

Homatula dotui, a new cave loach from Central Vietnam (Teleostei: Nemacheilidae)

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Homatula dotui, new species, is described from a cave in the Phong Nha-Ke Bang National Park in Central Vietnam. This troglotic loach is the first species of *Homatula* found in Vietnam and the first subterranean species of the genus. It differs from all congeners by a whitish or pinkish body in life, no scales, incomplete lateral line with 4–5 pores, reduced eyes, and the number of dorsal-fin rays and vertebrae.

Introduction

The nemacheilid genus *Homatula* was believed to be endemic to China and actually comprises a total of 18 species known from the upper Mekong River (=Lancang-Jiang in Chinese), Red River (=Yuan-Jiang), Pear River (=Zhu-Jiang), mid-upper Yangtze River (=Chang-Jiang) drainages, and the Wei-He, a tributary of the Yellow River (=Huang-He) drainage (Li et al., 2019). By the end of the last century, seven species of the genus had been placed in *Paracobitis*, which is a West Asian genus (Kottelat, 1990; Bănărescu & Nalbant, 1995; Nalbant & Bianco, 1998; Freyhof et al., 2014). These species are: *P. anguillioides*, *P. acuticephala*, *P. oligolepis*, *P. erhaiensis*, *P. potanini*, *P. variegata* and *P. wujiangensis*. Min et al. (2010) described

P. nanpanjiangensis, an additional species from the Chinese Yunnan Province. Hu & Zhang (2010) described *Homatula pycnolepis* from Yunnan Province and revalidated *H. berezowskii* from Sichuan Province, South China. Another eight species of *Homatula* have since been described from China: *H. laxiclathra* (Gu & Zhang, 2012), *H. disparizona* (Min et al., 2013), *H. change* (Endruweit, 2015), *H. wenshanensis* (Yang et al., 2017), *H. coccincola* (Endruweit et al., 2018), and *H. anteridorsalis*, *H. cryptoclathrata* and *H. nigra* (Li et al., 2019). Nguyen (2005) described two Vietnamese loaches in the genus *Paracobitis* (namely *P. hagiangensis* and *P. phongthoensis*). *Paracobitis hagiangensis* is a valid species in *Schistura* while *P. phongthoensis* is a junior synonym of *S. caudofurca* (Kottelat, 2012a, 2013; Endruweit, 2014).

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The Institute of Ecology and Biological Resources of the Vietnam Academy of Science and Technology conducted several expeditions into caves of the karstic areas of Central Vietnam between 2011 and 2015. These expeditions yielded two specimens of subterranean loaches representatives of an undescribed species of the genus *Homatula*. The purpose of this work is to describe and name this new species.

Material and methods

Morphological analysis. Fishes were caught by a hand-net. Meristic and morphometric methods follow Kottelat (1990). Measurements were taken point to point using a calliper and recorded to the nearest 0.1 mm. Dorsal, caudal and anal-fin rays

were counted from radiographs and pectoral and pelvic-fin rays under a binocular stereomicroscope. Vertebrae were counted from radiographs following Roberts (1989). The number of caudal vertebrae corresponds to the number of centra bearing a haemal spine, including the urostyle that is counted as one vertebra. Eye diameter was measured horizontally, body depth at dorsal-fin origin, and head length (HL) from the tip of the snout to the posteriormost margin of the operculum excluding the opercular membrane. Data for *Homatula wujiangensis* were taken from Ding & Deng (1990), *H. maolanensis* from Ran et al. (2006), *H. posterodorsalis* from Li et al. (2006), *H. nanpanjiangensis* from Min et al. (2010), *H. disparizona* from Min et al. (2013), *H. change* from Endruweit (2015), *H. wenshanensis* from Yang et al. (2017) and *H. coccinocola* from Endruweit et al. (2018).

Table 1. List of cyt b gene sequences produced in this study and downloaded from GenBank with information on drainage and country of origin.

