

**Table S2.** Sample and identification information pertaining to *Eda* sequences used in this study.

Group	Species	Collecting Site	Catchment	Drainage System	Number of Samples	Accession Number
Barbinae	<i>Barbodes opisthoptera</i>	Baoshan, Yunnan	Nujiang River	Nujiang River	2	KT239731
	<i>Spinibarbus hollandi</i>	Lijiang, Guangxi	Lijiang River	Zhujiang River	2	KT239732
	<i>Mystacoleucus lepturus</i>	Xishuangbanna Yunnan	Lancang River	Lancang River	2	KT239733
	<i>Onychostoma lini</i>	Rong'an, Guangxi	Zhujiang River	Zhujiang River	2	KT239734
Primitive groups	<i>Schizothorax eurystomus</i>	Yecheng, Xinjiang	Tizinafu River	Tarim River	3	KT239706
	<i>Schizothorax intermedius</i>	Yecheng, Xinjiang	Tizinafu River	Tarim River	3	KT239707
	<i>Schizothorax prenanti</i>	ABa, Sichuan	Dadu River	Yangtze River	3	KT239711
	<i>Schizothorax scleracantha</i>	Ganzi, Sichuan	Jinsha River	Yangtze River	2	KT239712
	<i>Schizothorax pseudoaksaiensis</i>	Xinyuan, Xinjiang	Kunnes River	Yili River	3	KT239708
	<i>Schizothorax waltoni</i>	Lhasa, Tibet	Lhasa River	Yarlung Zangbo River	3	KT239709
	<i>Schizothorax plagiostomus</i>	Gar, Tibet	Gar River	Indus River	2	KT239710
	<i>Schizothorax molesworthi</i>	Medog, Tibet	Yarlung Zangbo River	Yarlung Zangbo River	2	KT239715
	<i>Schizothorax meridionalis</i>	Tengchong, Yunnan	Longchuan River	Irrawaddy River	2	KT239716
	<i>Schizothorax elongatus</i>	Yingjiang, Yunnan	Irrawaddy River	Irrawaddy River	3	KT239717
	<i>Schizothorax oconnori</i>	Lhasa, Tibet	Lhasa River	Yarlung Zangbo River	3	KT239718
	<i>Schizothorax wangchiachii</i>	Shigu, Yunnan	Jinsha River	Yangtze River	3	KT239719
	<i>Schizothorax dolichonema</i>	Yushu, Qinghai	Jinsha River	Yangtze River	2	KT239720
	<i>Schizothorax nukiangensis</i>	Zuogong, Tibet	Nujiang River	Nujiang River	3	KT239721
	<i>Schizothorax heterochilus</i>	Ya'an Sichuan	Qingyi River	Yangtze River	3	KT239722
	<i>Schizothorax lissolabiatus</i>	Nangqian, Qinghai	Zhaqu River	Lancang River	3	KT239713
	<i>Schizothorax biddulphi</i>	Wuqia, Xinjiang	Tarim River	Tarim River	3	KT239723
	<i>Schizothorax yunnanensis</i>	Tengchong, Yunnan	Lancang River	Lancang River	2	KT239714
	<i>Schizothorax yunnanensis paoshanensis</i>	Baoshan, Yunnan	Baoshan east river	Nujiang River	2	KT239724
	<i>Schizothorax_gongshanensis</i>	Gongshan, Yunnan	Nujiang River	Nujiang River	2	KT239725
	<i>Schizothorax macropogon</i>	Xigaze, Tibet	Yarlung Zangbo River	Yarlung Zangbo River	3	KT239726
	<i>Schizothorax griseus</i>	Guiyang, Guizhou	Wujiang River	Yangtze River	2	KT239728
	<i>Schizothorax davidi</i>	Wudu, Sichuan	Jialing River	Yangtze River	3	KT239727
	<i>Schizothorax langtsangensis</i>	Zadoi, Qinghai	Zhaqu River	Lancang River	2	KT239729
	<i>Aspiorhynchus laticeps</i>	Bazhou, Xinjiang	Bosten Lake	Tarim River	2	KT239730

Specialized groups	<i>Gymnodiptychus dybowskii</i>	Xinyuan, Xinjiang	Kunnes River	Yili River	3	KT239704
	<i>Diptychus maculatus</i>	Akeqi Xinjiang	Akesu River	Tarim River	3	KT239705
	<i>Ptychobarbus conirostris</i>	Gar, Tibet	Gar River	Indus River	3	KT239701
	<i>Gymnodiptychus integrigymnatus</i>	Tengchong, Yunnan	Longchuan River	Irrawaddy River	2	KT239699
	<i>Ptychobarbus dipogon</i>	Xigaze, Tibet	Yarlung Zangbo River	Yarlung Zangbo River	3	KT239702
	<i>Ptychobarbus kaznakovi</i>	Yushu, Qinghai	Jinsha River	Yangtze River	3	KT239700
	<i>Gymnodiptychus pachycheilus</i>	Jiuzhi, Qinghai	Yellow River	Yellow River	3	KT239703
Highly specialized groups	<i>Platypharodon extremus</i>	Maduo, Qinghai	Gyaring Lake	Yellow River	3	KT239680
	<i>chuanchia labiosa</i>	Maduo, Qinghai	Gyaring Lake	Yellow River	3	KT239681
	<i>Herzensteinia microcephalus</i>	Tanggula Shan, Qinghai	Tuotuo River	Yangtze River	3	KT239682
	<i>Oxygymnocypris stewartii</i>	Xigaze, Tibet	Yarlung Zangbo	Yarlung Zangbo River	3	KT239683
	<i>Gymnocypris chui</i>	Lazi, Tibet	Lange lake	Indus River	3	KT239684
	<i>Gymnocypris namensis</i>	Lhasa, Tibet	Namsto Lake	Namsto Lake	3	KT239691
	<i>Gymnocypris eckloni</i>	Maduo, Qinghai	Gyaring Lake	Yellow River	3	KT239685
	<i>Gymnocypris przewalskii</i>	Gonghe, Qinghai	Qinghai Lake	Qinghai Lake	3	KT239686
	<i>Gymnocypris przewalskii ganzihonensis</i>	Haiyan, Qinghai	Ganzi River	Qinghai Lake	3	KT239687
	<i>Gymnocypris waddellii</i>	Langkazi, Tibet	Yamzho lake	Yamzho lake	3	KT239688
	<i>Gymnocypris dobula</i>	Xigaze, Tibet	Peiku lake	Peiku lake	3	KT239689
	<i>Gymnocypris potanini</i>	Songpan, Sichuan	Minjiang River	Yangtze River	3	KT239690
	<i>Schizopygopsis kialingensis</i>	Diebu, Gansu	Bailong River	Yangtze River	3	KT239692
	<i>Schizopygopsis younghusbandi</i>	Lhasa, Tibet	Yarlung Zangbo	Yarlung Zangbo River	3	KT239693
	<i>Schizopygopsis pylzovi</i>	Haiyan, Qinghai	Yellow River	Yellow River	3	KT239694
	<i>Schizopygopsis stoliczkai</i>	Ali, Tibet	Shiquan	Indus River	3	KT239695
	<i>Schizopygopsis malacanthus</i>	Yushu, Qinghai	Tongtian River	Yangtze River	3	KT239696
	<i>Schizopygopsis kessleri</i>	Dulan, Qinghai	Dadu River	Yangtze River	3	KT239697
	<i>Schizopygopsis thermalis</i>	Naqu, Tibet	Nujiang River	Nujiang River	3	KT239698

