterion (AIC), implemented in jModeltest (Darriba et al., 2012). MrBayes 3.2.2 (Ronquist & Huelsenbeck, 2003) was utilized for Bayesian analyses initiating from random starting trees, and four Markov chain Monte Carlo (MCMC) simulations were performed simultaneously for 4 000 000 replicates. Trees were sampled for every 1000 cycles. The first 25 % of the sampled trees were discarded as burnin. Sufficient mixing of the chains was regarded to be reached when the average standard deviation of split frequencies was below 0.01.

Morphological analysis. All measurements were taken point to point with digital calipers connected to a data recording computer and recorded to the nearest 0.1 mm. Measurements and counts of bilaterally symmetrical features were made from the left side of the body whenever possible, following methods used by Cheng et al. (2008). Subunits of head are provided as percents of the head length (HL). The head length and measurements of other portions of the body are presented as percents of the standard length (SL). Dorsal and anal-fin rays were counted from radiographs following the methods of Watanabe (1995). Other fin rays and gill-rakers were counted under a binocular dissecting microscope utilizing transmitted light. Vertebral number taken from radiographs

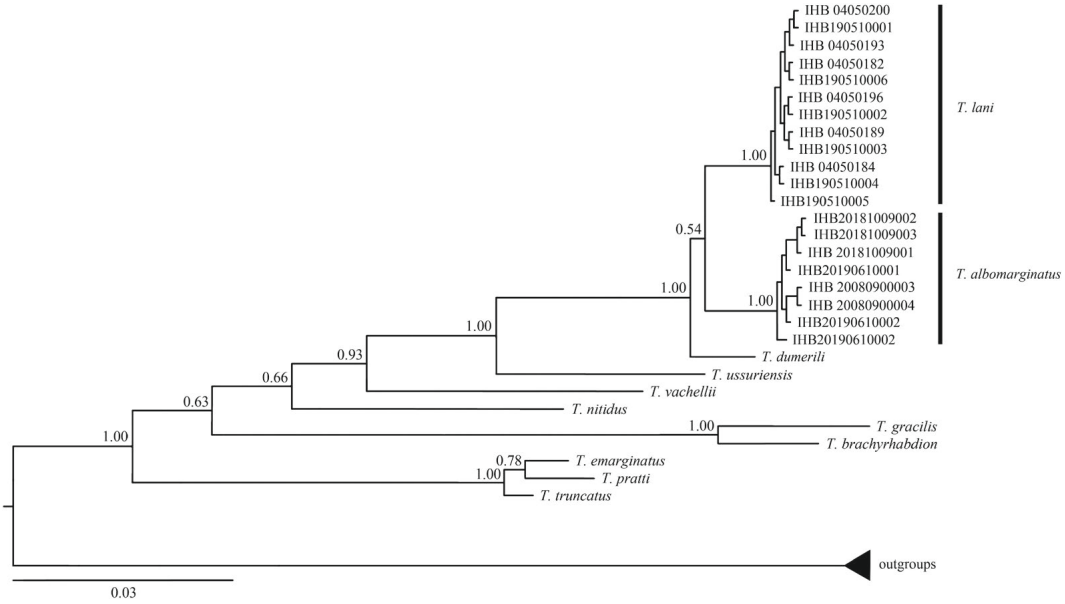

Fig. 1. Consensus tree derived from Bayesian inference analysis among *Tachysurus lani* and other congeneric species with a smooth anterior edge of the pectoral-fin spine. Numbers on branches refer to bootstrap support in posterior probabilities in Bayesian analysis.

contains the anterior five vertebrae including the Weberian complex and dissociative vertebra including the preurostyle. Osteological features were checked in cleared and double-stained specimens (CS) prepared following the modified methods of Dingerkus & Uhler (1977) and Taylor & Van Dyke (1985). Illustrations were prepared with a ZEISS SV 6 microscope and camera lucida using polarized light to distinguish ligaments and connective tissue on cleared and stained material. In this contribution, the diagnosis of *Tachysurus* follows that of Ng & Kottelat (2010) unless otherwise noted.

Specimens examined come from the following collections: Museum of Aquatic Organisms of Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan (IHB), Shanghai Ocean University, Shanghai (SOU), East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Shanghai (ECSFI), Swedish Museum of Natural History, Stockholm (NRM), American Museum of Natural History, New York (AMNH),

Table 2. The average K2-P distance among sampled species of *Tachysurus* with a smooth anterior edge of the pectoral-fin spine

Species		1	2	3	4	5	6	7	8	9	10
1	*T. albomarginatus*										
2	*T. lani*	0.017									
3	*T. dumerili*	0.020	0.018								
4	*T. vachellii*	0.076	0.076	0.073							
5	*T. truncatus*	0.101	0.098	0.103	0.103						
6	*T. gracilis*	0.128	0.121	0.125	0.104	0.108					
7	*T. nitidus*	0.083	0.082	0.084	0.072	0.088	0.107				
8	*T. ussuriensis*	0.059	0.059	0.058	0.073	0.087	0.124	0.075			
9	*T. emarginatus*	0.103	0.097	0.102	0.100	0.011	0.099	0.092	0.086		
10	*T. brachyrhabdion*	0.126	0.119	0.120	0.106	0.101	0.105	0.107	0.124	0.033	
11	*T. pratti*	0.097	0.097	0.100	0.103	0.015	0.017	0.095	0.088	0.117	0.109

Fig. 2. *Tachysurus lani*, IHB 2004050156, holotype, 121.5 mm SL; China: Zhu-Jiang River basin.

National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), and the Natural History Museum, London (BMNH).

Results

Twenty-four sequences from six species of *Tachysurus* were successfully amplified and used for phylogenetic analysis along with 10 sequences from other ten congeneric species downloaded from GenBank (including the members of the outgroup). Twenty-five haplotypes were detected for these sequences (Table 1). The Cyt b gene of 1119 base pairs in length was obtained after sequence alignment and trimming. This included 348 conserved sites, 744 variable sites, 266 parsimony informative sites and 478 singleton sites. The mean frequency of four nucleotides of the species under description was A = 28.3 %, T = 27.3 %, C = 23.7 %, and G = 20.7 %; the base composition was A-T rich (55.6 %). The Bayesian inference tree inferred from the Cyt b gene for the new species and other 15 congeners is shown in Figure 1, with node support values displayed. From the topology of the phylogenetic tree based on the Cyt b gene, all

Fig. 3. *Tachysurus lani*, freshly captured specimen from a hill stream, tributary to Liu-Jiang of Zhu-Jiang basin, in Jinxiu County of Guangxi Province, South China.

samples of new species were highly supported by 100 % posterior probabilities (pp) to group into an independent lineage; this lineage was sister to the strongly-supported (100 % pp) lineage formed by samples of *T. albomaginatus*, but these paired lineages received a weak support of 54 % pp. The genetic distance value between *t*he new species and *T. albomarginatus* was 1.7 % (see Table 2).

Tachysurus lani, new species
(Figs. 2–5, 7, 10; Table 3)

Pseudobagrus albomarginatus (not Rendahl, 1928): Yang & Zhang, 2006: 412 (Di-Shui, a tributary flowing to Liu-Jiang of Zhu-Jiang basin, in Jinxiu County, Guangxi Province, China).

Leiocassis albomarginatus (not Rendahl, 1928): Ze, 1989: 249 (Wu-Jiang of upper Chang-Jiang basin in Guiyang City, Zunyi City and Suiyang County, Jing-Jiang discharging into Yuan-Jiang of middle Chang-Jiang basin in Jiangkou County, and Caodu-He flowing into Xi-Jiang of Zhu-Jiang basin in Pingtang County, Guizhou Province).

