

Supplementary Materials for

A new endemic species *Oreonectes weii* sp. nov. (Cypriniformes: Nemacheilidae) within the Yangtze River Basin and its monsoon-driven evolutionary diversification

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This PDF file includes:

Figures S1 to S4

Tables S1 to S5

References

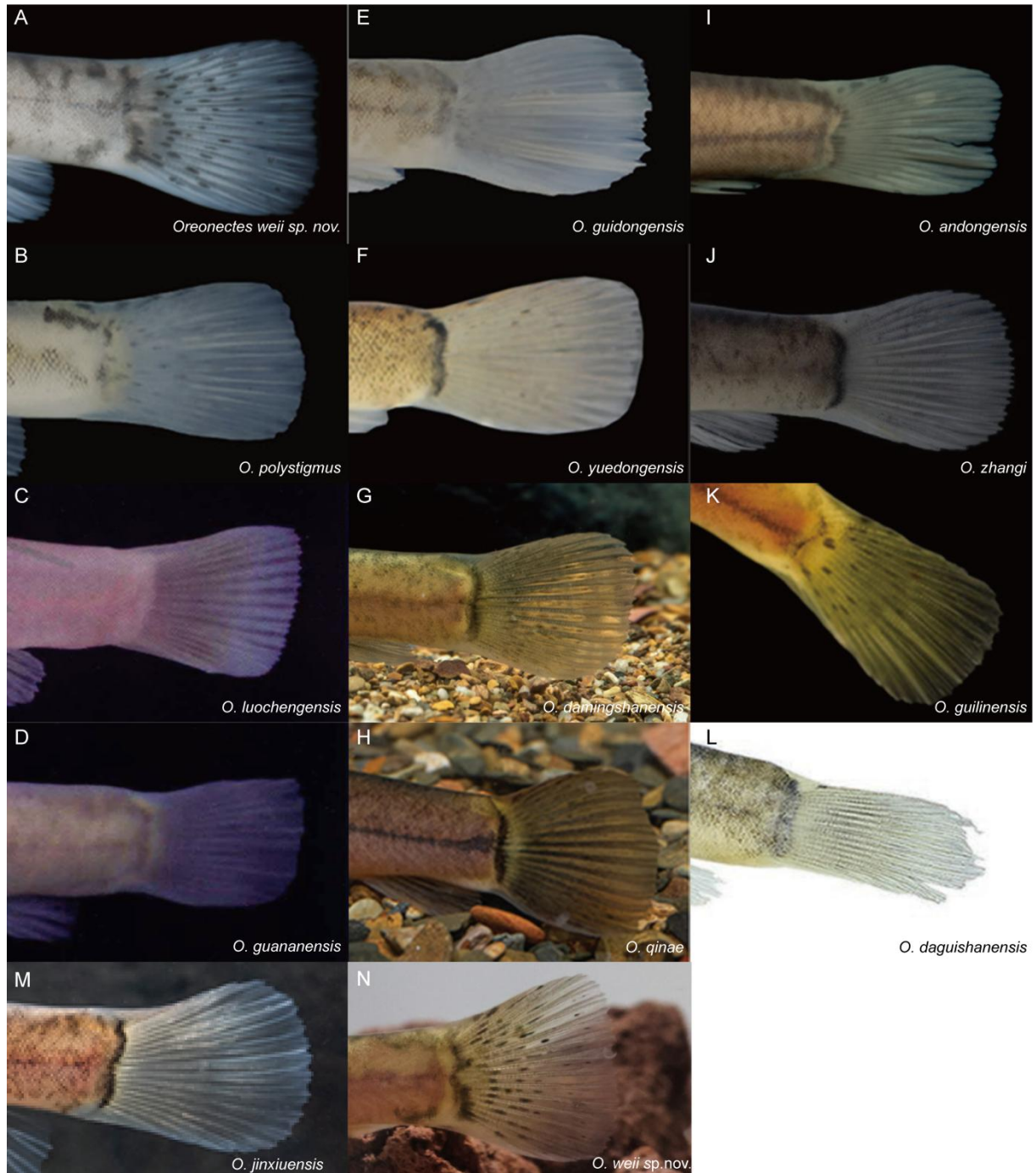


Figure S1. Photographs of caudal fin morphology for 12 species of the genus *Oreonectes* (*O. platycephalus* is not included due to lack of photographic material). The first column shows truncated (A–D), while columns two to three display rounded (E–L). (A) *O. weii* sp. nov.; (B) *O. polystigmus*, modified from [Liao et al. \(2025\)](#); (C) *O. luochengensis*, modified from [Lan et al. \(2013\)](#); (D) *O. guananensis*, modified from [Lan et al. \(2013\)](#); (E) *O. guidongensis*, modified from [Liao et al. \(2025\)](#); (F) *O. yuedongensis*, modified from [Lan et al. \(2024\)](#); (G) *O. damingshanensis*, modified from [Yu et al. \(2023\)](#); (H) *O. qinae*, modified from [Chen et al. \(2025a\)](#); (I) *O. andongensis*, modified from [Luo et al. \(2024\)](#); (J) *O. zhangji*, modified from [Zhong et al. \(2024\)](#); (K) *O. guilinensis*, modified from [Huang et al. \(2020\)](#); (L) *O. daguishanensis*, modified from [Chen et al. \(2025b\)](#); (M) *O. jinxiuensis*, modified from [Chen et al. \(2025c\)](#).

(2026); (N) *O. weii*, this study.

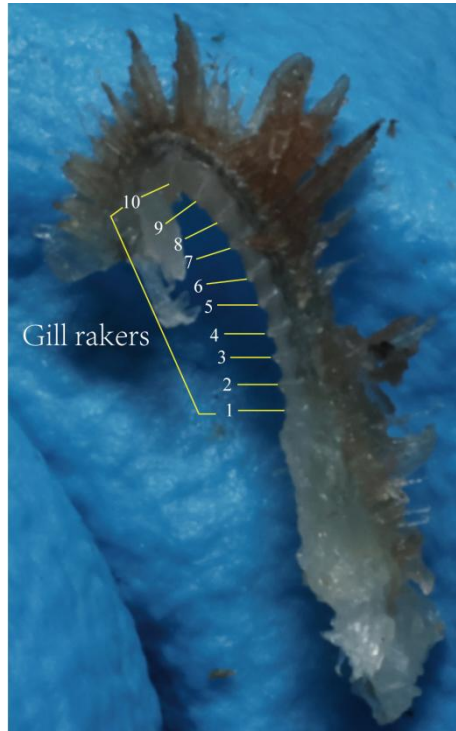


Figure S2. The number of gills rakers in *O. weii* sp. nov.