Species	Province/Country	Drainage	Source	Accession #
<i>Homatula dotui</i>	Quang Binh, Vietnam	Gianh	This study	OK230029
<i>Homatula dotui</i>	Quang Binh, Vietnam	Gianh	This study	OK230030
<i>Homatula potanini</i>	Sichuan, China	Jinsha	Min et al., 2012	JF340395
<i>Homatula potanini</i>	Sichuan, China	Jinsha	Min et al., 2012	JF340393
<i>Homatula potanini</i>	Sichuan, China	Jinsha	Min et al., 2012	JF340391
<i>Homatula potanini</i>	Sichuan, China	Jinsha	Min et al., 2012	JF340388
<i>Homatula pycnolepis</i>	Yunnan, China	Lancang	Min et al., 2012	HM010541
<i>Homatula pycnolepis</i>	Yunnan, China	Nu	Yue et al., 2013	KF041000
<i>Homatula pycnolepis</i>	Yunnan, China	Nu	Min et al., 2012	HM010567
<i>Homatula pycnolepis</i>	Yunnan, China	Lancang	Min et al., 2012	HM010549
<i>Homatula anguillioides</i>	Yunnan, China	Lancang	Min et al., 2012	HM010582
<i>Homatula wuliangensis</i>	Yunnan, China	Lancang	Min et al., 2012	HM010517
<i>Homatula longidorsalis</i>	Yunnan, China	Jinsha	Min et al., 2012	HM010550
<i>Homatula longidorsalis</i>	Yunnan, China	Jinsha	Min et al., 2012	HM010522
<i>Homatula longidorsalis</i>	Yunnan, China	Nanpan	Min et al., 2012	HM010519
<i>Homatula acuticephala</i>	Yunnan, China	Lancang	Min et al., 2012	HM010527
<i>Homatula variegata</i>	Yunnan, China	Jinsha	Min et al., 2012	HM010520
<i>Homatula variegata</i>	Yunnan, China	Jinsha	Min et al., 2012	HM010493
<i>Homatula variegata</i>	Yunnan, China	Jinsha	Min et al., 2012	HM010489
<i>Schistura callichroma</i>	Yunnan, China	Babian	Min et al., 2012	JN837652
<i>Schistura caudofurca</i>	Yunnan, China	Babian	Min et al., 2012	JN837651
<i>Schistura latifasciata</i>	Yunnan, China	Lancang	Min et al., 2012	JN837653
<i>Schistura longa</i>	Yunnan, China	Nu	Tang et al., 2006	JF340408
<i>Schistura poculi</i>	Thailand	Mae	Min et al., 2012	JF340407
<i>Schistura desmotes</i>	Chiangmai, Thailand	Chao Phraya	Havird et al., 2010	GQ174368
<i>Schistura fasciolata</i>	Yunnan, China	–	Min et al., 2012	HM010565
<i>Schistura bucculenta</i>	Yunnan, China	–	Min et al., 2012	JN837654
<i>Schistura cryptofasciata</i>	Yunnan, China	Salween	Min et al., 2012	JF340401
<i>Schistura sikmaiensis</i>	Yunnan, China	Irrawaddy	Min et al., 2012	JF340405
<i>Schistura amplizona</i>	Yunnan, China	Mekong	Min et al., 2012	JN837656
<i>Schistura macrotaenia</i>	Yunnan, China	Nanqi	Min et al., 2012	JN837655
<i>Schistura shuangjiangensis</i>	Yunnan, China	Lancang	Min et al., 2012	JF340404

Collection acronyms are as follows: IEBR, Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Hanoi; IHB, Museum for Aquatic Organisms Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan; KIZ, Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming; and YU, Yunnan University, Department of Biology, Kunming.

DNA extraction, amplification and Sequencing. The total genomic DNA was extracted from alcohol-preserved fin tissues, utilizing TIANamp Genomic DNA Kit (Tiangen Biotech, Beijing). The *cyt b* gene sequence was amplified

by the polymerase amplification with primers L14724 and H15915 adopted from Xiao et al. (2001). This gene extraction was performed in 25 μ l volumes containing 12.5 μ l Master mix Taq (Beijing TsingKe Biotech Co., Ltd.), 1 μ l of each primer, and 1 μ l template DNA, adding double distilled water (dd H₂O) to supply the volume. The thermocycling conditions were as follows: initial pre-denaturation for 4 min at 94 °C, denaturation for 50 s at 94 °C, annealing for 50 s at 55 °C, and extension for 1 min, in terms of the product length at 72 °C. After 35 cycles, the final extension was done at 72 °C for 10 min and the product was then stored at 4 °C. The sequencing was done by Tianyihuiyuan Biotechnology Company.

Table 1. (continued).