Holotype. IHB 2004050156, 121.5 mm SL; China: Guangxi Province: a stream on eastern bank of Liu-Jiang flowing to Qian-Jiang of Zhu-Jiang basin in Jinxiu County, Jia-Hu Lan, Apr 2004.

Paratypes. IHB 200405099, IHB 2004050157, IHB 2004050182, IHB 2004050184, IHB 2004050189, IHB 2004050193, IHB 2004050196, IHB 2004050200, IHB 2004050223, IHB 2004050225, IHB 2004050227, and IHB 2004050159 (CS), 12, 55.1–149.0 mm SL; collected with the holotype. IHB 20190510001-17, 17, 78.4–179.8 mm SL; Yongfu County, Wei-Han Shao, May 2019.

Diagnosis. A member of the species group of *Tachysurus* diagnosed by having a smooth anterior edge of the pectoral-fin spine, short maxillary barbels not extending to the base of the pectoral-fin spine (Lineage I of Ku et al., 2007: 156, fig. 1), and an emarginate, truncate or rounded caudal fin. *Tachysurus lani* (as well as *T. albomarginatus*, *T. brachyrhabdion*, *T. gracilis*, *T. tenuis*, and *T. ussuriensis*) is distinguished from all other species of this group by having a slightly serrated (vs. smooth) posterior margin of the dorsal-fin spine (Fig. 4). It is distinct from these five species in having a narrow interspace between the supraoccipital process and nuchal plate, being less than half of the supraoccipital process (vs. no interspace in *T. albomarginatus*, *T. tenuis* and *T. ussuriensis*, or a wide interspace, greater than half of the supraoccipital process in *T. brachyrhabdion* and *T. gracilis*) (Fig. 5). This new species is similar to *T. tenuis* in the presence of a broadly rounded caudal fin, a character useful in distinguishing both from *T. albomarginatus*, *T. brachyrhabdion*, *T. gracilis*, and *T. ussuriensis* with an emarginate caudal fin; it is further distinct from *T. tenuis* species in having a broad (vs. narrow) white mark along the distal edge of the caudal fin, a stout (vs. slender) caudal peduncle (its length/depth 1.3–2.3, mean 1.9, vs. 2.7–3.2, mean 3.0; Fig. 6a), and pelvic fins inserted nearly equidistant between the snout tip and the caudal-fin base or slightly positioned backwards

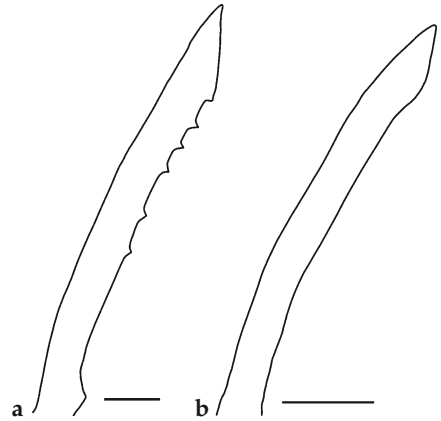

Fig. 4. Dorsal-fin spine of: **a,** *Tachysurus lani*, IHB 2004050159, paratype, 107.0 mm SL; China: Liu-Jiang flowing into Zhu-Jiang basin; **b,** *T. truncatus*, IHB 585005, 90.6 mm SL; China: Qingyi River of upper Chang-Jiang basin. Scale bars represent 2 mm.

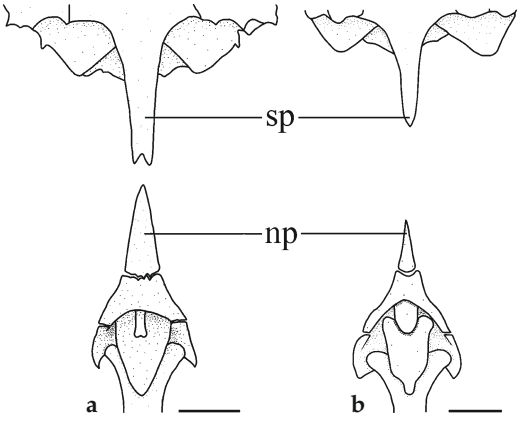

Fig. 5. Dorsal view of supraoccipital process and dorsal-fin spine base in: **a,** *Tachysurus lani*, IHB 2004050159, paratype, 107.0 mm SL; China: Liu-Jiang flowing into Zhu-Jiang basin; **b,** *T. brachyrhabdion*, IHB 84IV143, 82.8 mm SL; China: Oushui-Jiang, a tributary to Xiang-Jiang of middle Chang-Jiang basin. np, nuchal plate; sp, supraoccipital process. Scale bars represent 2 mm.

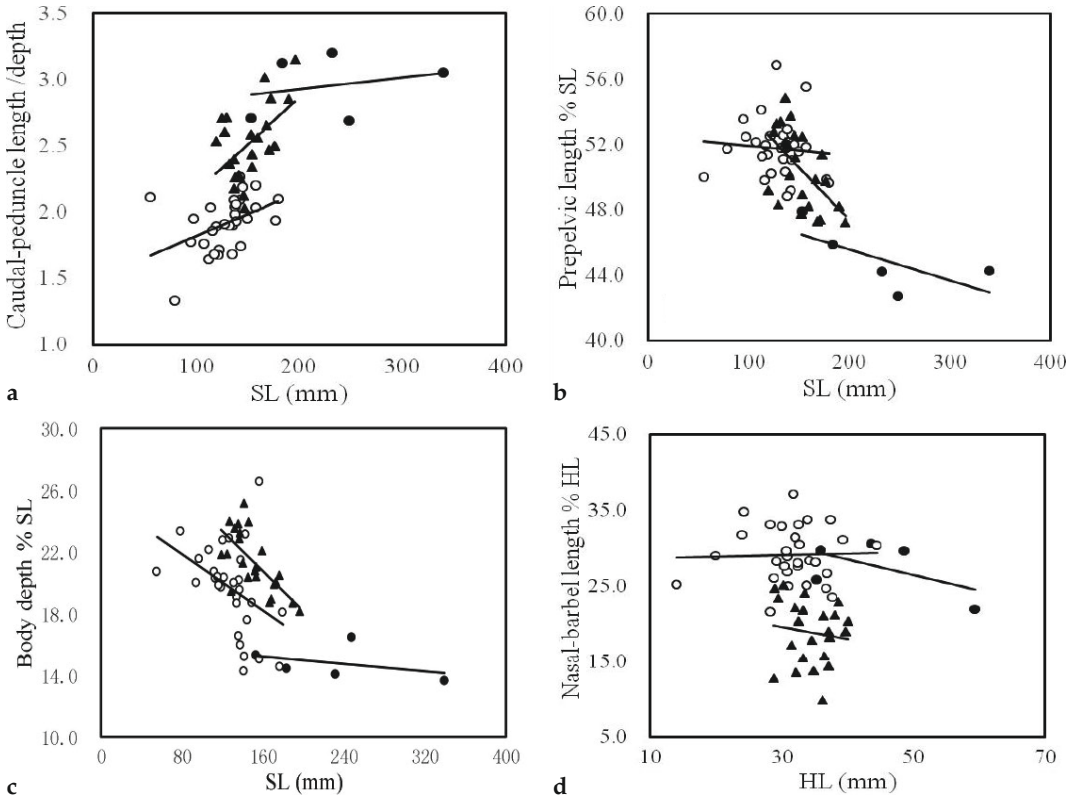

Fig. 6. Comparisons (linear regressions) of morphometric characters: **a,** between caudal-peduncle length / depth and SL; **b,** between pre-pelvic length % SL and SL; **c,** between body depth % SL and SL; **d,** between nasal barbel length % HL and HL, in *Tachysurus albomarginatus* (▲), *T. tenuis* (●) and *T. lani* (○).