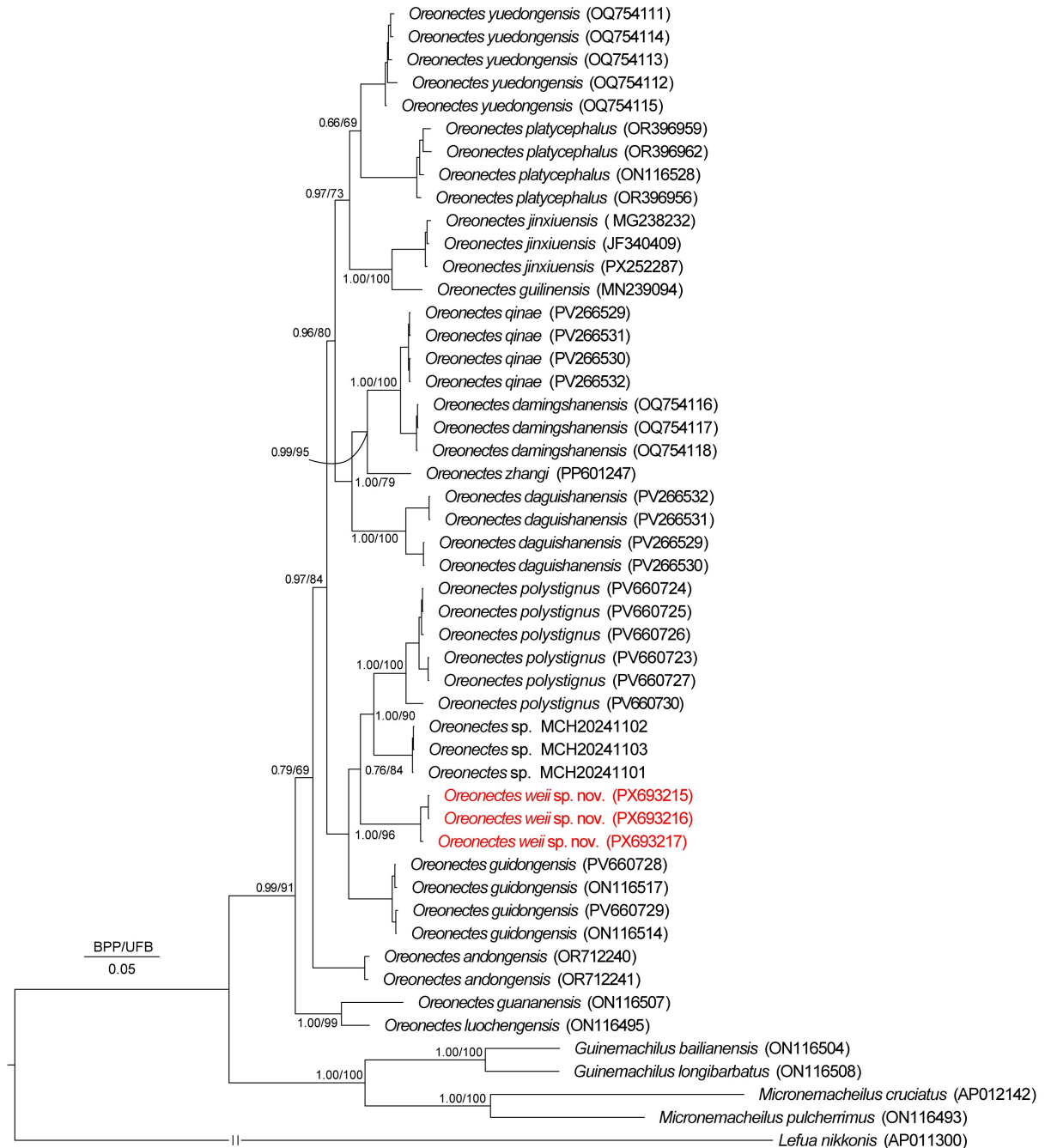


Figure S3. Phylogeny of the genus *Oreonectes*. Bayesian posterior probabilities (BPP) from BI inference and ultrafast bootstrap (UFB) support values from ML analysis are shown at the nodes. The scale bar represents 0.05 nucleotide substitutions per site.

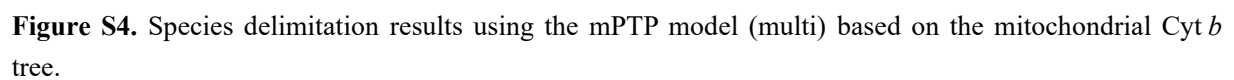


Figure S4. Species delimitation results using the mPTP model (multi) based on the mitochondrial Cyt *b* tree.

Table S1. Species composition of the three recognized genera.

ID	Genus	Species composition
1	<i>Oreonectes</i> Günther, 1868	<i>O. andongensis</i> Luo, Yang, Du & Luo, 2024; <i>O. damingshanensis</i> Yu, Luo, Lan, Xiao & Zhou, 2023; <i>O. guananensis</i> Yang, Wei, Lan & Yang, 2011; <i>O. guilinensis</i> Huang, Yang, Wu & Zhao, 2020; <i>O. luochengensis</i> Yang, Wu, Wei & Yang, 2011; <i>O. platycephalus</i> , <i>O. polystigmus</i> Du, Chen & Yang, 2008; <i>O. yuedongensis</i> Luo, Lan, Xiao & Zhou, 2024; <i>O. zhang</i> Zhong, Yang & Chen, 2024; <i>O. guidongensis</i> Luo, Yu, Liao & Zhou, 2025; <i>O. daguishanensis</i> Chen, Leng, Yang, Tang, Qiu & Zou; 2025, <i>O. qinae</i> Chen, Mo, Zhang & Du, 2025; and <i>O. jinxiuensis</i>