Species	Province/Country	Drainage	Source	Accession #
<i>Traccatichthys pulcher</i>	Yunnan, China	–	Min et al., 2012	JF340402
<i>Traccatichthys pulcher</i>	Guangxi, China	Liu	Tang et al., 2006	DQ105198
<i>Traccatichthys pulcher</i>	Guangxi, China	Li	Tang et al., 2006	DQ105199
<i>Barbatula nuda</i>	Liaoning, China	Liao	Tang et al., 2006	DQ105252
<i>Barbatula toni</i>	China	Amur	Šedivá et al., 2008	EF562772
<i>Barbatula vardarensis</i>	Macedonia	Vardar	Šedivá et al., 2008	EF562765
<i>Nemacheilus pallidus</i>	Ubon Ratchathani, Thailand	Mae	Havird et al., 2010	GQ174370
<i>Nemacheilus masyae</i>	Johor, Malaysia	Johor	Havird et al., 2010	GQ174377
<i>Nemacheilus ornatus</i>	Chanthaburi, Thailand	Tapi	Havird et al., 2010	GQ174363
<i>Oreonectes platycephalus</i>	Guangxi, China	Lipu	Tang et al., 2006	DQ105197
<i>Troglonectes daqikongensis</i>	China	Liu	Deng et al., 2016a	KU987436
<i>Troglonectes shuilongensis</i>	Guizhou, China	Liu	Deng et al., 2016b	KF640641
<i>Lefua costata</i>	Korea	Amur	Sgouros et al., 2019	EU670769
<i>Lefua nikkonis</i>	Hokkaido, Japan	Ono	Saka et al., 2003	AB100919
<i>Oxyonemacheilus bureschi</i>	Bulgaria	Struma	Šedivá et al., 2010	GQ199476
<i>Oxyonemacheilus merga</i>	Russia	Podkumok	Šedivá et al., 2008	EF562774
<i>Oxyonemacheilus pindus</i>	Greece	Aoos	Šedivá et al., 2008	EF562773
<i>Paracanthocobitis mackenziei</i>	India	Salween	Sgouros et al., 2019	GQ478439
<i>Paracanthocobitis nigrolineata</i>	Kanchanaburi, Thailand	Mae	Havird et al., 2010	GQ174374
<i>Sectoria heterognathos</i>	Yunnan, China	Nanla	Tang et al., 2006	DQ105200
<i>Turcinoemacheilus kosswigi</i>	Iran	Marboreh	Jamshidi et al., 2013	GQ338826
<i>Turcinoemacheilus kosswigi</i>	Iran	Marboreh	Jamshidi et al., 2013	GQ338827
<i>Turcinoemacheilus kosswigi</i>	Iran	Marboreh	Jamshidi et al., 2013	GQ338828
<i>Triplophysa xiangxiensis</i>	Hunan, China	Yangtze	Deng et al., 2016a	JN696407
<i>Triplophysa stenura</i>	Yunnan, China	–	Min et al., 2012	JN837657
<i>Triplophysa stolickai</i>	Sichuan, China	Dadu	Tang et al., 2006	DQ105249
<i>Triplophysa siluroides</i>	China	Chuan-Che	Deng et al., 2016a	EF212443
<i>Triplophysa bleekeri</i>	Sichuan, China	Yangtze	Deng et al., 2016a	FJ406605
<i>Triplophysa orientalis</i>	Qinghai, China	Chuan-Che	Tang et al., 2006	DQ105251
<i>Leptobotia tchangii</i>	Jiangxi, China	Xinjiang	Tang et al., 2006	AY625719
<i>Leptobotia rubrilabris</i>	Sichuan, China	Yangtze	Tang et al., 2006	AY625716
<i>Leptobotia microphthalmia</i>	China	Min	–	MH027691



Fig. 1. *Homatula dotui*: **a**, IHB 201300440, holotype, 60.0 mm SL, and **b**. IEBR 00439, paratype, 66.0 mm SL; Vietnam: Hang 21 Cave.



Fig. 2. *Homatula dotui*, IEBR 00439, paratype, 66.0 mm SL; dorsal and ventral view of head, Vietnam: Hang 21 Cave. Scale bar=2 mm.

Phylogenetic analysis. The amplified *cyt b* gene sequences were analysed along with sequences, retrieved from GenBank, from congeners and species of other nemacheilid genera (Table 1). Sequences from *Leptobotia* used as an outgroup, were downloaded from GenBank. Multiple alignments were prepared for all sequences utilizing MEGA 7.0, based on the amino acid sequences using the program MUSCLE (Edgar, 2004) with

the default settings. The genetic distance based on K2P (Kimura 2-parameter) modal was calculated with MEGA 7.0. DNASP v5 and was used to filter the haplotype (Librado & Rozas, 2009). DAMBE was used to measure the substitution saturation for the *cyt b* gene to test whether it could be utilized for phylogenetic analysis (Xia & Xie, 2001), and different data format conversion was finished by AliView (Larsson, 2014).