(vs. closer to the snout tip than to the caudal-fin base), with the pre-pelvic length 48.8–56.9, mean 51.8 % of SL (vs. 42.7–47.9, mean 45.0; Fig. 6b). *Tachysurus lani* is similar to *T. albomarginatus* in possessing a broad white mark along the distal margin of the caudal fin, a character used to distinguish both from *T. brachyrhabdion*, *T. gracilis*, *T. ussuriensis* and *T. tenuis*, with a narrow white mark along the distal margin of upper and lower margins of the caudal fin; it further differs from *T. albomarginatus* in having a rounded (vs. slightly emarginate) caudal fin and longer nasal barbel extending slightly beyond the posterior (vs. anterior) margin of the eye.

Tachysurus lani is further distinct from *T. albomarginatus*, *T. brachyrhabdion*, *T. gracilis* and *T. ussuriensis* in the morphology of the pelvic girdle. In the above four species, the anterior portion of the basipterygium is bifurcated and deeply notched forming two forward directed processes, while the posterior portion is roughly triangular. In *T. lani*, the depth of the notch is less than half the length of the anterior portion, and the two forward processes (anterolateral

Table 3. Morphometric data for type series of *Tachysurus lani* and topotypic specimens of *T. albomarginatus* and *T. tenuis*. H, holotype; n, number of specimens; SD, standard deviation.

Characters	*T. lani*, new species		*T. albomarginatus*	*T. tenuis*
	H	Paratypes (n = 29) Range (mean ± SD)	Topotypes (n = 23) Range (mean ± SD)	Topotypes (n = 5) Range (mean ± SD)
Standard length (mm)	121.5	55.1–179.8 (128.6 ± 26.6)	118.7–196.0 (150.8 ± 21.0)	152.8–339.2 (231.0 ± 71.3)
In percents of standard length				
Body depth at anus	17.2	14.1–21.2 (17.3 ± 1.9)	13.8–20.4 (17.3 ± 1.6)	9.1–13.0 (11.4 ± 1.5)
Body depth	20.3	14.3–26.5 (19.6 ± 2.9)	18.1–25.2 (21.3 ± 2.0)	13.6–16.5 (14.8 ± 1.1)
Pre-dorsal length	35.4	32.7–37.8 (35.5 ± 1.1)	30.6–36.0 (33.7 ± 1.4)	24.7–32.6 (28.7 ± 2.9)
Pre-anal length	61.3	57.6–67.5 (63.1 ± 2.0)	59.6–65.9 (62.6 ± 2.0)	55.3–61.7 (57.7 ± 2.4)
Pre-pelvic length	50.2	48.8–56.9 (51.8 ± 1.8)	47.2–54.9 (50.5 ± 2.4)	42.7–47.9 (45.0 ± 2.0)
Pre-pectoral length	21.6	20.5–25.3 (22.6 ± 1.2)	19.7–25.2 (21.8 ± 1.4)	18.2–19.7 (19.2 ± 0.6)
Dorsal-fin spine length	15.5	14.2–19.4 (16.9 ± 1.5)	13.5–18.8 (15.9 ± 1.2)	10.8–17.7 (13.9 ± 2.7)
Dorsal-fin length	20.9	18.0–25.6 (22.4 ± 1.8)	18.1–22.5 (20.9 ± 1.2)	14.2–21.1 (17.5 ± 3.2)
Length of dorsal-fin base	11.9	10.0–12.1 (11.1 ± 0.6)	8.8–12.0 (10.5 ± 0.7)	9.2–10.9 (9.9 ± 0.7)
Pectoral-fin spine length	14.5	13.1–19.6 (15.9 ± 1.6)	12.2–16.1 (14.4 ± 1.1)	13.2–14.8 (13.7 ± 0.7)
Pectoral-fin length	19.0	16.2–23.3 (19.5 ± 1.5)	15.3–19.4 (17.9 ± 1.1)	12.9–17.7 (15.2 ± 2.2)
Pelvic-fin length	11.0	9.8–14.3 (12.0 ± 0.9)	9.8–12.8 (11.7 ± 0.7)	8.2–12.7 (10.2 ± 1.6)
Anal-fin base length	23.6	20.6–27.5 (22.9 ± 1.6)	17.7–22.3 (20.5 ± 1.2)	22.3–26.6 (24.6 ± 1.6)
Adipose fin depth	4.9	3.2–6.0 (4.8 ± 0.6)	3.6–5.9 (4.6 ± 0.6)	2.6–4.2 (3.3 ± 0.6)
Adipose-fin base length	25.6	24.2–32.2 (27.3 ± 2.1)	26.7–32.6 (29.7 ± 1.6)	28.5–35.5 (32.8 ± 2.7)
Dorsal-adipose fin distance	16.8	9.7–22.2 (15.1 ± 2.6)	10.0–16.7 (13.6 ± 1.6)	13.4–18.5 (15.2 ± 1.9)
Adipose-caudal fin distance	13.3	9.7–15.1 (12.9 ± 1.1)	12.0–16.0 (14.1 ± 1.1)	12.3–16.7 (14.3 ± 1.7)
Caudal-peduncle length	15.1	10.5–17.1 (15.0 ± 1.3)	15.5–20.0 (17.9 ± 1.2)	16.8–18.8 (18.0 ± 0.8)
Caudal-peduncle depth	8.8	7.0–8.9 (7.8 ± 0.5)	5.9–8.2 (7.1 ± 0.5)	5.8–6.5 (6.1 ± 0.3)
Head length (HL)	25.3	22.2–26.8 (24.5 ± 1.2)	20.4–24.4 (22.9 ± 1.1)	17.5–23.1 (19.7 ± 2.1)
Caudal-peduncle length/depth	1.7	1.3–2.3 (1.9 ± 0.2)	2.0–3.2 (2.5 ± 0.3)	2.7–3.2 (3.0 ± 0.2)
In percents of head length				
Head depth	70.4	61.9–92.3 (72.2 ± 6.8)	61.7–77.0 (68.5 ± 4.4)	52.4–65.8 (58.0 ± 4.9)
Head width	75.6	54.9–85.0 (70.5 ± 8.4)	69.3–82.5 (75.9 ± 3.0)	69.0–73.6 (70.6 ± 1.8)
Snout length	33.6	31.2–39.7 (34.9 ± 2.2)	32.5–38.4 (35.8 ± 1.6)	31.9–38.8 (35.0 ± 2.7)
Interorbital width	37.2	33.5–41.7 (37.1 ± 2.1)	30.7–39.6 (35.0 ± 2.5)	31.8–39.4 (36.0 ± 3.2)
Eye diameter	16.5	12.6–23.8 (15.8 ± 2.2)	12.0–15.3 (13.5 ± 1.0)	11.6–15.9 (13.4 ± 1.8)
Mouth width	45.5	35.3–45.8 (41.9 ± 2.3)	36.5–45.7 (41.7 ± 2.2)	41.6–48.3 (43.7 ± 2.7)
Nasal barbel length	28.9	21.7–37.1 (29.2 ± 3.7)	13.5–24.7 (19.1 ± 3.4)	22.0–30.6 (27.6 ± 3.6)
Maxillary barbel length	46.2	39.8–57.4 (48.6 ± 4.3)	36.3–56.2 (45.9 ± 4.6)	42.4–59.7 (52.6 ± 7.2)
Inner mandibular barbel length	19.9	16.3–24.7 (19.5 ± 2.3)	13.8–24.9 (18.5 ± 2.6)	17.8–23.9 (20.6 ± 2.6)
Outer mandibular barbel length	31.9	24.8–37.1 (30.1 ± 3.3)	24.9–37.8 (29.8 ± 2.9)	23.4–40.1 (35.3 ± 6.8)