2	<i>Troglonectes</i> Zhang, Zhao & Yang, 2016	<i>T. barbatus</i> (Gan, 2013); <i>T. daqikongensis</i> (Deng, Wen, Xiao & Zhou, 2016); <i>T. donglanensis</i> (Wu, 2013); <i>T. dongganensis</i> (Yang 2013); <i>T. duanensis</i> (Lan, 2013); <i>T. elongatus</i> (Tang, Zhao & Zhang, 2013); <i>T. furcocaudalis</i> (Zhu & Cao, 1987); <i>T. hechiensis</i> (Zhao, Liu, Du & Luo, 2021); <i>T. huanjiangensis</i> (Yang, Wu & Lan, 2011); <i>T. jiarongensis</i> (Lin, Li & Song, 2012); <i>T. lihuensis</i> (Wu, Yang & Lan, 2012); <i>T. lingyunensis</i> (Liao, Wang & Luo, 1997); <i>T. longibarbatus</i> (Chen, Yang, Sket & Aljancic, 1998); <i>T. macrolepis</i> (Huang, Du, Chen & Yang, 2009); <i>T. maolanensis</i> (Li, Ran & Chen, 2006); <i>T. microphthalmus</i> (Du, Chen & Yang, 2008); <i>T. retrodorsalis</i> (Lan, Yang & Chen, 1995); <i>T. shuilongensis</i> (Deng, Wen, Xiao & Zhou, 2016); and <i>T. translucens</i> (Zhang, Zhao & Zhang, 2006).
3	<i>Karstsinnectes</i> Zhou, Luo, Wang, Zhou & Xiao, 2023	<i>K. anophthalmus</i> (Zheng, 1981); <i>K. hyalinus</i> (Lan, Yang & Chen, 1996); <i>K. acridorsalis</i> (Lan, 2013); <i>K. parvus</i> (Zhu & Zhu, 2014); <i>K. cehengensis</i> Luo, Zhao & Zhou, 2024; <i>K. longzhouensis</i> Ge, Du & Zhou, 2024; and <i>Karstsinnectes daxinensis</i> Luo, Zhou & Zhou, 2024.

