Appendix 1. The list of specimens included in phylogenetic estimation with voucher details and GenBank accession numbers, newly sequenced data are in bold.

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| --- | --- | --- | --- | --- |
| Taxon | Specimen voucher | GenBank accession number | | |
| ITS1-2 nrDNA | *rbc*L cpDNA | *trn*L-F cpDNA |
| *Acrobolbus ochrophyllus* | Chile, *Engel 26633* (F) |  | KF852285 | KJ802071 |
| *Acroscyphella phoenicorhiza* | New Zealand, *Braggins & Renner 4174* (F) |  | KF852339 |  |
| *Anastrepta orcadensis* | China: Yunnan Prov., *Long 34711* (E) |  | KF852268 |  |
| *Anastrepta orcadensis* | Russia: Buryatia Rep., *Konstantinova 59-1-01* (KPABG-102486) | DQ875126 |  | DQ875088 |
| *Anthelia julacea* | United Kingdom: Scotland, *Long 31292* (E) |  | KF852280 | KJ802070 |
| *Arnellia fennica* | Finland, *Shaw 1250* (DUKE) |  | KF852402 | KJ802096 |
| *Arnellia fennica* | Russia: Buryatia Rep., *Konstantinova K372-1-17,* (KPABG-122033) | **OR611950** | **OR604353** | **OR604343** |
| *Balantiopsis diplophylla* | Australia, *Streimann 59554* (NY) |  | KF852348 |  |
| *Blepharidophyllum vertebrale* | New Zealand, *Engel & von Konrat s.n.* (F) |  | KF852363 | KJ802086 |
| *Calypogeia muelleriana* | USA, *Davis 130* (DUKE) |  | JF316291 |  |
| *Calypogeia vietnamica* | Viet Nam: Lao Cai Prov., *Bakalin V-8-61-17* (VBGI) | MK335824 |  | MK336253 |
| *Cephalozia bicuspidata* | Dominican Rep.: San Jose de Ocoa Prov., *Schaefer-Verwimp & Verwimp 26879/A* (M) |  | KX098877 | KX098955 |
| *Cephalozia bicuspidata* | Russia: Kemerovo Prov., *Konstantinova 61-4-00* (KPABG-101873) | JX629821 |  | JX629938 |
| *Clandarium gottscheanum* | Chile, *Engel 26229* (F) |  | KF852329 |  |
| *Cryptocolea imbricata* | Norway: Svalbard, *Frisvoll* *732314* (KPABG-122667) | **OR664122** | **OR604355** | **OR604345** |
| *Cryptocolea imbricata* | Russia: Kamchatka Terr., *Bakalin K-66-5-15* (KPABG-120389) | **OR611952** | **OR604356** | **OR604346** |
| *Cryptocolea imbricata* | Russia: Khabarovsk Terr., *Bakalin Kh-36-56-13* (KPABG-119106) | **OR611955** |  | **OR604349** |
| *Cryptocolea imbricata* | Russia: Krasnoyarsk Terr., Khatanga Settl., *Fedosov 13-3-0382* (KPABG-116993) | **OR611956** |  | **OR604350** |
| *Cryptocolea imbricata* | Russia: Krasnoyarsk Terr., Taimyr, *Fedosov G107969* (KPABG-107969) | **OR611957** |  | **OR604351** |
| *Cryptocolea imbricata* | Russia: Trans-Baikal Terr., *Mamontov YuSM-524-3-6* (KPABG-119564) | **OR611954** |  | **OR604348** |
| *Cryptocolea imbricata* var. *minima* | Russia: Krasnoyarsk Terr., Taimyr, *Lapshina 213E/4-3-21* (KPABG-124714) | **OR611953** | **OR604357** | **OR604347** |
| *Cryptocoleopsis imbricata* | Russia, *Bakalin* (DUKE) |  |  | KJ802098 |
| *Cylindrocolea recurvifolia* | Japan, *Yamaguchi* (F) |  | KF852297 |  |
| *Delavayella serrata* | China: Yunnan Prov., *Long 34809* (E) |  | KF852269 | KJ802066 |
| *Endogemma caespiticia* | Russia: Murmansk Prov., *Konstantinova 2/3-02* (KPABG) |  |  | JF421605 |
| *Eocalypogeia quelpaertensis* | Japan: Kyushu, *Furuki 20233* ( HIRO) |  | AB476566 |  |
