

Supplementary Material

Phylogeny of freshwater mollusc genus *Brotia* H. Adams, 1866 (Gastropoda: Pachychilidae) from north-east India

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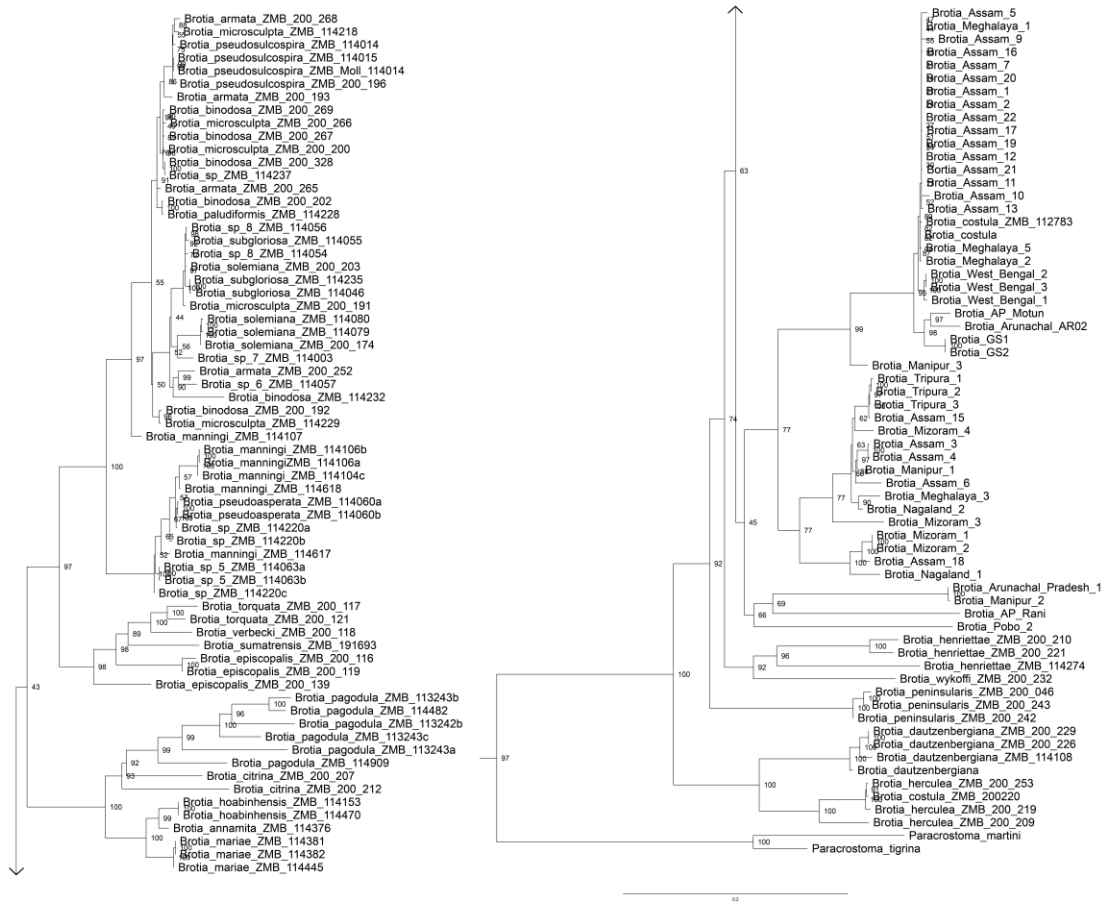


Fig. S1. Global phylogeny of genus *Brotia* using *COI* and *16S* markers.