Table S2. Sampling locations, voucher information, and GenBank accession numbers for sequences used in the phylogenetic analysis of the genus *Oreonectes*.

ID	Species	Localities (* type localities)	Voucher	Cyt <i>b</i>
1	<i>Oreonectes weii</i> sp. nov.	Meisha Village, Nangang Town, Shanggao County, Jiangxi Province, China*	JX20250920JXO1	PX693215
2	<i>Oreonectes weii</i> sp. nov.	Meisha Village, Nangang Town, Shanggao County, Jiangxi Province, China*	JX20250920JXO2	PX693216
3	<i>Oreonectes weii</i> sp. nov.	Dong Village, Dongcun Township, Fenyi County, Jiangxi Province, China	JX20250920JXQ1	PX693217
4	<i>O. jinxiuensis</i>	Jingxiu County, Guangxi, China*	KIZ20051015058	PX252287
5	<i>O. jinxiuensis</i>	Jingxiu County, Guangxi, China*	KIZ20051015059	JF340409
6	<i>O. jinxiuensis</i>	Jingxiu County, Guangxi, China*	KIZ20051015043	MG238232
7	<i>Oreonectes</i> sp.	Guilin City, Guangxi, China*	MCH20241101	In publishing
8	<i>Oreonectes</i> sp.	Guilin City, Guangxi, China*	MCH20241102	In publishing
9	<i>Oreonectes</i> sp.	Guilin City, Guangxi, China*	MCH20241103	In publishing
10	<i>O. daguishanensis</i>	Daguishan Crocodile Lizard National Reserve, Hezhou City, Guangxi, China*	DLN20240571	PQ738635
11	<i>O. daguishanensis</i>	Daguishan Crocodile Lizard National Reserve, Hezhou City, Guangxi, China*	DLN20240572	PQ738636
12	<i>O. daguishanensis</i>	Daguishan Crocodile Lizard National Reserve, Hezhou City, Guangxi, China*	DLN20240573	PQ738637
13	<i>O. daguishanensis</i>	Daguishan Crocodile Lizard National Reserve, Hezhou City, Guangxi, China*	DLN20240574	PQ738638
14	<i>O. yuedongensis</i>	Liangtian Township, Jiexi County, Guangdong, China	GZNU 20230405002	OQ754111
15	<i>O. yuedongensis</i>	Hekou Town, Luhe County, Guangdong, China	GZNU 20230405005	OQ754114
16	<i>O. yuedongensis</i>	Xiajiashan Town, Puning City, Guangdong, China*	GZNU 20230405004	OQ754113
17	<i>O. yuedongensis</i>	Baipenzhu Town, Huidong County, Guangdong, China	GZNU 20230405003	OQ754112
18	<i>O. yuedongensis</i>	Yuhu Town, Jieyang City, Guangdong, China	GZNU 20230405006	OQ754115
19	<i>O. platycephalus</i>	Shenzhen City, Guangdong, China	GZNU2020112501	ON116528
20	<i>O. platycephalus</i>	Baiyun Mountain, Guangzhou City, Guangdong, China	GZNU 20230405007	OR396956
21	<i>O. platycephalus</i>	Hengqin Island, Zhuhai City, Guangdong, China	GZNU 20230405010	OR396959
22	<i>O. platycephalus</i>	Hong Kong, China*	GZNU 20230405013	OR396962
23	<i>O. guilinensis</i>	Xingping Town, Yangshuo County, Guangxi, China*	N/A	MN239094
24	<i>O. damingshanensis</i>	Guling Town, Mashan County, Guangxi, China*	GZNU20230216010	OQ754116