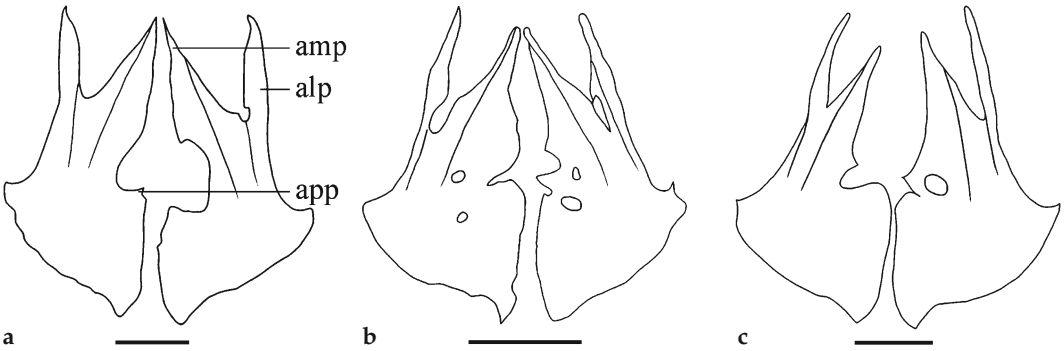

Fig. 7. Dorsal view of pelvic girdle in: **a,** *Tachysurus lani*, IHB 200404050159, paratype, 107.0 mm SL; China: Liu-Jiang flowing into Zhu-Jiang basin; **b,** *T. albomarginatus*, IHB 200605268, topotype, 128.5 mm SL; China: lower Chang-Jiang basin; **c**, *T. ussuriensis*, IHB 581028, 111.4 mm SL; China: Amour River basin. amp, anteromedial process; alp, anterolateral process; app, the anteromedial process of the posterior portion. Scale bars represent 2 mm.

and anteromedial) are equal in length, while the posterior portion presents a weakly developed anteromedial process (Fig. 7a). Contrarily, in *T. albomarginatus* the depth of the notch is more than half the length of the anterior portion of the basipterygium (Fig. 7b). In *T. ussuriensis*, the anteromedial process is shorter than the anterolateral process (Fig. 7c). In *T. gracilis* and *T. brachyrhabdion*, the anteromedial process of the posterior portion is more developed (see Cheng et al., 2008: 120, fig. 7a–b) when compared to *T. lani* (Fig. 7a).

Description. Morphometric data in Table 3. See Figures 2 and 3 for general body appearance. Dorsal profile rising gradually, but not steeply from tip of snout to dorsal-fin origin, straight from this point to adipose-fin origin, then sloping ventrally to posterior end of adipose-fin base and rising evenly to origin of dorsal procurrent caudal-fin rays. Ventral profile nearly straight from tip of snout to anal-fin origin, straight and slanting dorsally along anal-fin base, then gradually sloping ventrally from posterior end of anal fin to origin of ventral procurrent caudal-fin rays. Lateral line complete, straight and mid-lateral. Vertebrae 5 + 45 (7) or 46 (2).

Head depressed, broad and covered with thick skin. Dorsal profile slightly convex and ventral profile nearly straight. Supraoccipital process slender with evenly converging sides and forked tip, separated from nuchal plate by narrow gap (being less than supraoccipital process length) (Fig. 5a). Snout blunt in dorsal view, longer than eye diameter. Eye elliptical, covered with thick membrane, latero-dorsally positioned in anterior half of head and visible when viewed dorsally, but not ventrally; interorbital space wide, convex. Mouth inferior, crescentic; upper jaw projecting forwards past lower jaw. Gill openings broad, extending from posttemporal to beyond isthmus. Gill rakers 12 (8), 13 (1) or 14 (3). Four pairs of barbels; nasal barbel thin, short, extending slightly beyond middle point, but not to posterior edge of eye; maxillary barbel long, extending beyond posterior margin of eye, almost to gill membrane; outer mandibular barbel shorter than maxillary, extending beyond posterior margin of eye, and inner mandibular barbel longer than eye diameter, located in transverse row at level of posterior naris, not extending beyond anterior margin of eye.

Dorsal fin with spinelet, spine, and 7 soft branched rays; origin closer to anal-fin origin than to snout tip, or nearer to pectoral-fin insertion than to pelvic-fin insertion; distal margin convex. Dorsal-fin spine stout, 1.5–1.8 times in HL, longer than pectoral-fin spine, but shorter than body depth, with smooth anterior edge and slightly-serrated posterior edge distally (Fig. 4b). Nuchal plate triangular, anteriorly with pointed tip. Adipose-fin origin opposite to anal-fin origin, with convex distal margin for full length and deeply incised posterior portion forming a rounded apex. Adipose-fin base moderately long, greater than anal-fin base in length. Distance between posterior end of adipose-fin base and caudal-fin base less than caudal peduncle length.

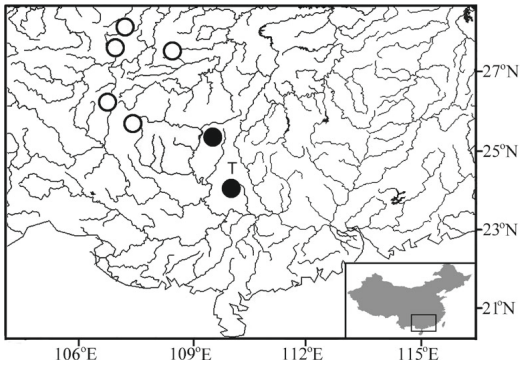

Fig. 8. Map showing known distribution of *Tachysurus lani* in China. Records based on material examined [●] and based on Ze (1989) [○]. "T" indicates the type locality.

Pectoral fin with spine and 8 soft branched rays, inserted anterior to vertical through posteriormost point of opercle, and reaching halfway to pelvic-fin insertion. Pectoral-fin spine stout, sharply pointed at its distal tip, with smooth anterior edge and with 12–16 (average 13.5) strong serrations along posterior edge. Pectoral-fin edge straight anteriorly and convex posteriorly. Cleithral process triangular with sharp pointed tip, extending for roughly three-quarters of pectoral-fin spine length. Pelvic fin with 5 soft branched rays, inserted nearly equidistant from snout tip and caudal-fin base or slightly moved backwards, or anterior to vertical through tip of adpressed dorsal-fin rays. Adpressed pelvic fin extending to anal-fin origin in some individuals. Pelvic-fin margin slightly convex. Anus and urogenital openings halfway between pelvic-fin insertion and anal-fin origin. Males with conical genital papilla not extending to anal-fin origin. Anal fin with 20 (4) or 21 (5) soft branched rays, originating closer to caudal-fin base than to snout tip. Anal-fin base shorter than adipose-fin base in length. Distal margin of anal fin convex; anterior rays shortest. Caudal fin broadly rounded with 8+9 principal rays; procurrent rays extending anterior to fin base.

Coloration. In formalin-stored specimens (Fig. 2), body dark brown dorsally and laterally, grayish ventrally; caudal and anal fins blackish with a broad, white distal margin, and other fins uniformly dark brown. When in life (Fig. 3), body pale brown dorsally and laterally, yellowish ventrally; caudal and anal fins with a broad, yellowish or white distal margin, other fins uniformly brown.