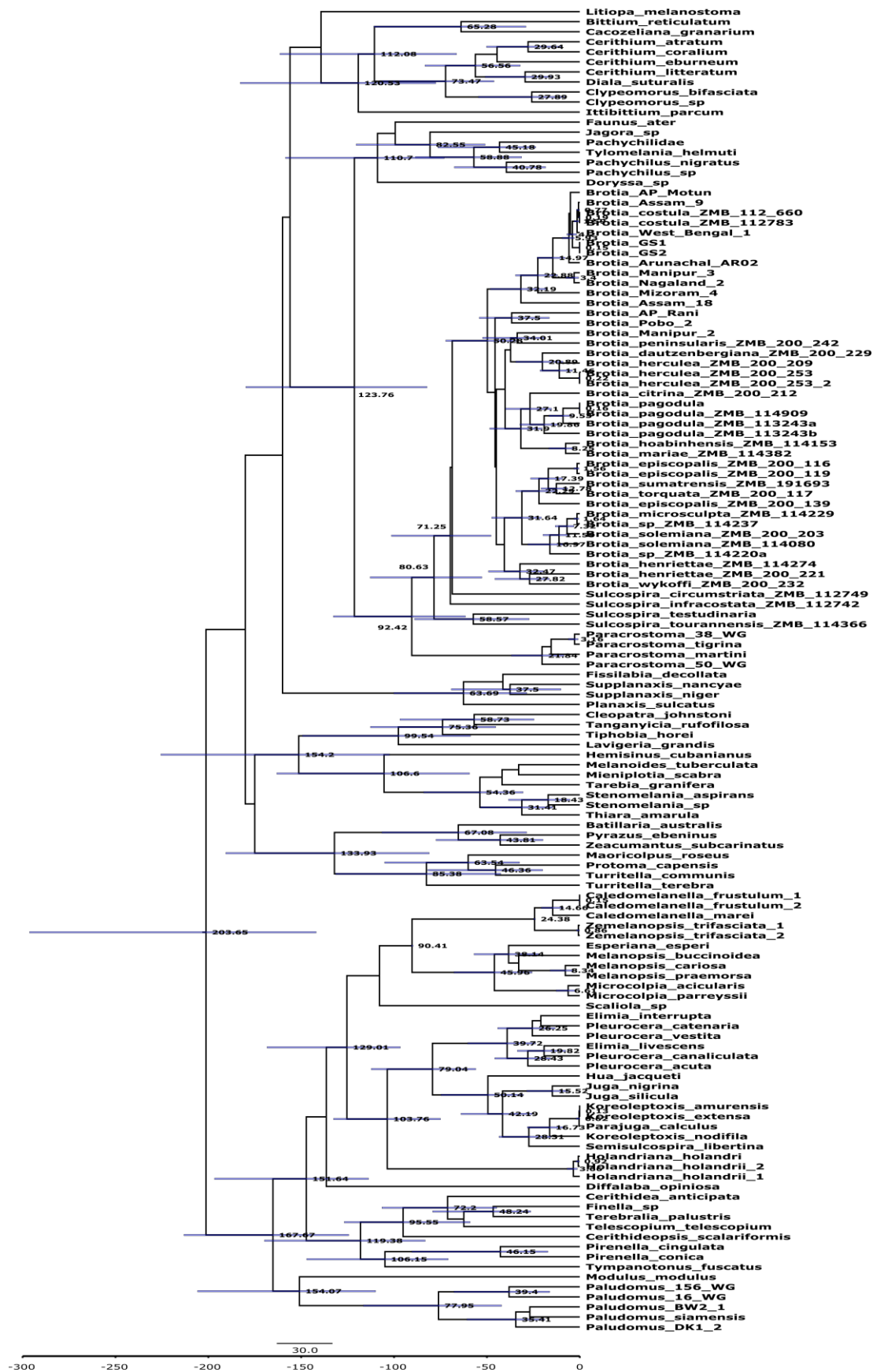


Fig. S2. Molecular dating of members of super family Certhoidea.

Table S1. Details of the collection localities from India and accession numbers for each sample used in the study.