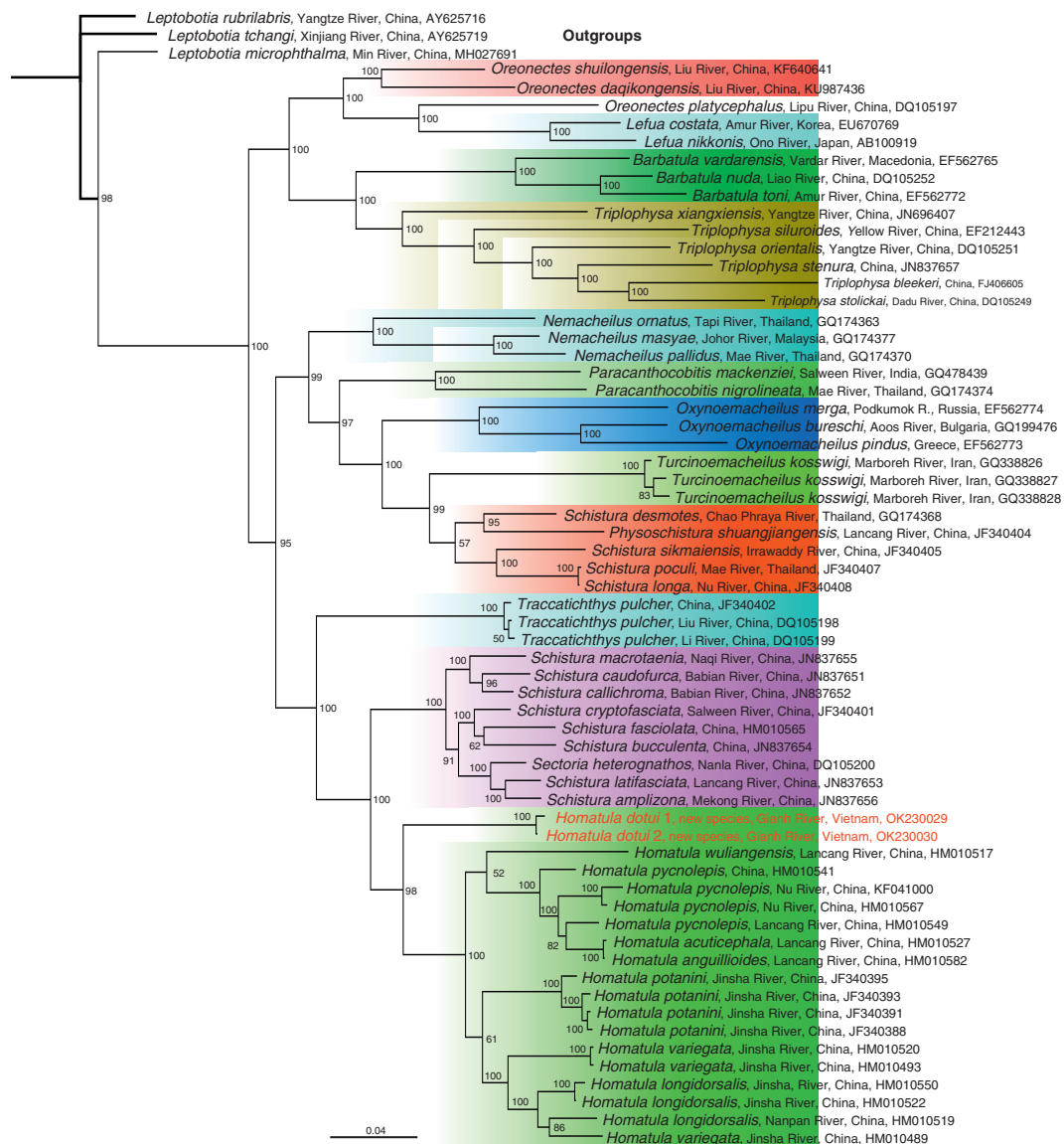


Fig. 3. Bayesian inference tree based on cyt b gene sequences of *Homatula* spp. and representatives of other nemacheilid genera. Nodal numbers are posterior probability values larger than 50 %.

The nucleotide substitution was selected by Akaike's information criterion (AIC), implemented in jModeltest (Darriba et al., 2012) for Bayesian inference (BI) analysis methods. Bayesian analysis was performed using MrBayes 3.2.2 (Ronquist & Huelsenbeck, 2003) with the selected model: TrN + I + G, applying the optimal nucleotide evolution model and mcmc method with four chains (three hot ones and one cold one)

running simultaneously for 4 000 000 generations to calculate posterior probability (pp). 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. FigTree v.1.4.3 was used to illustrate phylogeny.