25	<i>O. damingshanensis</i>	Guling Town, Mashan County, Guangxi, China*	GZNU20230216011	OQ754117
26	<i>O. damingshanensis</i>	Guling Town, Mashan County, Guangxi, China*	GZNU20230216012	OQ754118
27	<i>O. zhangii</i>	Mt. Hanshan, Xinye County, Yulin City, Guangxi, China*	NNNU2023100202	PP601247
28	<i>O. polystignus</i>	Wanfu Lu Forest Park, Guilin City, Guangxi, China	GZNU2024GL02	PV660724
29	<i>O. polystignus</i>	Wanfu Lu Forest Park, Guilin City, Guangxi, China	GZNU2024GL03	PV660725
30	<i>O. polystignus</i>	Wanfu Lu Forest Park, Guilin City, Guangxi, China	GZNU2024GL04	PV660726
31	<i>O. polystignus</i>	Wanfu Lu Forest Park, Guilin City, Guangxi, China	GZNU2024GL01	PV660723
32	<i>O. polystignus</i>	Wanfu Lu Forest Park, Guilin City, Guangxi, China	GZNU2024GL05	PV660727
33	<i>O. polystigmus</i>	Dabu Town, Guilin, Guilin City, Guangxi, China*	GZNU2025O14	PV660730
34	<i>O. guidongensis</i>	Laoxi Village, Fuchuan County, Hezhou City, Guangxi, China*	GZNU2024LQ01	PV660728
35	<i>O. guidongensis</i>	Jianghua County, Yongzhou City, Hunan, China	GZNU20210609005	ON116517
36	<i>O. guidongensis</i>	Laoxi Village, Fuchuan County, Hezhou City, Guangxi, China	GZNU2024LQ02	PV660729
37	<i>O. guidongensis</i>	Dabu Town, Yanshan District, Guilin, Guangxi, China*	GZNU2020011501	ON116514
38	<i>O. andongensis</i>	Andong Town, Xincheng County, Laibin City, Guangxi, China*	N/A	OR712240
39	<i>O. andongensis</i>	Andong Town, Xincheng County, Laibin City, Guangxi, China*	N/A	OR712241
40	<i>O. guananensis</i>	Changmei Town, Huanjiang County, Guangxi, China*	GZNU2020073102	ON116507
41	<i>O. luochengensis</i>	Tianhe Town, Luocheng County, Guangxi, China*	GZNU2020011502	ON116495
42	<i>O. qinae</i>	Gutingshan Forest Park, Luocheng County, Guangxi, China*	KIZ202410567	PV266532
43	<i>O. qinae</i>	Gutingshan Forest Park, Luocheng County, Guangxi, China*	KIZ202410564	PV266529
44	<i>O. qinae</i>	Gutingshan Forest Park, Luocheng County, Guangxi, China*	KIZ202410565	PV266530
45	<i>O. qinae</i>	Gutingshan Forest Park, Luocheng County, Guangxi, China*	KIZ202410566	PV266531
46	<i>Guinemachilus bailianensis</i>	Bailian Cave, Liuzhou City, Guangxi, China*	GZNU2020041603	ON116504
47	<i>Guinemachilus longibarbus</i>	Gaoling Town, Duan County, Guangxi, China*	GZNU2020073104	ON116508
48	<i>Micronemacheilus cruciatus</i>	N/A	N/A	AP012142
49	<i>Micronemacheilus pulcherrimus</i>	Duan County, Hechi City, Guangxi, China	GZNU20210609004	ON116493
50	<i>Lefua nikkonis</i>	N/A	CBM: ZF 11290	AP011300

Table S3. Results and percentage of variance explained by principal component analysis.