Specimen code	Locality	State	Latitude	Longitude	Altitude (m)	River Basin
Pobo_2	Pobo Reserve	Arunachal Pradesh	27.8632	95.279	134	Upper Bramhaputra
AP_Motum	Motum village	Arunachal Pradesh	28.0827	95.439	168	Siang River Basin
AP_Rani	Rani village	Arunachal Pradesh	27.9635	95.3131	147	Siang River Basin
Assam_3	Barak River, Silchar	Assam	24.8375	92.7821	22	Lower Bramhaputra
Assam_4	Barak River, Silchar	Assam	24.8375	92.7821	22	Lower Bramhaputra
Assam_6	Barak River, Silchar	Assam	24.8375	92.7821	22	Lower Bramhaputra
Assam_15	Stream Makunda, near Bazaricherra	Assam	24.4334	92.329	37	Lower Bramhaputra
Assam_18	Forest at Makunda	Assam	24.4334	92.329	37	Lower Bramhaputra
Assam_9	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_1	Nonoi River	Assam	26.645	91.9008	79	Lower Bramhaputra
Assam_2	Nonoi River	Assam	26.645	91.9008	79	Lower Bramhaputra
Assam_5	Barak river, Silchar	Assam	24.8375	92.7821	22	Lower Bramhaputra
Assam_7	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_10	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_11	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_12	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_13	Gurmow High School	Assam	26.4878	91.6853	56	Lower Bramhaputra
Assam_16	Stream Makunda, near Bazaricherra	Assam	24.4334	92.329	37	Lower Bramhaputra
Assam_17	Stream Makunda, near Bazaricherra	Assam	24.4334	92.329	37	Lower Bramhaputra
Assam_19	Fonir Chowk (Sesa River)	Assam	26.4753	91.7221	55	Lower Bramhaputra
Assam_20	Fonir Chowk (Sesa River)	Assam	26.4753	91.7221	55	Lower Bramhaputra
Assam_21	Sesa River, Dalingapam	Assam	27.4084	94.9275	102	Lower Bramhaputra
Assam_22	Sesa River, Dalingapam	Assam	27.4084	94.9275	102	Lower Bramhaputra
Kahalipara market	Kahalipara	Assam	26.141	91.762	59	Lower Bramhaputra
GS 1	Gossaigaon	Assam	26.4454	89.9774	46	Upper Bramhaputra
GS 2	Gossaigaon	Assam	26.4454	89.9774	46	Upper Bramhaputra
West Bengal_1	Kashiganj (Koribhari Market)	Bihar	26.0982	87.9450	50	Lower Gangetic
Arunachal Pradesh_1	Some market in Manipur	Manipur	24.663	93.9069	774	Barak River Basin
Manipur_2	Zeilad Lake	Manipur	24.973	93.4978	1238	Imphal River Basin
Manipur_1	Zeilad Lake	Manipur	24.973	93.4978	1238	Imphal River Basin
Manipur_3	Bunning WLS	Manipur	24.9347	93.8759	832	Imphal River Basin
Meghalaya_3	Shillong Market (2018)	Meghalaya	25.579	91.8877	1443	Barak River Basin
Meghalaya_1	Shillong Market (2019)	Meghalaya	25.579	91.8877	1443	Barak River Basin
Meghalaya_2	Shillong Market (2019)	Meghalaya	25.579	91.8877	1443	Barak River Basin
Meghalaya_5	Garobadha Market	Meghalaya	25.5858	90.0233	69	Barak River Basin
Mizoram_4	Bara Bazar, Aizwal	Mizoram	23.732	92.717	1097	Imphal River Basin

