

**Table S1** List of specimens considered in the study, including of voucher numbers, collection information and GenBank numbers. New sequences are shown in bold. Missing data is marked with “-”.

Families	Species	Specimen n voucher	COI	16S	Sampling locality	Longitude (E)	Latitude (N)	Altitude (m)	Lineage
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0038	<b>OP537036</b>	<b>OP535918</b>	Taihu Lake, Jiangsu, China	120.171	31.536	37	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0040	<b>OP537037</b>	<b>OP535919</b>	Taihu Lake, Jiangsu, China	120.171	31.536	37	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0050	<b>OP537038</b>	<b>OP535920</b>	Dongjiang, Guangdong, China	114.402	23.102	321	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0741	<b>OP537052</b>	<b>OP535937</b>	Qionghai, Sichuan, China	102.267	27.862	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0834	<b>OP537053</b>	<b>OP535938</b>	Xinkaihe River, Zhejiang, China	120.470	29.954	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0835	<b>OP537054</b>	<b>OP535939</b>	Xinkaihe River, Zhejiang, China	120.470	29.954	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0259	MW888788	<b>OP535921</b>	Wild Goose Island, Naolihe River, Heilongjiang, China	132.892	46.788	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0262	<b>OP537039</b>	<b>OP535922</b>	Wild Goose Island, Naolihe River, Heilongjiang, China	132.892	46.788	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0263	MW888789	<b>OP535923</b>	Wild Goose Island, Naolihe River, Heilongjiang, China	132.892	46.788	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0264	MW888790	<b>OP535924</b>	Wild Goose Island, Naolihe River, Heilongjiang, China	132.892	46.788	-	II
Lumbriculidae	<i>Lumbriculus</i>	CW0461	<b>OP537040</b>	<b>OP535925</b>	Naolihe River 11, Heilongjiang, China	133.966	47.276	-	II

	<i>variegatus</i>								
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0463	<b>OP537041</b>	<b>OP535926</b>	Naolihe River 14, Heilongjiang, China	134.062	47.296	-	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0719	<b>OP537045</b>	<b>OP535930</b>	Naolihe River 3, Heilongjiang, China	133.221	47.233	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0720	<b>OP537046</b>	<b>OP535931</b>	Naolihe River 5, Heilongjiang, China	133.220	47.221	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0722	<b>OP537047</b>	<b>OP535932</b>	Naolihe River 6, Heilongjiang, China	133.456	47.248	-	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0724	<b>OP537048</b>	<b>OP535933</b>	Naolihe River 12, Heilongjiang, China	133.961	47.275	-	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0727	<b>OP537049</b>	<b>OP535934</b>	Naolihe River 21, Heilongjiang, China	133.023	46.521	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0732	<b>OP537050</b>	<b>OP535935</b>	Naolihe River 24, Heilongjiang, China	132.892	46.788	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0735	<b>OP537051</b>	<b>OP535936</b>	Naolihe River 25, Heilongjiang, China	132.949	46.784	-	II
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0632	<b>OP537042</b>	<b>OP535927</b>	Batang Grassland, Qinghai, China	97.051	32.852	3841	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0633	<b>OP537043</b>	<b>OP535928</b>	Longbao Beach, Qinghai, China	96.510	33.212	4204	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0634	<b>OP537044</b>	<b>OP535929</b>	Longbao Beach, Qinghai, China	96.510	33.212	4204	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0786	<b>OP536146</b>	<b>OP535889</b>	Niyanghe River, Xizang, China	92.499	29.891	4260	I
Lumbriculidae	<i>Lumbriculus</i>	CW0787	<b>OP536130</b>	<b>OP535890</b>	Niyanghe River, Xizang, China	92.499	29.891	4260	I

	<i>variegatus</i>								
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0788	<b>OP536131</b>	<b>OP535891</b>	Niyanghe River, Xizang, China	92.499	29.891	4260	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0789	<b>OP536132</b>	<b>OP535892</b>	Niyanghe River, Xizang, China	92.499	29.891	4260	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0790	<b>OP536133</b>	<b>OP535893</b>	Niyanghe River, Xizang, China	92.499	29.891	4260	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0792	<b>OP536134</b>	<b>OP535894</b>	Lalu Wetland, Xizang, China	91.104	29.665	3647	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0793	<b>OP537029</b>	<b>OP535895</b>	Lalu Wetland, Xizang, China	91.104	29.665	3647	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0797	<b>OP536135</b>	<b>OP535896</b>	Cuomujiri, Xizang, China	94.408	29.762	4122	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0798	<b>OP537030</b>	<b>OP535897</b>	Cuomujiri, Xizang, China	94.408	29.762	4122	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0803	<b>OP536147</b>	<b>OP535898</b>	Milin, Xizang, China	94.439	29.442	2927	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0804	<b>OP536148</b>	<b>OP535899</b>	Milin, Xizang, China	94.439	29.442	2927	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0805	<b>OP536149</b>	<b>OP535900</b>	Milin, Xizang, China	94.439	29.442	2927	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0807	<b>OP536136</b>	<b>OP535901</b>	Lulang, Xizang, China	94.732	29.607	3327	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0808	<b>OP537031</b>	<b>OP535902</b>	Lulang, Xizang, China	94.732	29.607	3327	I
Lumbriculidae	<i>Lumbriculus</i>	CW0810	<b>OP537032</b>	<b>OP535903</b>	Lulang, Xizang, China	94.732	29.607	3327	I