| *Eremonotus myriocarpus* | Russia: Karachaevo-Cherkesia Rep. *Konstantinova* *K446-6-05* (KPABG-109615) | EU791839 |  | EU791716 |
| *Eremonotus myriocarpus* | United Kingdom: Scotland, *Buryová 165/93* (DUKE) |  | KF852354 | KJ802082 |
| *Geocalyx caledonicus* | New Zealand, *Engel & von Konrat 28342* (F) |  | KF943584 |  |
| *Geocalyx graveolens* | China: Yunnan Prov., *Long 34828* (E) |  | KF852271 | KJ802067 |
| *Goebelobryum unguiculatum* | New Zealand: North Island, *Qiu, Renner, Schuster NZ-03054* (AK) |  | KF852375 |  |
| *Gongylanthus ericetorum* | Greece, *Duell 63.(35.)* (GOET) |  | AM392303 |  |
| *Gongylanthus ericetorum* | Portugal, *Long 31-Mar-2007* |  | JX305547 |  |
| *Gongylanthus himalayensis* | Bhutan, *Long 18-Sep-1999* |  | JX305548 |  |
| *Gongylanthus limbatus* | Ecuador, *Schaefer-Verwimp 24463* (MO) | **OR611958** | **OR604358** | **OR604352** |
| *Gymnomitrion alpinum* | United Kingdom: Scotland, *Long 38270* (DUKE) |  | KF852406 | KJ802101 |
| *Gymnomitrion commutatum* | Russia: Buryatya Rep., *Konstantinova 83-2-02* (KPABG-104502) | EU791828 |  | EU791707 |
| *Gymnomitrion concinnatum* | Norway: Svalbard, *Konstantinova & Savchenko K158/8-07* (F) |  | KF943557 | KF942980 |
| *Gymnomitrion concinnatum* | Russia: Murmansk Prov., *Konstantinova 366-00* (KPABG-8182) | EU791832 |  | AF519202 |
| *Gymnomitrion pacificum* | Russia: Commander Islands, I. Bering, *Bakalin K 26-4-02-VB* (KPABG-103350) | EU791835 |  | EU791713 |
| *Gymnomitrion pacificum* | USA: Alaska, *Shaw F956/3* (DUKE) |  | KF943591 | KF943050 |
| *Gymnomitrion verrucosum* | China: Yunnan Prov., *Long & Shevock 37182* (DUKE) |  | KF852409 | KJ802102 |
| *Gyrothyra underwoodiana* | Canada: Vancouver Island, *Forrest 593* (ABSH) |  | DQ268970 | KF942997 |
| *Harpanthus flotovianus* | Norway, *Long & Schill 31355* (E) |  | KF852272 | KJ802065 |
| *Hygrobiella laxifolia* | Russia, *Bakalin* (F) |  | KF852320 |  |
| *Hygrobiella laxifolia* | Russia: Murmansk Prov., *Konstantinova K201-1-04* (KPABG- 12761) | JX629931 |  | JX630054 |
| *Hygrobiella nishimurae* | Japan, *Bakalin J-11-42-15* (KPABG- 122546, VGBI) | MH580594 |  | MH580592 |
| *Isotachis lyallii* | New Zealand, *Engel 21825* (F) |  | KF852343 | AY608130 |
| *Jackiella curvata* | New Zealand, *Qiu, Braggins, Renner, Schuster NZ-03064* (AK) |  | DQ787461 |  |
| *Jungermannia atrovirens* | Russia: Karachaevo-Cherkesia Rep., *Ignatov, Ignatova MHA 4.8.02* (KPABG) | GQ220782 |  | GQ220766 |
| *Jungermannia atrovirens* | Switzerland, *Hrad lek 2-Nov-2008* (DUKE) |  | KF852398 | KJ802093 |
| *Jungermannia borealis* | Russia: Buryatia Rep., *Konstantinova 21-4-02* (KPABG-104405) | GQ220781 |  | GQ220765 |
| *Jungermannia* cf. *exsertifolia* | Russia: Kamchatka Terr., *Bakalin K-74-13a-04* (KPABG-106804) | GQ220780 |  | GQ220764 |
| *Jungermannia* cf. *exsertifolia* | Russia: Karachaevo-Cherkesia Rep., *Konstantinova K421-6-05* (KPABG-109568) | GQ220779 |  | GQ220763 |
| *Jungermannia exsertifolia* subsp. *cordifolia* | USA: Alaska, *Shaw F951/5* (DUKE) |  | KF943592 | KF943051 |