	<i>O. weii</i> sp. nov., <i>O. guidongensis</i> and <i>O. polystigmus</i>		<i>O. weii</i> sp. nov. vs. <i>O. polystigmus</i>									<i>O. weii</i> sp. nov. vs. <i>O. guidongensis</i>			
	CAN 1	CAN 2	PCA 1	PCA 2	PCA 3	PCA 4	PCA 5	PCA 6	PCA 7	PCA 8	PCA 9	PCA 1	PCA 2	PCA 3	PCA 4
Total length	-11.219	8.354	-0.046	0.565	0.771	0.036	0.102	-0.032	-0.050	-0.201	0.075	0.972	0.09	-0.073	0.041
Standard length	11.610	-7.595	-0.108	0.466	0.823	0.032	0.140	-0.010	-0.057	-0.184	0.078	0.969	0.006	-0.098	0.051
Body depth	-4.730	-0.766	0.698	-0.428	0.211	0.152	-0.125	-0.154	-0.230	-0.238	-0.118	0.828	-0.006	0.118	-0.422
Body width	-0.964	-0.170	0.639	-0.476	0.464	0.109	0.041	-0.126	-0.113	-0.070	-0.070	0.731	0.085	0.188	-0.493
Head length	5.090	-1.897	0.911	-0.062	0.190	0.204	0.040	0.087	0.135	-0.037	-0.009	0.956	-0.055	-0.144	-0.007
Head depth	2.082	1.433	0.913	0.021	0.242	-0.135	-0.025	-0.198	-0.053	0.124	-0.089	0.834	-0.012	-0.101	0.075
Head width	-4.005	2.563	0.611	0.332	-0.049	-0.172	0.003	0.022	0.429	0.238	-0.105	0.916	-0.291	-0.107	-0.06
Snout length	-0.883	-0.238	0.687	0.424	0.273	0.165	0.136	0.198	-0.126	-0.267	-0.100	0.901	0.212	-0.138	0.023
Upper jaw length	-5.833	-0.133	0.287	-0.638	-0.277	-0.023	0.001	0.417	0.303	-0.216	0.074	0.716	-0.46	0.25	0.205
Lower jaw length	-1.938	-0.849	0.347	-0.651	0.064	0.257	-0.098	0.430	-0.010	0.240	0.122	0.77	-0.47	-0.101	0.086
Mouth width	4.688	1.444	0.327	-0.571	0.511	0.088	-0.185	0.420	-0.118	0.160	0.071	0.911	-0.179	-0.056	0.016
Eye diameter	1.257	0.177	0.486	-0.645	-0.244	0.284	-0.125	-0.104	-0.012	-0.125	0.100	0.508	0.449	0.547	-0.16
Interorbital distance	-0.778	-1.833	0.556	0.231	0.307	-0.250	-0.022	-0.179	0.026	0.265	0.595	0.883	0.236	0.105	0.23
Predorsal length	2.654	-0.985	0.882	0.353	-0.056	0.019	0.103	0.006	-0.006	-0.222	0.056	0.981	0.066	-0.064	0.037
Dorsal-fin base length	-1.094	1.779	-0.139	-0.412	0.505	0.215	0.063	-0.313	0.411	0.055	0.100	0.793	-0.224	-0.236	-0.05
Dorsal-fin length	-2.780	-0.542	0.509	-0.103	-0.272	0.645	-0.301	-0.063	-0.299	-0.078	-0.086	0.923	-0.038	0.004	-0.192
Pectoral-fin length	0.378	0.792	0.235	0.857	0.041	0.254	0.152	0.033	0.136	0.113	0.175	0.888	0.241	-0.107	0.009
Pectoral-fin base length	-1.205	-1.544	0.512	-0.387	0.282	-0.220	-0.010	0.069	-0.016	0.587	-0.173	0.75	-0.243	0.365	0.1
Prepectoral length	0.605	1.961	0.761	-0.211	-0.339	-0.243	0.098	0.061	-0.086	0.102	-0.103	0.849	-0.057	0.224	0.007
Pelvic-fin length	-2.631	3.891	0.055	0.856	0.015	0.308	-0.258	0.086	-0.015	0.045	-0.074	0.947	0.052	-0.006	0
Pelvic-fin base length	-2.919	0.128	-0.436	-0.300	0.218	0.348	0.420	0.128	0.404	0.254	-0.108	0.623	-0.439	0.287	0.318

[illegible]

Table S4. Comparison of diagnostic characters between the new species and its congeners. Grey shading highlights characters that clearly differ from those of *O. weii* sp. nov.