Results

Two sequences of the *cyt b* gene (1086 bp in length) of the new species were successfully amplified as well as 62 GenBank sequences, 17 of which from congeneric species and 42 from other 13 nemacheilid genera, i. e. *Barbatula* (3), *Lefua* (2), *Nemacheilus* (3), *Oreonectes* (1), *Troglonectes* (2), *Oxyanoemacheilus* (3), *Paracanthocobitis* (2), *Schistura* (12), *Physoschistura* (1), *Sectoria* (1), *Traccatichthys* (3), *Triplophysa* (6) and *Turcinoemacheilus* (3) as well as sequences from three species of *Leptobotia* (Botiidae), which were selected as outgroups. There are 782 conserved sites, 243 parsimony informative sites, 304 variable sites, and 61 singleton sites. The two individuals of the new species show a 0.4 % intraspecific genetic distance. The interspecific genetic distance to other species is given in Table 2. The Bayesian 50 % majority consensus tree based on the *cyt b* gene was inferred for the new species, seven congeneric species and 38 species of other 13 nemacheilid genera (see Figure 3). The new species was found to be the sister to the robustly-supported (100 % pp) group formed by sampled species of *Homatula*; these paired groups comprised a strongly-supported (98 % pp) independent lineage being sister to the highly-supported (100 % pp) composed of sequences from eight species of *Schistura* and one species of *Sectoria*.

Homatula dotui, new species

(Figs. 1–2)

Holotype IHB 201300440, 60.0 mm SL; Vietnam: Quang Binh Prov.: Hang 21 Cave, ca. 36 km from Tourist Center of Phong Nha Ke Bang and emptying into Gianh River, 106°12'46" E 17°24'53" N; V. T. Do, April 2014.

Paratype: IEBR 00439, 1, 66.0 mm SL, collected with the holotype.

Diagnosis. *Homatula dotui* belongs to a group of *Homatula* species lacking scales or having only few scales scattered over the caudal peduncle (*H. disparizona*, *H. oligolepis*, *H. nanpanjiangensis*, and *H. wujiangensis*). It is distinguished from these species by having a whitish or pinkish body in life (vs. flank with black or brown bars, stripes or irregularly shaped and set blotches), very small eye, 4–6 % HL (vs. normally developed, 11–23 % HL), and 4+31 vertebrae (vs. 4+39–41 in *H. oligolepis*, 4+39–40 in *H. disparizona*, 4+33–34 in *H. wujiangensis*, and 4+36–38 in *H. nanpanjiangensis*). The new species is similar to *H. wujiangensis*, from the upper Chang-Jiang drainage, by having an incomplete lateral line, but it is distinguished by having 7½ (vs. 8½) branched dorsal-fin rays, and a shorter maxillary barbel not reaching beyond (vs. reaching beyond) the vertical through the anterior margin of the eye.

Table 2. Genetic distance between paired samples of *Homatula dotui* and congeneric species

Sequences	1	2	3	4	5	6	7	8	9	10	11
<i>H. pycnolepis</i> 1	0.0										
<i>H. pycnolepis</i> 2	0.055										
<i>H. pycnolepis</i> 3	0.046	0.043									
<i>H. pycnolepis</i> 4	0.012	0.047	0.040								
<i>H. anguillioides</i>	0.045	0.044	0.034	0.041							
<i>H. acuticephala</i>	0.046	0.043	0.035	0.042	0.001						
<i>H. longidorsalis</i> 1	0.101	0.090	0.090	0.097	0.085	0.084					
<i>H. longidorsalis</i> 2	0.097	0.086	0.085	0.092	0.082	0.081	0.005				
<i>H. longidorsalis</i> 3	0.102	0.083	0.089	0.093	0.086	0.085	0.048	0.043			
<i>H. potanini</i> 1	0.106	0.088	0.097	0.100	0.096	0.094	0.082	0.080	0.078		
<i>H. potanini</i> 2	0.107	0.091	0.096	0.101	0.096	0.095	0.086	0.084	0.083	0.020	
<i>H. potanini</i> 3	0.109	0.094	0.097	0.104	0.099	0.098	0.085	0.082	0.087	0.021	0.007
<i>H. potanini</i> 4	0.109	0.094	0.099	0.104	0.099	0.098	0.089	0.087	0.087	0.021	0.003
<i>H. variegata</i> 1	0.106	0.098	0.086	0.094	0.082	0.083	0.073	0.069	0.071	0.100	0.106
<i>H. variegata</i> 2	0.106	0.098	0.086	0.094	0.082	0.083	0.073	0.069	0.073	0.100	0.106
<i>H. variegata</i> 3	0.106	0.089	0.097	0.101	0.090	0.088	0.046	0.043	0.047	0.088	0.091
<i>H. wuliangensis</i>	0.122	0.112	0.111	0.113	0.115	0.117	0.126	0.123	0.126	0.123	0.124
<i>H. dotui</i> 1	0.150	0.140	0.146	0.150	0.144	0.142	0.138	0.135	0.142	0.140	0.140
<i>H. dotui</i> 2	0.146	0.135	0.141	0.146	0.139	0.138	0.133	0.131	0.138	0.135	0.135