Distribution. *Tachysurus lani* is presently known from a stream on the eastern bank of the Liu-Jiang, a tributary to the Qian-Jiang of the Zhu-Jiang basin, at Jinxiu and Yongfu counties, Guangxi Province. It has been documented by Ze (1989) from the Wu-Jiang of the upper Chang-Jiang basin in Guiyang City, Zunyi City and Suiyang County, the Qian-Jiang (a tributary discharging into the Yuan-Jiang of the middle Chang-Jiang basin) in Jiangkou County, and the Caodu-He (a tributary flowing into the Zhu-Jiang basin) in Pingtang County, Guizhou Province (Fig. 8).

Etymology. The specific name is meant to honor Jia-Hu Lan, a parataxonomist who collected the type specimens, in recognition of his contributions to the understanding on freshwater fishes of Guangxi Province based on products of his field surveys.

Discussion

Tachysurus lani has been misidentified as *T. albomarginatus* in Chinese literature, a species which was sometimes confused with *T. tenuis*. The original descriptions of *T. albomarginatus* and *T. tenuis* were brief and vague, and therefore provided little useful diagnostic information for their recognition. Revisions of these two species by Chinese authors were made without access to type specimens, or even reference to topotypic specimens (e.g. Li, 1994). In order to facilitate comparisons with this new species, here we provide brief comments on the identity of these two species, and add some clarity to the state of knowledge of their distribution.

Rendahl (1928) described *Tachysurus albomarginatus* based on five specimens (49.0–90.0 mm SL) collected from Tang-tu-hsien [now Dangtu County, in the lower Chang-Jiang basin], Anhui Province, South China. There is an apparent error in the original description, in that the caudal fin is stated to be rounded. This is likely the key cause of *T. albomarginatus* sometimes being mistaken for *T. tenius* in Chinese literature. Our examination of the syntype and topotypes of *T. albomarginatus* (Figs. 9a–b) indicates that this species possesses a slightly emarginate caudal fin with the upper

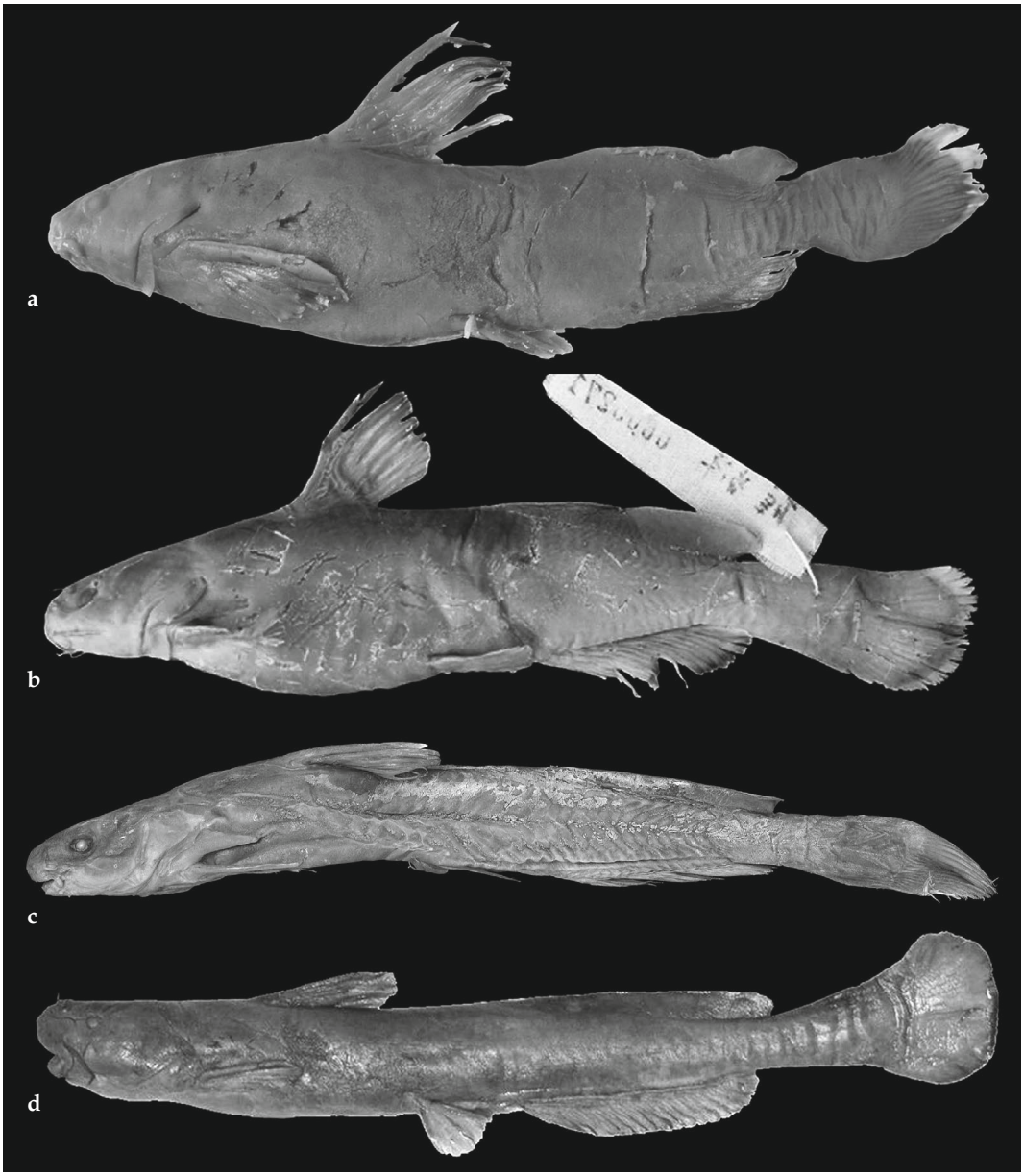

Fig. 9. a, *Tachysurus albomarginatus*, NRM 10017, syntype, 46.2 mm SL; China: lower Chang-Jiang basin; **b,** *T. albomarginatus*, IHB 200605271, topotype, 158.7 mm SL; China: lower Chang-Jiang basin; **c,** *T. tenuis*, BMNH 1873.7.30.72, holotype, 266.7 mm SL; China: Shanghai City; **d,** *T. tenuis*, ECSFI, uncatalogued, topotype, 339.2 mm SL; China: Chongming Island located in Chang-Jiang mouth.

lobe slightly longer than the lower (Fig. 10b), a dorsal-fin spine with a slightly serrated posterior margin distally, no interspace between the supraoccipital process and the nuchal plate, a broad white mark along the distal edge of the caudal fin, short nasal barbel extending slightly beyond the anterior edge of the eye, and pelvic fin inserted nearly equidistant from the snout tip and the caudal-fin base or slightly moved backwards. Previously recognized as this species were

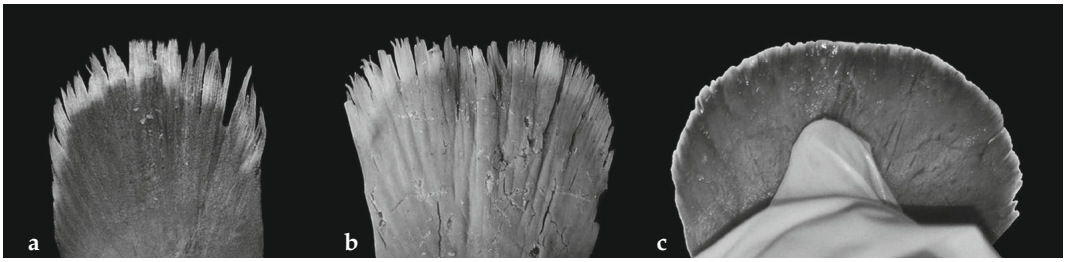

Fig. 10. Shape of caudal-fin of: **a,** *Tachysurus lani*, IHB 2004050156, holotype, 121.5 mm SL; China: Liu-Jiang of Zhu-Jiang basin; **b,** *T. albomarginatus*, IHB 200605271, topotype, 158.7 mm SL; China: lower Chang-Jiang basin; **c,** *T. tenuis*, ECSFI, uncatalogued, topotype, 339.2 mm SL; China: Chongming Island located in Chang-Jiang mouth.