Specimen code	Locality	State	Latitude	Longitude	Altitude (m)	River Basin
Mizoram_1	Tuirial Bridge Market	Mizoram	23.718	92.8	299	Imphal River Basin
Mizoram_2	Tuirial Bridge Market	Mizoram	23.718	92.8	299	Imphal River Basin
Mizoram_3	Bara bazar, Aizawl	Mizoram	23.732	92.717	1097	Imphal River Basin
Nagaland_2	Supermarket, Dimapur	Nagaland	25.8856	93.7605	157	Bramhaputra River Basin
Nagaland_1	Supermarket, Dimapur	Nagaland	25.8856	93.7605	157	Bramhaputra River Basin
Tripura_3	Lakechowmoni Market, Agartala	Tripura	23.8419	91.2819	13	Barak River Basin
Tripura_1	Lakechowmoni Market, Agartala	Tripura	23.8419	91.2819	13	Barak River Basin
Tripura_2	Lakechowmoni Market, Agartala	Tripura	23.8419	91.2819	13	Barak River Basin
West Bengal_2	Victoria Memorial	West Bengal	22.544	88.342	5	Lower Gangetic
West Bengal_3	Victoria Memorial	West Bengal	22.544	88.342	5	Lower Gangetic

Table S2. Accession numbers for *COI* and *16S* for *Brotia* from South-East Asia along with voucher number and location.

Species	Voucher number	<i>COI</i> Accession number	<i>16S</i> Accession number	Location
<i>Brotia annamita</i> _ZMB_114376	ZMB_114.376	FJ377236	FJ377080	VNM: Tam Quang, Truong Son Mountains
<i>Brotia armata</i> _ZMB_200_193	ZMB_200.193	AY330853	AY330810	THA: Phitsanulok Prov., Kaek River, Kaeng Song rapids
<i>Brotia armata</i> _ZMB_200_252	ZMB_200.252	AY330854	AY330809	THA: Phitsanulok Prov., Kaek River, Thung Salaeng rapids
<i>Brotia armata</i> _ZMB_200_265	ZMB_200.265	AY330855	AY330806	THA: Phitsanulok Prov., Kaek River, Thung Salaeng rapids
<i>Brotia armata</i> _ZMB_200_268	ZMB_200.268	AY330856	AY330811	THA: Phitsanulok Prov., Kaek River, Poi Waterfall
<i>Brotia binodosa</i> _ZMB_200_192	ZMB_200.192	AY330857	AY330815	THA: Phitsanulok Prov., Kaek River, Thung Salaeng rapids
<i>Brotia binodosa</i> _ZMB_200_328	ZMB_200.328	AY330858	AY330817	THA: Phitsanulok Prov., Kaek River, Kaeng Song rapids
<i>Brotia binodosa</i> _ZMB_200_202	ZMB_200.202	AY330859	AY330819	THA: Phitsanulok Prov., Chattrakan waterfall
<i>Brotia binodosa</i> _ZMB_200_267	ZMB_200.267	AY330860	AY330818	THA: Phitsanulok Prov., Kaek River, 53 km E of Phitsanulok
<i>Brotia binodosa</i> _ZMB_200_269	ZMB_200.269	AY330861	AY330820	THA: Phitsanulok Prov., Kaek River, Poi Waterfall
<i>Brotia citrina</i> _ZMB_200_207	ZMB_200.207	AY330829	AY330798	THA: Tak Prov., Pa Charoen Waterfall
<i>Brotia citrina</i> _ZMB_200_212	ZMB_200.212	AY330830	AY330799	Thailand
<i>Brotia costula</i> _ZMB_200220	ZMB_200.220	AH012879	AY242971	Not found
<i>Brotia costula</i> _ZMB_112783	ZMB_112.783	FJ377193	FJ377036	NPL: Haripur, tributary of Sapta Koshi River near India
<i>Brotia costula</i>		DQ284985		NPL: Bis Hajaar Lakes
<i>Brotia dautzenbergiana</i> _ZMB_200_226	ZMB_200.226	AY330831		Thailand
<i>Brotia dautzenbergiana</i> _ZMB_200_229	ZMB_200.229	AY330832	AY330800	THA: Road Lampang - Uttaradit, ~20 km from Lampang
<i>Brotia dautzenbergiana</i>		AY533177		THA: irrigation ditch, near Thoern, Highway 106
<i>Brotia dautzenbergiana</i> _ZMB_114108	ZMB_114.108	FJ377194	FJ377037	THA: Mae Phun Waterfall, between Phrae and Uttaradit
<i>Brotia episcopalis</i> _ZMB_200_116	ZMB_200.116	AY330838	AY330784	Thailand
<i>Brotia episcopalis</i> _ZMB_200_139	ZMB_200.139	AY330839		Thailand
<i>Brotia episcopalis</i> _ZMB_200_119	ZMB_200.119	AY330840	AY330785	Thailand