Description. See Figures 1 and 2 for general appearance and Table 3 for morphometric data. Body elongate, slightly depressed or cylindrical from nape to dorsal-fin origin, laterally compressed from dorsal-fin origin to caudal-fin base. Head slightly depressed. Snout rounded in dorsal view, and obtuse in lateral view. Caudal peduncle long (14.5–15.4 % SL) and compressed laterally. Both dorsal and ventral crests on caudal peduncle soft and thin. Eye very small, close to dorsal profile of head, not visible from ventral view. Anterior and posterior nostrils well separated. Anterior and posterior nostrils nearer to anterior margin of eye than to tip of snout. Anterior nostril situated at end of small and oblique tube and prolonged into short nasal barbel. Mouth inferior. Lips thick and smooth, with small median incision in upper lip and marked median longitudinal groove on lower lip. Outer rostral barbel reaching to middle of posterior nostril; inner rostral barbel reaching to origin of anterior nostril; maxillary barbel short, not reaching vertically anterior edge of eye.

Scales absent, lateral line incomplete, with 4–5 lateral pores close to opercular opening. Four +31 vertebrae. Dorsal fin short with three unbranched and 7½ branched rays; distal margin straight or very slightly convex; origin above pelvic-fin origin. Pectoral fin with one unbranched and 9 branched rays, long and narrow, extending midway from posterior end of pectoral-fin base to pelvic-fin insertion. Pelvic fin with one

unbranched and eight branched rays, reaching slightly beyond anus or halfway to anal-fin origin; inserted below base of last unbranched or first branched dorsal-fin ray. Anal fin with three unbranched and 5½ branched rays, reaching halfway to caudal-fin base. Anus slightly anterior to anal-fin origin. Dorsal crest origin above anal-fin origin, extending to procurrent caudal-fin rays; ventral crest shorter, reaching halfway between posterior end of anal-fin base and procurrent caudal-fin rays. Caudal fin with 8+7 branched rays, slightly forked or deeply emarginate, with upper and lower lobes rounded or slightly pointed.

Table 3. Morphometric data and counts for type specimens of *Homatula dotui*.

	Holotype Paratype	
Standard length (mm)	60.0	66.0
Total length (mm)	70.8	77.7
In percent of standard length		
Dorsal head length	18.6	20.6
Lateral head length	22.5	23.9
Predorsal length	51.2	50.4
Prepelvic length	54.8	58.5
Pre-anus length	70.9	74.7
Preanal length	77.6	81.4
Head depth at eye	10.3	11.0
Head depth at nape	12.6	13.3
Body depth at dorsal-fin origin	17.0	16.3
Depth of caudal peduncle	12.4	11.4
Length of caudal peduncle	14.5	15.4
Snout length	6.8	7.0
Head width at nares	15.6	16.1
Body width at dorsal origin	14.9	12.4
Eye diameter	1.1	0.9
Interorbital width	7.6	7.8
Length of dorsal fin	17.5	18.5
Length of upper caudal lobe	18.7	22.1
Length of median caudal rays	12.4	13.5
Length of lower caudal lobe	19.5	19.0
Length of anal-fin	15.5	15.0
Length of pelvic-fin	14.3	17.8
Length of pectoral-fin	17.6	20.8
Maxillary barbel length	8.0	7.5
In percent of dorsal head length		
Snout length	36	34
Eye diameter	6	4
Interorbital width	41	38
In percent of lateral head length		
Snout length	30	29
Eye diameter	5	4
Interorbital width	4	3

	12	13	14	15	16	17	18
0.007							
0.105	0.107						
0.105	0.107	0.002					
0.092	0.095	0.081	0.079				
0.123	0.128	0.122	0.122	0.138			
0.139	0.141	0.152	0.152	0.140	0.166		
0.134	0.137	0.148	0.148	0.136	0.161	0.004	

Coloration. Preserved specimens: background colour plain pale yellow, without patches of pigmentation. In life: background colour pale pink, almost white. Fins hyaline.

Distribution and habitat. *Homatula dotui* is only known from the type locality in the Son River drainage. The Son River is a tributary of the Gianh River in the Quang Binh Province. The cave entrance may take in a large amount of water during the rainy season. A large boulder-covered entrance drops very steeply into a large passage of 50 m in length and 40 m in width until the stream is met. For over 500 m walk downstream often involves swimming or wading. More than 10 individuals of nearly the same size were observed; only two were captured using a hand-net.

Etymology. The species is named after Do Van Tu (IEBR), who captured the fishes. A noun in genitive case.