specimens from the Yi-He and Lake Dongping in Shandong Province (Cheng & Zhou, 1997); from the mid-lower Chang-Jiang basin in Hunan and Jiangxi provinces (Anonymous, 1976a–b); from the Han-Jiang basin in Guangdong Province (Gao, 1990); from the Huai-He basin and the Han-Jiang discharging into the middle Chang-Jiang basin in Henan Province (Anonymous, 1984); and from the Min-Jiang, Ting-Jiang, Mulan-Xi and Jiao-Xi basin in Fujian Province (Chen, 1984). Careful comparison of available specimens, coupled with a brief review of literature records, has indicated that *T. albomarginatus*, as herein diagnosed, is restricted to the lower Chang-Jiang basin and neighboring river basins such as the Qiantang-Jiang and Huai-He basin. *Tachysurus albomarginatus*, as currently diagnosed, is most likely a species complex including several species. A thorough taxonomic revision of this species complex is under work by the authors.

Tachysurus tenuis was reported from the mid-upper Chang-Jiang basin in Sichuan and Shaanxi provinces (Li, 1994; Gao et al., 1992), Lake Weishan in Shandong Province (Cheng & Zhou, 1997), Lake Taihu in Jiangsu Province (Ni & Zhu, 2005), the Qiantang-Jiang basin in Zhejiang Province (Xu, 1991) and the Min-Jiang and Ting-Jiang basins in Fujian Province (Chen, 1984). Until now, no critical comparisons have been made of the samples from these areas. A literature review of the species is uneasily done owing to the paucity and inconsistency of descriptive information provided by Chinese authors. Its type locality is in Shanghai, China, but without precise sampling location. Our examination of the holotype (BMNH 1873.7.30.72, 266.7 mm SL) indicates that *T. tenuis* has no interspace between the supraoccipital process and the nuchal plate, an elongate body (depth being one-eighth of SL stated in its original account), a slender caudal peduncle (about 2.5 times longer than deep), and pelvic fin inserted nearer to snout tip than to caudal-fin base (Fig. 9c). These four characters are shared only with other five examined specimens (four without precise locality and one collected from Chongming Island in the mouth of the Chang-Jiang) from Shanghai City (Fig. 9d). The examination of these specimens also showed the presence of the following features: a slightly serrated posterior edge of the dorsal-fin spine, a broadly rounded caudal fin bearing a very narrow white mark along its distal edge (Fig. 10c), and nasal barbel not reaching to the posterior margin of the eye. These specimens are thus conspecific with *T. tenuis*. Our ongoing study on the taxonomy of Chinese species of *Tachysurus* showed that specimens from the mid-lower Chang-Jiang basin formerly recognized as *T. tenuis* were wrongly identified and those recorded from the Qiantang-Jiang basin were misidentifications of *T. albomarginatus*, so indicating that *T. tenuis* has a restricted distribution and is not a widespread species as historically recorded. It has also been shown that a rounded caudal fin is only present in *T. tenuis*, *T. taeniatus*, *T. trilineatus*, and *T. analis*. There are subtle variations in their caudal-fin shape; the first three species, like *T. lani*, has a broadly rounded caudal fin (Fig. 10a,c), while the last species has a narrow, slightly tapering, rounded one (see Nichols, 1930: 4, fig. 3).

Based on the above analyses, *Tachysurus albomarginatus* is a valid species distinct from *T. tenuis*. These two species differ in caudal-fin shape and coloration (Fig. 10b–c). *Tachysurus albomarginatus* further differs from *T. tenuis* in having a deeper body (depth 18.1–25.2, mean 21.3 % of SL, vs. 13.6–16.5, mean 14.8; see Fig. 6c), more posteriorly-positioned pelvic fin (pre-pelvic

length 47.2–54.9, mean 50.5 % of SL vs. 42.7–47.9, mean 45.0; see Fig. 6b), shorter anal-fin base (length 17.7–22.3, mean 20.5 % of SL vs. 22.3–26.6, mean 24.6) (see Table 2), and shorter nasal barbels (length 13.5–24.7, mean 19.1, of HL vs. 22.0–30.6, mean 27.6; see Fig. 6d).

Our molecular data shows that *Tachysurus lani* is genetically distinct from *T. albomarginatus*. In the Bayesian inference tree generated from the Cyt b gene for 16 Chinese species of *Tachysurus* (Fig. 1), samples of *T. lani* clustered into an independent lineage being sister to the lineage formed by those of *T. albomarginatus*. The genetic distance value between these paired species was 1.7 %, equal to the minimum one (1.7 %) calculated by Ku et al. (2007) between *T. ondon* (endemic to China) and *T. aurantiacus* (endemic to Japan). Hence, the specific status of *T. lani* is supported by its significant genetic distinction with *T. albomarginatus* and its monophyly recovered in this study. See the diagnosis for morphological differences between these two species.

Ku et al.'s (2007) phylogenetic analysis of *Pseudobagrus* (now *Tachysurus*) based on mitochondrial sequence data suggested the taxonomic usefulness of the presence or absence of serrations along the anterior edge of the pectoral spine and length of maxillary barbel. *Tachysurus lani* should be referred to a species group characterized by the possession of a smooth anterior margin of the pectoral spine and short maxillary barbel not extending to the base of the pectoral-fin spine (Lineage I of Ku et al, 2007: 156, fig. 1). Twenty-two species of *Tachysurus* can be placed within this species group: *T. adiposalis*, *T. albomarginatus*, *T. analis*, *T. brachyrhabdion*, *T. brevicaudatus*, *T. crassilabris*, *T. dumerili*, *T. emarginatus*, *T. fui*, *T. gracilis*, *T. lani*, *T. nitidus*, *T. omeihensis*, *T. pratti*, *T. similis*, *T. taeniatus*, *T. tenuifurcatus*, *T. tenuis*, *T. trilineatus*, *T. truncatus*, *T. ussuriensis*, and *T. vachellii*. These species can be further split into two groups based on the caudal-fin shape. The first includes those species with a forked caudal fin, its middle rays being shorter than two-thirds of the longest ray. Representatives of this group are: *T. brevicaudatus*, *T. crassilabris*, *T. dumerili*, *T. emarginatus*, *T. fui*, *T. nitidus*, *T. pratti*, *T. similis*, *T. tenuifurcatus*, and *T. vachellii*. The remaining 12 species can be assigned to a second group of species with an emarginate, truncate or rounded caudal fin; its middle rays being slightly longer than two-thirds of the longest ray: *T. adiposalis*, *T. albomarginatus*, *T. analis*, *T. brachyrhabdion*, *T. gracilis*, *T. lani*, *T. omeihensis*, *T. taeniatus*, *T. tenuis*, *T. trilineatus*, *T. truncatus*, and *T. ussuriensis*.