Species	Body pigmentation	Caudal fin	Dorsal-fin rays	Pectoral-fin rays	Pelvic-fin rays	Anal-fin rays	Caudal-fin rays	Lateral line pores	Gill rakers	Posterior chamber of air-bladder	Tip of pelvic fin	Reference*
<i>O. weii</i> sp.nov.	Present	Truncated	iii, 7	i, 9–10	i, 6	iii, 5	14	10–12	10	Well-developed	Not reaching the anus	This study
<i>O. andongensis</i>	Present	Rounded	iii, 7	i, 9–10	i, 6	iii, 5	13–14	8–16	11–12	Developed	Not reaching the anus	Luo et al. 2023
<i>O. damingshanensis</i>	Present	Rounded	iii, 7	i, 9	i, 7	iii, 5	14	14–15	8	Developed	Not reaching the anus	Yu et al. 2023
<i>O. daguishanensis</i>	Present	Rounded	iii, 6–7	i, 7–9	ii, 6–7	i, 5–6	14	5–8	9–10	Reduced	Not reaching the anus	Chen et al. 2025a
<i>O. guananensis</i>	Present	Truncated	iii, 7	i, 10–11	i, 7–8	iii, 5	13–17	7–13	11	Developed	Not reaching the anus	Yang et al. 2011a
<i>O. guidongensis</i>	Present	Rounded	iii, 7	i, 10	i, 6	iii, 5	14–16	6–10	10	Developed	Not reaching the anus	Liao et al. 2025
<i>O. guilinensis</i>	Present	Rounded	ii, 6	i, 9–10	i, 6	iii, 5	13–14	4–6	–	Well-developed	Not reaching the anus	Huang et al. 2020
<i>O. jinxiuensis</i>	Present	Rounded	iv, 7	i, 10	i, 6	iii, 5	14–15	8–16	13	Reduced	Not reaching the anus	Chen et al., 2026
<i>O. luochengensis</i>	Absent	Truncated	iii, 7	i, 11–12	i, 7	ii, 5	14–16	6–13	13–14	Developed	Not reaching the anus	Yang et al. 2011b
<i>O. platycephalus</i>	Present	Rounded	iii, 6	i, 10–11	i, 7	ii, 6–7	14–15	6–15	–	Reduced	Not reaching the anus	Günther, 1868; Lan et al. 2024
<i>O. polystigmus</i>	Present	Truncated	iii, 6–7	i, 10	i, 6	ii, 5	14–15	6–8	–	Developed	Reaching the anus	Liao et al. 2025
<i>O. qinae</i>	Present	Rounded	iii, 7	ii, 10	ii, 6–7	iii, 5	16	11–13	12	Reduced	Not reaching the anus	Chen et al. 2025b
<i>O. yuedongensis</i>	Present	Rounded	iii, 6	i, 8–9	i, 6	iii, 5	13	6–8	9–10	Well-developed	Reaching the anus	Lan et al. 2024
<i>O. zhangii</i>	Present	Rounded	iii, 7	i, 8–9	i, 6	iii, 5	15–16	7–13	9	Reduced	Not reaching the anus	Zhong et al. 2024

*For detailed references, please refer to the main text.

Table S5. Estimated and statistical results for six models (DEC, DIVALIKE, BAYAREALIKE, and their corresponding +J models) using the R package BioGeoBEARS. The model with the maximum AIC model weight is the best model and is indicated using bold. Abbreviations: LnL referred to log-likelihood; d , rate of dispersal; e , rate of extinction; j , likelihood of founder-event speciation at cladogenesis; AICc, corrected Akaike's information criterion.

Model	LnL	Number of parameters	Parameters			AICc	AICc modelweight
			d	e	j		
DEC	-44.57	2	0.011	0.027	0	93.14	0.0010
DEC+J	-37.05	3	1.0e-12	1.0e-12	0.017	80.11	0.69
DIVALIKE	-40.67	2	0.011	5.0e-09	0	85.34	0.051
DIVALIKE+J	-40.67	2	0.011	2.2e-09	0	85.34	0.051
BAYAREALIKE	-49.22	2	0.013	0.089	0	102.4	9.9e-06
BAYAREALIKE+J	-38.29	3	1.0e-07	1.0e-07	0.019	82.57	0.20

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