Species	Voucher number	COI Accession number	I6S Accession number	Location
<i>Brotia henriettae</i> _ZMB_200_210	ZMB_200.210	AY330845	AY330793	THA: Tak Prov., Maenam Moei, S of Mae Sot
<i>Brotia henriettae</i> _ZMB_200_221	ZMB_200.221	AY330846	AY330794	THA: Chiang Mai Prov., Pai River in Pai
<i>Brotia henriettae</i> _ZMB_114274	ZMB_114.274	FJ377213	FJ377057	Not found
<i>Brotia herculea</i> _ZMB_200_209	ZMB_200.209	AY330842	AY330789	THA: Tak Prov., Maenam Moei 30 km S of Mae Sot
<i>Brotia herculea</i> _ZMB_200_219	ZMB_200.219	AY330843	AY330790	THA: Chiang Mai Prov., Pai River, 20 km E of Pai
<i>Brotia herculea</i> _ZMB_200_253	ZMB_200.253	AY330844	AY330788	THA: Chiang Mai Prov., River at road Samoeng - Chiang Mai
<i>Brotia hoabinhensis</i> _ZMB_114153	ZMB_114.153	FJ377237	FJ377081	Hoa Binh Prov., Muong Khen
<i>Brotia hoabinhensis</i> _ZMB_114470	ZMB_114.470	FJ377238	FJ377082	Hoa Binh Prov., Muong Khen
<i>Brotia manningi</i> _ZMB_114104c	ZMB_114.104c	FJ377201	FJ377046	THA: Phitsanulok Prov., Road 1237 30 km N of Chattrakan
<i>Brotia manningi</i> _ZMB_114106a	ZMB_114.106a	FJ377202		THA: Phitsanulok Prov., Phu Soi Dao Waterfall, S of Mayom
<i>Brotia manningi</i> _ZMB_114106b	ZMB_114.106b	FJ377203		THA: Phitsanulok Prov., Phu Soi Dao Waterfall, S of Mayom
<i>Brotia manningi</i> _ZMB_114107	ZMB_114.107	FJ377204	FJ377048	THA: Phitsanulok Prov., Road 1269, Mayom - Huai Tat
<i>Brotia manningi</i> _ZMB_114617	ZMB_114.617	FJ377205	FJ377049	THA: Loei Prov., Song Khon Waterfall
<i>Brotia manningi</i> _ZMB_114618	ZMB_114.618	FJ377206	FJ377050	THA: Phitsanulok Prov., Road 1237 30 km N of Chattrakan
<i>Brotia mariae</i> _ZMB_114381	ZMB_114.381	FJ377207	FJ377051	LAO: Bolikhamsai Prov., Ngum River W of Phone Savan
<i>Brotia mariae</i> _ZMB_114382	ZMB_114.382	FJ377208	FJ377052	LAO: Ban Pha Xan, Highway 13
<i>Brotia mariae</i> _ZMB_114445	ZMB_114.445	FJ377209	FJ377053	LAO: Chin River in Phônông, Highway 13
<i>Brotia microsculpta</i> _ZMB_200_200	ZMB_200.200	AY330833	AY330804	THA: Phitsanulok Prov., Kaek River, Poi Waterfall