	<i>variegatus</i>								
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0811	<b>OP536137</b>	<b>OP535904</b>	Zhegucuo, Xizang, China	91.641	28.710	4620	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0812	<b>OP536150</b>	<b>OP535905</b>	Zhegucuo, Xizang, China	91.641	28.710	4620	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0813	<b>OP536138</b>	<b>OP535906</b>	Zhegucuo, Xizang, China	91.641	28.710	4620	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0814	<b>OP536151</b>	<b>OP535907</b>	Zhegucuo, Xizang, China	91.641	28.710	4620	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0815	<b>OP536152</b>	<b>OP535908</b>	Zhegucuo, Xizang, China	91.641	28.710	4620	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0816	<b>OP537033</b>	<b>OP535909</b>	Zigetangcuo Hot Spring, Xizang, China	91.816	32.037	4568	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0817	<b>OP536153</b>	<b>OP535910</b>	Zigetangcuo Hot Spring, Xizang, China	91.816	32.037	4568	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0818	<b>OP536139</b>	<b>OP535911</b>	Zigetangcuo Hot Spring, Xizang, China	91.816	32.037	4568	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0819	<b>OP537034</b>	<b>OP535912</b>	Zigetangcuo Hot Spring, Xizang, China	91.816	32.037	4568	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0820	<b>OP536140</b>	<b>OP535913</b>	Zigetangcuo Hot Spring, Xizang, China	91.816	32.037	4568	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0822	<b>OP536141</b>	<b>OP535914</b>	Boquzangbu Wetland, Xizang, China	89.451	31.435	4869	I
Lumbriculidae	<i>Lumbriculus variegatus</i>	CW0823	<b>OP536154</b>	<b>OP535915</b>	Boquzangbu Wetland, Xizang, China	89.451	31.435	4869	I
Lumbriculidae	<i>Lumbriculus</i>	CW0824	<b>OP537035</b>	<b>OP535916</b>	Boquzangbu Wetland, Xizang, China	89.451	31.435	4869	I

Lumbriculidae	<i>variegatus</i> <i>Lumbriculus</i> <i>variegatus</i>	CW0825	<b>OP536584</b>	<b>OP535917</b>	Boquzangbu Wetland, Xizang, China	89.451	31.435	4869	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1104	FJ639289	FJ639260	Lärjeån, Göteborg, Sweden	12.002	57.765	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1103	FJ639288	FJ639259	Lärjeån, Göteborg, Sweden	12.002	57.765	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1102	FJ639280	FJ639255	Strömsbergsån, Jönköping, Sweden	14.169	57.782	-	II
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1109	FJ639301	FJ639266	Bålerödsbäcken, Strömstad, Sweden	11.193	58.944	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE27	FJ639299	FJ639263	Viktoriadammen, Stockholm, Sweden	18.052	59.330	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1106	FJ639291	FJ639262	Kvibergsbäcken, Göteborg, Sweden	-	-	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1105	FJ639290	FJ639261	Lärjeån, Göteborg, Sweden	12.002	57.765	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1100	FJ639287	FJ639258	Lärjeån, Göteborg, Sweden	12.002	57.765	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1108	FJ639286	FJ639257	Klämmestorpsbäcken, Jönköping, Sweden	14.196	57.778	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1101	FJ639285	FJ639256	Klämmestorpsbäcken, Jönköping, Sweden	14.196	57.778	-	I
Lumbriculidae	<i>Lumbriculus</i> <i>variegatus</i>	CE1072	FJ639307	FJ639271	Inglenook Fen, California, America	-	-	-	I
Lumbriculidae	<i>Lumbriculus</i>	CE869	FJ639306	FJ639270	Aquatic Foods, California, America	-	-	-	I

<b>Outgroups</b>		<i>variegatus</i>							
Naididae	<i>Tubifex tubifex</i>	-	MW69057 9	MW69057 9	South Korea	-	-	-	-
Naididae	<i>Limnodrilus hoffmeisteri</i>	-	MW73214 4	MW73214 4	South Korea	-	-	-	-
Moniligastridae	<i>Drawida japonica</i>	-	KM199288	KM199288	China	-	-	-	-
Megascolecidae	<i>Perionyx excavatus</i>	-	EF494507	EF494507	South Korea	-	-	-	-
Megascolecidae	<i>Amyntas triastriatus</i>	-	KT429016	KT429016	China	-	-	-	-
Lumbricidae	<i>Aporrectodea rosea</i>	-	MK573632	MK573632	Russia	-	-	-	-
Lumbricidae	<i>Lumbricus rubellus</i>	-	MN102127	MN102127	China	-	-	-	-