| *Jungermannia pumila* | Norway, *Sova 19-Jul-2008* (DUKE) |  | KF943603 | KF943070 |
| *Leiomylia anomala* | Canada: Alberta, *Vitt s.n.* (ABSH) |  | KF852367 | KJ802088 |
| *Lethocolea glossophylla* | Ecuador, *Davis 259* (DUKE) |  | DQ439692 | KJ802080 |
| *Liochlaena lanceolata* | Russia: Vladimir Prov., *Kokoshnikova G112323* (KPABG-112323) | KF516120 |  | KF516228 |
| *Liochlaena lanceolata* | USA: Oregon, *Shaw 6259a* (DUKE) |  | KF852381 | KJ802091 |
| *Liochlaena sichuanica* | China: Sichuan Prov., *Bakalin & Klimova China-40-10-17* (VBGI-37315, KPABG-122540) | MH703731 |  | MH686187 |
| *Marsupella aquatica* | Russia: Murmansk Prov., *Konstantinova 152-5-87* (KPABG-6090) | EU791813 |  | AF519201 |
| *Marsupella aquatica* | United Kingdom: Scotland, *Long 29202* (E) |  | KF943544 | KF942959 |
| *Marsupella arctica* | Norway: Svalbard, *Konstantinova 128-04* (KPABG) | EU791815 |  | EU791695 |
| *Marsupella arctica* | Norway: Svalbard, *Konstantinova & Savchenko k113/2-06* (F) |  | KF852300 | KJ802072 |
| *Marsupella funckii* | Russia, *Konstantinova and Savchenko* (F) |  | KF943562 | KF942985 |
| *Marsupella funckii* | Russia: Karachaevo-Cherkesia Rep. *Konstantinova K516-1-05* (KPABG-109804) | EU791820 |  | EU791700 |
| *Mesoptychia badensis* | Russia: Amur Terr., *Bakalin 33-1-00* (KPABG-101674) | EU791842 |  | EU791718 |
| *Mesoptychia badensis* | Russia: Komi Rep., *Dulin & Konstantinova 24-Jun-2001* (KPABG-101313) | EU791841 |  | EU791717 |
| *Mesoptychia polymorpha* | USA: California, *Doyle 11541* (ABSH) |  | KF943581 | KF943034 |
| *Mesoptychia rutheana* | Canada: British Columbia, *Shaw F702* (DUKE) |  | KF943573 | KF943025 |
| *Mesoptychia sahlbergii* | Russia, *Fedosov 107967* (F) |  | KF852310 | KJ802078 |
| *Mesoptychia sahlbergii* | Russia: Chukotka A.O., *Afonina, 10-Aug-1979* (KPABG) | EU791840 |  | AF519189 |
| *Metacalypogeia alternifolia* | Bhutan, *Long 28712* (E) |  | KF852276 | KJ802068 |
| *Mizutania riccardioides* | Malaysia: Fraser's Hill, *Masuzaki 147* (HIRO) |  | AB476582 |  |
| *Mnioloma fuscum* | Fiji, *Braggins et al. 16-Apr-2008* (NSW) |  | KF852404 | KJ802100 |
| *Mylia anomala* | Russia: Magadan Prov., *Bakalin, D#Mag 21-6-14* (VBGI) |  | MF989962 | MF989970 |
| *Mylia taylorii* | China: Yunnan Prov., *Long 34707* (E) |  | KF852277 |  |
| *Mylia taylorii* | Russia: Primorsky Terr., *Bakalin P-18-4-12* (VBGI) | MF989964 |  | MF989972 |
| *Nardia assamica* | Russia: Kuril Islands, I. Iturup, *Bakalin K-54-1a-05* (KPABG-123316) | EU791838 |  | EU791715 |
| *Nardia compressa* | Canada: British Columbia, *Konstantinova A97/1-95* (KPABG) | EU791837 |  | AF519188 |
| *Nardia compressa* | Russia, *Bakalin K-74-9-04* (F) |  | KF943556 | KF942978 |
| *Nardia insecta* | Belgium, *Konstantinova 1-99* (KPABG-102077) | EU791836 |  | EU791714 |
| *Nardia scalaris* | Russia, *Konstantinova & Savchenko 1/3/2002* (F) |  | KF852307 | KJ802077 |
| *Nardia succulenta* | Colombia, *Benavides* (SIU) |  | KF943622 | KF943094 |
| *Neesioscyphus argillaceus* | Brazil, *Schaefer-Verwimp & Verwimp 11107* (GOET) |  | DQ312509 |  |