<i>Brotia microsculpta</i> _ZMB_200_266	ZMB_200.266	AY330835	AY330803	THA: Phitsanulok Prov., Kaek River, 53 km E of Phitsanulok
<i>Brotia microsculpta</i> _ZMB_200_191	ZMB_200.191	AY330836	AY330805	THA: Phetchabun Prov., Kaek River, Thung Salaeng rapids
<i>Brotia microsculpta</i> _ZMB_114218	ZMB_114.218	FJ377210	FJ377054	THA: Phitsanulok Prov., Kaek River, 37 km E of Phitsanulok
<i>Brotia microsculpta</i> _ZMB_114229	ZMB_114.229	FJ377211	AY330800	THA: Phitsanulok Prov., Kaek River, Kaeng Sopha Waterfall
<i>Brotia pagodula</i> _ZMB_113243a	ZMB_113.243a	HM229693	HM229687	Thailand
<i>Brotia pagodula</i> _ZMB_113243c	ZMB_113.243c	HM229694	HM229682	Thailand
<i>Brotia pagodula</i> _ZMB_114482	ZMB_114.482	HM229696	HM229685	Thailand
<i>Brotia pagodula</i> _ZMB_114909	ZMB_114.909	HM229697		Thailand
<i>Brotia pagodula</i> _ZMB_113243b	ZMB_113.243b	HM229694	HM229684	Thailand
<i>Brotia paludiformis</i> _ZMB_114228	ZMB_114.228	FJ377212	FJ377056	THA: Phitsanulok Prov., Kaek River, Kaeng Sopha Waterfall
<i>Brotia peninsularis</i> _ZMB_200_046	ZMB_200.046	AY330850	AY330792	THA: Road 4, Ao Luk
<i>Brotia peninsularis</i> _ZMB_200_242	ZMB_200.242	AY330851	AY330791	THA: Nakhon Si Thammarat Prov., near Surat Thani
<i>Brotia peninsularis</i> _ZMB_200_243	ZMB_200.243	AY330852		Thailand
<i>Brotia pseudoasperata</i> _ZMB_114060a	ZMB_114.060a	FJ377214	FJ377058	THA: Prov. Loei, Stream at road Dan Sai - Loei
<i>Brotia pseudoasperata</i> _ZMB_114060b	ZMB_114.060b	FJ377215	FJ377059	THA: Prov. Loei, Stream at road Dan Sai - Loei
<i>Brotia pseudosulcospira</i> _ZMB_200_196	ZMB_200.196	AY330862	AY330797	THA: Phitsanulok Prov., Kaek River, Sakunothayan waterfall
<i>Brotia pseudosulcospira</i> _ZMB_114014	ZMB_114.014	FJ377216	FJ377061	THA: Phitsanulok Prov., Kaek River, Sakunothayan waterfall
<i>Brotia pseudosulcospira</i> _ZMB_114015	ZMB_114.015	FJ377217	FJ377062	THA: Phitsanulok Prov., Kaek River, Sakunothayan waterfall
<i>Brotia solemiana</i> _ZMB_200_203	ZMB_200.203	AY330848	AY330812	Thailand