Discussion

Body squamation is one of main characters used to distinguish species of *Homatula* (Zhou & He, 1993; Hu & Zhang, 2010; Gu & Zhang, 2012). Li et al. (2019) divided all currently-named species of this genus into three groups: the fully-scaled, the partially-scaled and the scaleless species group. The latter included seven species without scales or with only a small number of scales scattered over the caudal peduncle. Among them, four species (*H. disparizona*, *H. oligolepis*, *H. nanpanjiangensis* and *H. wujiangensis*) are here retained in this group. Other two species, *H. berezowskii* and *H. variegata*, were misplaced by Li et al. (2019) in the scaleless species group as both have a partially-scaled body, with its predorsal portion covered with visible scales in the former and scaleless in the latter (Hu & Zhang, 2010). *Homatula wenshanensis* is here removed from *Homatula*. This species, according to the original description, has indistinct adipose crests along the dorsal and ventral midlines of the caudal peduncle similar to *Oreonectes polystigmus* (Du et al., 2008: fig. 7), but dissimilar to the crests of all species of *Homatula*. Besides, it has a forked caudal fin and 4 + 47–48 vertebrae, rather than a slightly emarginate caudal fin and 4 + 35–44 vertebrae found in all species of *Homatula* (Hu & Zhang, 2010; Gu & Zhang, 2012; Endruweit et al., 2018).

Two species of *Homatula* have been found in the Chinese part of the Red River drainage (*H. coccinocola* and *H. disparizona*), and *H. change* is known from the Chinese part of the Black River drainage. These three species might also occur in northern Vietnam as both rivers flow through Vietnam to meet the sea. *Homatula dotui* is distinguished from these three species by a reduced eye (vs. normally developed), and plain colour pattern (vs. dark, irregularly split, oblique bars in *H. change*, sparsely barred pattern in *H. coccinocola*, and irregular reticulate pattern very variable tending to be organised in bars anteriorly and in stripes posteriorly in *H. disparizona*). It is further distinguished from *H. coccinocola* and *H. change* by having fewer vertebrae (4 + 31 vs. 4 + 42–45), a scaleless (vs. scaled) body, no median notch on the lower jaw (vs. present in *H. coccinocola*), 9 branched pectoral-fin rays (vs. 10–11 in *H. change*) and 7½ branched dorsal-fin rays (vs. 8½ in *H. change*).

From the topology of the phylogenetic tree inferred from the *cyt b* gene, *H. dotui* constitutes an independent lineage sister to all analysed species of *Homatula*. Its placement in *Homatula* needs to be re-studied in the future as the species coverage of *Homatula* in our molecular phylogenetic analysis is very limited. Including all species is needed to assess the hypothesis of monophyly of this genus and to test whether *H. dotui* actually is a species of *Homatula*.

Three blind species previously included in *Paracobitis* (*P. longibarbatus*, *P. maolanensis* and *P. posterodorsalus*) were excluded from that genus by Hu & Zhang (2010). Du et al. (2008) placed *P. longibarbatus* in *Triplophysa*. *Paracobitis posterodorsalus* and *P. maolanensis* are also currently placed in *Triplophysa*, however without supporting evidence (Yang et al., 2011; Liu et al., 2017; Wu et al., 2018). The generic allocation of these two species requires reconsideration as it cannot be excluded that both belong to *Homatula*. *Homatula dotui* can be distinguished from ‘*P.*’ *posterodorsalus* and ‘*P.*’ *maolanensis* by having a reduced eye (vs. eye absent), from ‘*P.*’ *posterodorsalus* by the pelvic fin inserted below (vs. anterior to) dorsal-fin origin and extending slightly beyond (vs. extending to) the anus, and from *P. maolanensis* by the pectoral fin reaching halfway to (vs. reaching to) the pelvic-fin insertion, and a short nasal barbel (vs. nasal barbel absent).

To date three subterranean loaches have been described from Vietnam: *Schistura spekuli*

is known only from the Tam Duong in Lai Chau Province (Kottelat, 2004), *S. mobbsi* from Phuong Hoang cave in the Thai Nguyen province (Kottelat & Leisher, 2012), and *Draconectes narinosus* from an island in Halong Bay (Kottelat, 2012b). *Schistura kaysonei* is another subtterranean species currently confined to the Khammouan karst of Laos in the Mekong River drainage (Vidthayanon & Jaruthanin, 2002). The phylogenetic relationships of *H. dotui* with these four cave loaches remain unclear. *Homatula dotui* is distinguished from *D. narinosus* by having the pores of the cephalic and body lateral line system not located at the tip of small papillae (vs. located) and an incomplete (vs. complete) lateral line, with only 4–5 pores behind the head. *Homatula dotui* is distinguished from *S. kaysonei*, *S. mobbsi*, and *S. spekuli* by reduced eye (vs. eye absent), and shorter maxillary barbel not reaching [vs. extending beyond] the vertical through anterior margin of the eye (Vidthayanon & Jaruthanin, 2002; Kottelat, 2004; Kottelat & Leisher, 2012).