Tachysurus lani has a weakly serrated posterior margin of the dorsal-fin spine (Fig. 4a), a character that can be used to separate it from other six congeners included in the same species group (namely: *T. analis*, *T. adiposalis*, *T. omeihensis*, *T. taeniatus*, *T. trilineatus*, and *T. truncatus*) with a smooth posterior edge of the dorsal-fin spine (Fig. 4b). Among them, *T. analis*, *T. lani*, and *T. trilineatus*, differ from the remaining four species in having a rounded (vs. slightly emarginate or truncate) caudal fin; from *T. omeihensis*, based on our examination on the holotype, in having a dorsal-fin spine longer (vs. shorter) than the dorsal-fin base length, and pelvic fin inserted at or slightly posterior to the halfway point from the snout tip to the caudal-fin base (vs. closer to the caudal-fin base than to the snout tip); from *T. taeniatus* in the absence of a dark brown longitudinal stripe along the flank (vs. presence of such stripe) and a smooth (vs. serrated) anterior edge of the pectoral-fin spine; from *T. truncatus* in having 20–21 branched anal-fin rays (vs. 16–17); and from *T. adiposalis* in having 20–21 (vs. 18–19) branched anal-fin rays and a caudal peduncle that is shorter (vs. longer) than the anal-fin base. *Tachysurus lani* is further distinct from *T. analis* in having a broadly (vs. narrow, slightly tapering; see Nichols, 1930: 4, fig. 3) rounded caudal fin (Fig. 10), and pelvic fin inserted at or slightly posterior to the halfway point from the snout tip to the caudal-fin base (vs. closer to the snout tip than to the caudal-fin basin) and from *T. trilineatus* by having 20–21 (vs. 17–18) branched anal-fin rays and the absence (vs. presence) of longitudinal yellowish stripes along the flank. Data used here for *T. adiposalis* is from Shen (1993); *T. taeniatus*, from Watanabe & Kitabayshi (2001); and *T. truncatus*, from Zheng & Dai (1999).

Yang & Zhang (2006) recorded 10 species of *Tachysurus* from the Zhu-Jiang basin in Guangxi Province, southern China. Specimens from this basin identified as *T. adiposalis* by Yang & Zhang (2006) were demonstrated to represent a distinct species, which was described and named *T. gracilis* (see Li et al., 2005). Those identified as *T. albomarginatus* by Yang & Zhang (2006) are herein referred to as *T. lani*. Therefore, as here recognized, ten valid described species of *Tachysurus* occur in Guangxi Province: *T. argentivittatus*, *T. crassilabris*, *T. gracilis*, *T. intermedius*, *T. kyphus*, *T. lani*, *T. sinensis*, *T. tenuifurcatus*, *T. vachellii*, and

T. virgatus. *Tachysurus lani* is distinct from the other nine congeneric species in having a rounded (vs. slightly emarginate in *T. gracilis*, or forked in the remaining species) caudal fin. A smooth (vs. slightly serrated) anterior margin of the pectoral-fin spine can distinguish *T. lani* from *T. sinensis*, *T. intermedius* and *T. virgatus*; an adipose-fin base longer (vs. shorter) than the anal-fin base differentiates *T. lani* from *T. argentivittatus*, *T. sinensis*, *T. vachellii*, *T. intermedius*, and *T. virgatus*; the absence (vs. presence) of a longitudinal black band extending along the flank separates *T. lani* from *T. argentivittatus* and *T. virgatus*; short maxillary barbel not extending beyond the posterior edge of the eye (vs. beyond the base of the pectoral-fin spine) differentiates *T. lani* from *T. argentivittatus* *T. sinensis* and *T. vachellii*; the absence (vs. presence) of dark blotches on the flank separates *T. lani* from *T. intermedius*, *T. kyphus* and *T. sinensis*; and a dorsal-fin spine shorter (vs. longer) than the pectoral-fin spine distinguishes *T. lani* from *T. tenuifurcatus*.

It is worthwhile to mention the nomenclatural and taxonomic status of *Tachysurus sinensis*. Ng & Kottelat (2007) designated a neotype (USNM 336888) for *T. sinensis*. Moreover, these authors restricted the name *T. sinensis* to the populations of northern China, and retained the name *T. fulvidraco* for those of southern China. However, Ku et al.'s (2010) study based on both morphometry and DNA sequence found that there were no significant differences between populations of northern and southern China, therefore suggesting that all these populations are conspecific. Kottelat (2013) treated *T. sinensis* and *T. fulvidraco* as valid and distinct species, but without giving any further information about the differences between these two species. In agreement with Ku et al. (2010), *Tachysurus sinensis* La Cepède, 1803 is herein considered as a subjective senior synonym of *Pimelodus fulvidraco* Richardson, 1846.

Herre (1934) described, as *Liocassus hirsutus*, specimens from the Xun-Jiang of the Zhu-Jiang basin in Wuchow (now Wuzhou City), Kwangsi (now Guangxi Province). Since no additional specimens of the species have been collected from the type locality or elsewhere, it has not been treated in recent literature (Yue, 1981; Yang & Zhang, 2006). However, it has caught the attention of many investigators interested in synthesizing information on freshwater fish diversity in China. Controversy over its generic placement remains. Burgess (1989) listed it as a species of *Leiocassis* and of *Bagroides*. Ferraris (2007) regarded it as species inquirenda within the Bagridae. *Bagroides*, as diagnosed by Mo (1990), is an endemic Southeast Asian bagrid genus, and has no representative in South China. It is likely that *Liocassus hirsutus* is a member of *Tachysurus*. Its generic placement will be clarified when specimens are available. Regardless of the taxonomic status of *Liocassus hirsutus*, available information from the original description and our radiographic examination of the holotype indicate that it has fewer anal-fin rays (18 vs. 20–21) and vertebrae (5 + 37 vs. 5 + 45–46), an emarginate (vs. rounded) caudal fin, and a head that is shorter (vs. longer) than the body depth, compared to *T. lani*.

Ze (1989) reported, as *Tachysurus albomarginatus*, eight specimens from the Wu-Jiang (a tributary of the upper Chang-Jiang basin), Jing-Jiang (a tributary of the Yuan-Jiang flowing into the Dongting Lake linked to the middle Chang-Jiang), and Caodu-He (a tributary flowing to the Hongshui-He of the Zhu-Jiang basin) in Guizhou Province. His description and illustration indicated that these specimens have a rounded caudal fin with a broad, white mark along its distal margin as present in *T. lani*. Further comparison shows that Ze's material has no distinct variations with the type material of *T. lani*. Unfortunately, Ze (1989) provided no information about the interspace between the supraoccipital process and nuchal plate, and the presence or absence of serrations along the posterior margin of the dorsal-fin spine, two key diagnostic characters for recognition of species within *Tachysurus*. During this study, we had no access to Ze's (1989) specimens, and thus we provisionally consider them as conspecific with *T. lani*.

Comparative material. *Tachysurus adiposalis*: USNM 00177474, 1, 160.0 mm SL; Taiwan Island: Taoyuan County (photograph and X-ray examined). – FMNH 59079, lectotype, 172 mm TL (total length); Taiwan Island: Tamusui River near Shinten (photograph and X-ray examined).