Species	Voucher number	COI Accession number	16S Accession number	Location
<i>Brotia_solemiana_ZMB_200_174</i>	ZMB_200.174	AY330849	AY330814	THA: Loei Prov., Tat Kok Waterfall
<i>Brotia_solemiana_ZMB_114079</i>	ZMB_114.079	FJ377219		THA: Loei Prov., Tat Hong Waterfall, Phu Kradung NP
<i>Brotia_solemiana_ZMB_114080</i>	ZMB_114.080	FJ377220	FJ377066	THA: Loei Prov., Tat Hong Waterfall, Phu Kradung NP
<i>Brotia_sp_ZMB_114220a</i>	ZMB_114.220a	FJ377232	FJ377077	THA: Loei Prov., Stream at road Dan Sai - Loei
<i>Brotia_sp_ZMB_114220b</i>	ZMB_114.220b	FJ377233	FJ377078	THA: Loei Prov., Stream at road Dan Sai - Loei
<i>Brotia_sp_ZMB_114220c</i>	ZMB_114.220c	FJ377234		THA: Loei Prov., Stream at road Dan Sai - Loei
<i>Brotia_sp_ZMB_114237</i>	ZMB_114.237	FJ377235	FJ377079	THA: Phitsanulok Prov., Kaek River, Kaeng Song rapids
<i>Brotia_sp_Gossaigaon</i>		MN704857		Assam
<i>Brotia_sp_5_ZMB_114063a</i>	ZMB_114.063a	FJ377239	FJ377084	THA: Loei Prov., Song Khon Waterfall
<i>Brotia_sp_5_ZMB_114063b</i>	ZMB_114.063b	FJ377240	FJ377085	THA: Loei Prov., Song Khon Waterfall
<i>Brotia_sp_6_ZMB_114057</i>	ZMB_114.057	FJ377241	FJ377087	THA: Phetchabun Prov., Kaek River, Sri Dit Waterfall
<i>Brotia_sp_7_ZMB_114003</i>	ZMB_114.003a	FJ377242	FJ377090	THA: Phetchabun Prov.: Tat Mok NP, Tat Mok Waterfall
<i>Brotia_sp_8_ZMB_114054</i>	ZMB_114.054	FJ377243	FJ377091	THA: Phetchabun Prov., Kaek River, Sri Dit Waterfall
<i>Brotia_sp_8_ZMB_114056</i>	ZMB_114.056	FJ377244	FJ377092	THA: Phetchabun Prov., Kaek River, Sri Dit Waterfall
<i>Brotia_subgloriosa_ZMB_114046</i>	ZMB_114.046	FJ377245	AY330792	THA: Phitsanulok Prov., Kaek River, Thung Salaeng Luang rapids
<i>Brotia_subgloriosa_ZMB_114055</i>	ZMB_114.055	FJ377246	FJ377094	THA: Phetchabun Prov., Kaek River, Sri Dit Waterfall
<i>Brotia_subgloriosa_ZMB_114235</i>	ZMB_114.235	FJ377247	FJ377095	THA: Phitsanulok Prov., Kaek River, Thung Salaeng Luang rapids
<i>Brotia_sumatrensis_ZMB_191693</i>	ZMB_191.693	FJ377248	FJ377096	IDN: Lampung Prov., Lake Ranau
<i>Brotia_torquata_ZMB_200_117</i>	ZMB_200.117	AY330864	AY330781	IDN: W Sumatra, Lake Maninjau
<i>Brotia_torquata_ZMB_200_121</i>	ZMB_200.121	AY330865	AY330782	IDN: W Sumatra, Ditch in Rao, Trans-Sumatra Highway
<i>Brotia_verbecki_ZMB_200_118</i>	ZMB_200.118	AY330863	AY330779	IDN: W Sumatra, Lake Singkarak
<i>Brotia_wykoffi_ZMB_200_232</i>	ZMB_200.232	AY330866	FJ377034	THA: Kanchanaburi Prov., Sai Yok Falls 2