Comparative material. All from China: *Homatula acuticephala*. YU 784130, 784132, 2, paratypes, 107.8–119. mm SL; Yunnan Prov.: middle Lancang-Jiang basin. – IHB 78IV365–6, IHB 78IV368, and IHB 78IV387, 4, 89.2–103.9 mm SL, Haixi-Hai in Eryuan County.

H. anguillioides. Yunnan Prov.: middle Lancang-Jiang basin in Eryuan County: IHB 820134, holotype, 134.8 mm SL; IHB 820131, IHB 820119–29, IHB 820135, and IHB 820137, 14, paratypes, 49.3–134.8 mm SL; and IHB 820533–5, IHB 820538–40, 6, topotypes, 114.1–126.0 mm SL.

H. berezowskii. Shanxi Prov.: Jialing-Jiang of Chang-Jiang basin: IHB 73VI1194, 73VI1191–3, 4, 89.0–125.4 mm SL; Lueyang County. – IHB 73VI1044, 1, 120.7 mm SL; Fengxian County. Gansu Prov.: Jialing-Jiang of Chang-Jiang basin: IHB 82VI2489, 1, 122.6 mm SL; Chengxian County. – IHB 82V2386, 1, 85.8 mm SL; Huixian County. – IHB 82VI2753, IHB 82VI2755, IHB 82VI2757, 3, 97.3–117.0 mm SL; Wudu County.

H. erhaiensis. Yunnan Prov.: middle Lancang-Jiang basin in Eryuan County: IHB 64VI0012, holotype, 68.8 mm SL; IHB 64VI0001–11, IHB 64VI0013–5, IHB 646775–7, IHB 646779, 18, paratypes, IHB 64.4–86.8 mm SL; IHB 1270142–8 and IHB 1270150–4, 12, topotypes, 49.1–79.9 mm SL.

H. laxiclathra. Shaanxi Prov.: Wei-He of Huang-He basin in Zhouzhi County: IHB 73VI10738, holotype, 136.7 mm SL, IHB 80VI0956–7, IHB 80VI0959, IHB 80VI0961, IHB 80VI0964–8, IHB 80VI0971–3, IHB 80VI0976, IHB 80VI1185, IHB 82VI0103, IHB 82VI0106–8, IHB 82VI2279, and IHB 82VI2283–4, 21, paratypes, 67.6–121.9 mm SL.

H. longidorsalis. Yunnan Prov.: Zhu-Jiang basin: KIZ 874042–3, KIZ 874045–6, KIZ 874050, KIZ 1987005739, KIZ 1987005748, 1987005752, 8, 50.7–80.9 mm SL; Nanpan-Jiang in Yiliang County.

H. oligolepis. Yunnan Prov.: Zhu-Jiang basin in Zhanyi County: KIZ 652099, KIZ 774557, KIZ 774558, KIZ 774559, 774560, KIZ 856145, 6, 83.5–171.1 mm SL.

H. potanini. Sichuan Prov.: upper Chang-Jiang basin: IHB 42IX0661–2, IHB 42IX0664, IHB 42IX0666–7, IHB 79IV0597–8, IHB 79IV0600, IHB 79IV0605, IHB 79IV0609–10, IHB 82 V0301–4, 15, 68.6–83.3 mm SL; Emei County. – IHB 78IV0175, IHB 78IV0228–9, 78IV0233–34, IHB 78IV0239, IHB 78IV0243, IHB 79IV0401–2, IHB 79IV0483–6, IHB 820004–5, 15, 62.3–82.4 mm SL; Leshan City.

H. pycnolepis. Yunnan Prov.: middle Lancang-Jiang basin: IHB 814042–3, IHB 814045–51, 9, 90.5–118.8 mm SL; Yangbi-Jiang in Jianchuan County.

H. variegata. Sichuan Prov.: Jinsha-Jiang of upper Chang-Jiang basin: IHB 42VI0726, 1, 90.8 mm SL; Xikang County. – IHB 82VI0517, 1, 119.3 mm SL; Dechang County. – IHB 82VI0461, 1, 89.9 mm SL; Huili County. – IHB 64VI0600, 1, 103.4 mm SL; Wen County. Chongqing City: upper Chang-Jiang basin: IHB 572090, 1, 83.4 mm SL; Da'ning-He in Wuxi County.

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