T. albomarginatus: NRM 10017, 5, syntypes, 46.2–84.4 mm SL; China: Anhui Province: Tang-tu-hsien [now Dangtu County]. – NRM 25669, 1, 126.0 mm SL; China: Anhui Province: "Tang-tu-hsien" [now Dangtu County] (photograph and X-ray examined). – IHB 200605264-7, IHB 200605269-86, IHB 200605268 (CS), 23, topotypes, 118.7–196.0 mm SL; China: Anhui Province: lower Chang-Jiang basin in Dangtu County. – IHB

200605255-9, IHB 200605261-3, 8, 79.5–221.2 mm SL, and IHB uncatalogued, 4, 79.0–104.5 mm SL; China: Jiangxi Province: Xin-Jiang, tributary to Poyang Lake linked to lower Chang-Jiang in Yiyang County and Guixi City. – IHB uncatalogued, 1, 157.2 mm SL, IHB 150, IHB 720, and IHB 731-2, 4, 152.8–161.4 mm SL; China: Hubei Province: middle Chang-Jiang basin in Yichang City. – IHB 74V6238, 74V6244, IHB 74V6662-4, IHB 75VII5218, IHB 75VII5243, and IHB 75VII5247, 8, 50.6–128.4 mm SL; China: Hubei Province: middle Chang-Jiang basin in Hanyang County and Honghu City. –IHB uncatalogued, 3, 132.7–156.2 mm SL; China: Zhejiang Province: Xin'an-Jiang, upper Qiantang-Jiangin Jiande City. – IHB uncatalogued, 2, 103.5–147.2 mm SL; China: Zhejiang Province: mid-lower Ou-Jiang basin in Qingtian County.

T. analis: AMNH 9680, holotype, 101.0 mm SL; China: northeastern Kiangsi [now Jiangxi Province] Hokou [now Chaoshan].

T. brachyrhabdion: IHB 89VII2156-65, IHB 89VII2167-8, 12, 100.0–213.3 mm SL; China: Hunan Province: Yuan-Jiang, the middle Chang-Jiang basin in Yuanling County. – IHB 87V989-94, 6, 116.0–187.4 mm SL; China: Guizhou Province: Qing-Shui, tributary to Yuan-Jiang of middle Chang-Jiang basin in Jinping County. – IHB 8840755-8, 4, 178.0–207.2 mm SL; China: Guizhou Province: Songtao-He, tributary to YuanJiang of the middle Chang-Jiang basin in Songtao County. – IHB uncatalogued, 4, 83.3–180.7 mm SL; China: Hunan Province: You-Shui, tributary to Yuan-Jiang of middle Chang-Jiang basin in Longshan County. – IHB 84IV360-3, IHB 84IV142, IHB 84IV143 (CS), and IHB 84IV144, 7, 82.8–128.0 mm SL; China: Hunan Province: Ou-Shui, tributary to Xiang-Jiang of middle Chang-Jiang basin in Zixing County.

T. dumerili: IHB 583120, IHB 581026, IHB 58286, IHB 582077, IHB 581041, and IHB 590437, 6, 107.2–218.0 mm SL; China: Chongqing City: upper Chang-Jiang basin. – IHB 6452365-6, IHB 645268-9, IHB 6452372-3, IHB 6452375, and IHB 6452377-81, 12, 116.8–261.8 mm SL; China: Hubei Province: middle Chang-Jiang basin in Shishou City.

T. gracilis: IHB 4050299-300, IHB 4050286, IHB 4050317, IHB 4050295, 5, 79.7–120.3 mm SL, IHB 83V0602, IHB 83V0603, IHB 83V0604, IHB 83V0444, 4, 80.5–116.7 mm SL; China: Guangxi Province: Rong-Shui, tributary to Liu-Jiang of Zhu-Jiang basin in Rongshui County. – IHB 2040229-30, IHB 2040222, IHB 2040218, and IHB 2040187, 5, 62.3–106.2 mm SL; China: Guangxi Province: Meng-Jiang, a tributary to Xun-Jiang of Zhu-Jiang basin in Mengshan County. – IHB 75IV2744-8, 75IV2757-9, 75IV2542-7, 14, 80.6–170.0 mm SL; China: Guangxi Province: Li-Jiang, tributary to Gui-Jiang of Zhu-Jiang basin in Yangshuo and Lipu counties. – IHB 87V666, 87V862-7, 7, 85.6–133.0 mm SL; China: Guizhou Province: Duliu-Jiang, tributary to Liu-Jiang of Zhu-Jiang basin in Rong'an County.

T. omeihensis: AMNH 15217, holotype, 103 mm SL; China: Szechwan [now Sichuan Province]: Omeihsein [now E'mei County] (photographs and X-ray examined).

T. ondon: IHB 74IX4068-70, 3, 111.3–122.4 mm SL, and uncatalogued, 1, 116.8 mm SL; China: Zhejiang Province: Cao'e-Jiang in Chengzhou City. – IHB 740101, IHB 740103-10, 9, 96.4–187.9 mm SL and uncatalogued, 5, 79.6–92.4 mm SL; China: Fujian Province: Mulan-Xi in Xianyou County.

T. sinensis: IHB 76IV6371, IHB III1466 0271, IHB III2066 0337, IHB III14660272, IHB III1466 0270, and IHB 600943, 6, 76.99–134.21 mm SL; China: Guangdong Province: Lian-Jiang, tributary to Bei-Jiang of Zhu-Jiang basin in Lianzhou City. – IHB 76IV5806-8, 108.03–134.84 mm SL; China: Guangdong Province: Bei-Jiang tributary to Zhu-Jiang basin. – IHB 58 7175, 1, 141.33 mm SL; China: Guangxi Province: Zuo-Jing, tributary to Xi-Jiang of Zhu-Jiang basin.

T. taeniatus: BMNH 1873.7.30.73, holotype, 127.3 mm SL; China: Shanghai City (photograph and X-ray examined). – SOU 22070, 59A0165, 59A0048, 59A0155, 59A0166, 5, 109.5–201.3 mm SL; China: Shanghai City: Huangpu-Jiang in Wusong and Baoshan counties.

T. tenuis: BMNH 1873.7.30.72, holotype, 266.7 mm SL; China: Shanghai City (photograph and X-ray examined): without precise location. – ECSFI, uncatalogued, 1, 339.2 mm SL; China: Shanghai City: Chongming Island. – SOU 23415, SOU 23420, SOU 23425-6, 4, 152.8–247.8 mm SL; China: Shanghai City: without precise location.

T. trilineatus: IHB 76VII021-4, 4, paratypes, 53.1–64.9 mm SL; China: Guangdong Province: Luofu Mountain in Boluo County.

T. truncatus: BMNH 1891.6.13.24, 1, syntype, 83.0 mm SL; China: Sichuan Province: Kia-tiang-fu, foot of Omei-shan (= E'mei Shan) (photograph and X-ray examined). – IHB 78IV550-1, IHB 79IV0542-5, IHB 78IV0395, IHB 79IV0501, IHB 78IV0219-20, 10, 95.0–167.2 mm SL, and IHB uncatalogued, 1, 124.1 mm SL; China: Sichuan Province: Min-Jiang of upper Chang-Jiang basin in Leshan City. – IHB 585004, IHB 585005 (CS), IHB 585007, IHB 585098, IHB 586125, IHB 58429-30, IHB 585030, 8, 77.9–111.0 mm SL, and IHB uncatalogued, 1, 131.4 mm SL; China: Sichuan Province: Qingyi-Jiang of upper Chang-Jiang basin in Ya'an City.

T. ussuriensis: IHB 580055, IHB 580281, IHB 580377, IHB 580556, IHB 580930, IHB 580951, IHB 580967, IHB 581025, IHB 581027, IHB 581028 (CS), IHB 581029, IHB 581050, IHB 581120, IHB 581124, IHB 581128, IHB 581158, IHB 581225, IHB 581456, 18, 91.0–226.5 mm SL, and IHB uncatalogued, 1, 117.1 mm SL; China: Heilongjiang Province: Amur River (= Heilong-Jiang in Chinese) basin.

'*T.*' *hirsutus*: SU 13884, holotype, China: Kwangsi [now Guangxi Province]: Xun-Jiang of Zhu-Jiang basin in Wuchow [now Wuzhou City] (photograph and X-ray examined).

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CONTENTS

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Cláudio Henrique Zawadzki and Iago de Souza Penido
(this volume pp. 361–375)

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