Table S3. Accession numbers for the newly generated sequences for genus *Brotia* from India.

Locality details	Specimen code	Specimen voucher	16S Genbank accession	COI Genbank accession
Sesa River, Dalingapam	Assam_21	AT/2020/FW2010-1	OR689240	OR686954
Motum village	AP_Motum	AT/2022/FW2002	OR689241	OR686955
Rani village	AP_Rani	AT/2022/FW2003	OR689242	OR686956
Kahalipara	AR02	AT/2022/FW2011		OR686957
Some market in Manipur	Manipur_4	AT/2019/FW2014	OR689243	OR686958
Nonoi river	Assam_1	AT/2020/FW2008-1	OR689244	OR686959
Gurmow High school	Assam_10	AT/2020/FW2007-3	OR689245	OR686960

Locality details	Specimen code	Specimen voucher	<i>I6S</i> Genbank accession	<i>COI</i> Genbank accession
Gurmow High school	Assam_11	AT/2020/FW2007-4	OR689246	OR686961
Gurmow High school	Assam_12	AT/2020/FW2007-5	OR689247	OR686962
Gurmow High school	Assam_13	AT/2020/FW2007-6		OR686963
Stream Makunda, near Bazaricherra	Assam_15	AT/2020/FW2005-1	OR689248	OR686964
Stream Makunda, near Bazaricherra	Assam_16	AT/2020/FW2005-2	OR689249	OR686965
Stream Makunda, near Bazaricherra	Assam_17	AT/2020/FW2005-3	OR689250	OR686966
Forest at Makunda	Assam_18	AT/2020/FW2006	OR689251	OR686967
Fonir Chowk (Sesa River)	Assam_19	AT/2021/FW2009-1	OR689252	OR686968
Nonoi river	Assam_2	AT/2020/FW2008-2	OR689253	OR686969
Fonir Chowk (Sesa River)	Assam_20	AT/2021/FW2009-2	OR689254	OR686970
Sesa River, Dalingapam	Assam_22	AT/2020/FW2010-2	OR689255	OR686971
Barak river, Silchar	Assam_3	AT/2020/FW2004-1	OR689256	OR686972
Barak river, Silchar	Assam_4	AT/2020/FW2004-2	OR689257	OR686973
Barak river, Silchar	Assam_5	AT/2020/FW2004-4	OR689258	OR686974
Gurmow High school	Assam_9	AT/2020/FW2007-1	OR689261	OR686975
Gossaigaon	GS 1	AT/2022/FW2012-1	OR689262	OR686976
Gossaigaon	GS 2	AT/2022/FW2012-1	OR689263	OR686977
Zeilad Lake	Manipur_2	AT/2019/FW2015-2		OR686978
Zeilad Lake	Manipur_1	AT/2019/FW2015-1	OR689264	OR686979
Bunning WLS	Manipur_3	AT/2019/FW2016	OR689265	OR686980
Shillong market (2019)	Meghalaya_1	AT/2019/FW2018-1		OR686981
Shillong market (2019)	Meghalaya_2	AT/2019/FW2018-2		OR686982
Shillong market (2018)	Meghalaya_3	AT/2018/FW2017		OR686983
Garobadha market	Meghalaya_5	AT/2021/FW2019		OR686984
Tuirial bridge market	Mizoram_1	AT/2019/FW2021-1	OR689266	OR686985
Tuirial bridge market	Mizoram_2	AT/2019/FW2021-2		OR686986
Bara bazar, Aizawl	Mizoram_3	AT/2019/FW2020-2		OR686987
Bara Bazar, Aizawl	Mizoram_4	AT/2019/FW2020-1	OR689267	OR686988
Supermarket, Dimapur	Nagaland_1	AT/2022/FW2022-2	OR689268	OR686989
Supermarket, Dimapur	Nagaland_2	AT/2022/FW2022-1		OR686990
Pobo Reserve	Pobo_2	AT/2022/FW2001	OR689269	OR686991

Locality details	Specimen code	Specimen voucher	<i>16S</i> Genbank accession	<i>COI</i> Genbank accession
Lakechowmoni market, Agartala	Tripura_1	AT/2019/FW2023-2	OR689270	OR686992
Lakechowmoni market, Agartala	Tripura_2	AT/2019/FW2023-3	OR689271	OR686993
Lakechowmoni market, Agartala	Tripura_3	AT/2019/FW2023-1	OR689272	OR686994
Kashiganj (Koribhari market)	West Bengal_1	AT/2019/FW2013	OR689273	OR686995
Victoria Memorial	West Bengal_2	AT/2021/FW2024-1	OR689274	OR686996
Victoria Memorial	West Bengal_3	AT/2021/FW2024-2	OR689275	OR686997
Gurmow High school	Assam_7	AT/2020/FW2007-2	OR689260	
Barak river, Silchar	Assam_6	AT/2020/FW2004-3	OR689259	