| *Odontoschisma elongatum* | Norway: Svalbard, *Konstantinova & Savchenko K142-1-04* (KPABG-110058) | JX629870 |  | JX630001 |
| *Odontoschisma elongatum* | Portugal: Azores, Terceira Island, *Schaefer-Verwimp & Verwimp 33337* (M) |  | KX098925 | KX099007 |
| *Plectocolea obovata* | Russia: Buryatia Rep., *Konstantinova 70-2-01* (KPABG- 102519) | GQ220767 |  | GQ220751 |
| *Plectocolea obovata* | Russia: Kemerovo Prov., *Konstantinova 72-2-00* (KPABG-102004) | GQ220769 |  | GQ220753 |
| *Plectocolea obovata* | Russia: Murmansk Prov., *Konstantinova 196-6-02* (KPABG-9543) | GQ220770 |  | GQ220754 |
| *Plectocolea obovata* | Russia: Perm Terr., *Konstantinova K324-1-04* (KPABG-108265) | GQ220771 |  | GQ220755 |
| *Plectocolea obovata* | Russia, *Konstantinova & Savchenko ?382-3?-04* (F) |  | KF943552 | KF942974 |
| *Plectocolea* sp. | Russia: Karachaevo-Cherkesia Rep., *Konstantinova K495-2-05* (KPABG-109772) | GQ220778 |  | GQ220762 |
| *Plectocolea* sp. | Russia: Murmansk Prov., *Konstantinova 30-1-97* (KPABG-6176) | GQ220777 |  | GQ220761 |
| *Plectocolea subelliptica* | Russia: Kamchatka Terr., *Bakalin K-48-13-03* (KPABG-105188) | GQ220768 |  | GQ220752 |
| *Prasanthus suecicus* | Norway: Svalbard, *Konstantinova K121-5-06* (KPABG-111821) | EU791825 |  | EU791704 |
| *Prasanthus suecicus* | Norway: Svalbard, *Konstantinova & Savchenko K106/1-07* (F) |  | KF852304 | KJ802074 |
| *Saccogyna viticulosa* | Portugal: Sintra, *Stotler & Crandall-Stotler 4657* (SIU) |  | KF852385 |  |
| *Saccogynidium decurvum* | Australia: Tasmania, *Shaw 6410* (DUKE) |  | KF852389 |  |
| *Solenostoma appressifolium* | China: Yunnan Prov., *Shaw 5761* (DUKE) |  | KF943570 | KF943010 |
| *Solenostoma confertissimum* | Norway, *Sova 15-Jul-2008* (DUKE) |  | KF943601 | KF943065 |
| *Solenostoma confertissimum* | Russia: Karachaevo-Cherkesia Rep., *Konstantinova K459-8a-05* (KPABG- 109680) | GQ220774 |  | GQ220758 |
| *Solenostoma crenuliforme* | USA: North Carolina, *Shaw 7212* (DUKE) |  | KF943617 | KF943085 |
| *Solenostoma fusiforme* | Russia: Kamchatka Terr., *Bakalin HRE 42* (KPABG) | GQ220773 |  | GQ220757 |
| *Solenostoma gracillimum* | Austria, *Sova 21-Aug-2008* (DUKE) |  | KF943614 | KF943082 |
| *Solenostoma handelii* | Japan, *Itouga Bryophytes of Asia 194* (KPABG) | GQ220772 |  | GQ220756 |
| *Solenostoma inundatum* | New Zealand, *Renner 4201 ? 4021* (DUKE) |  | KF943596 | KF943058 |
| *Solenostoma montanum* | Australia, *Pocs & Streimann* (F) |  | KF943564 | KF942987 |
| *Solenostoma orbiculatum* | New Zealand, *Engel & von Konrat 28158* (F) |  | KF943583 | KF943036 |
| *Solenostoma pseudopyriflorum* | Russia: Buryatia Rep., *Konstantinova 30-2-01* (KPABG-102426) | GQ220775 |  | GQ220759 |
| *Solenostoma rosulans* | China: Yunnan Prov., *Long 36185* (E) |  | KF943574 | KF943026 |
| *Solenostoma sphaerocarpum* | Norway, *Sova 21-Jul-2008b* (DUKE) |  | KF943618 | KF943086 |
| *Solenostoma sphaerocarpum* | Russia: Karachaevo-Cherkesia Rep., *Konstantinova K419-05* (KPABG-109579) | GQ220776 |  | GQ220760 |
| *Southbya nigrella* | Italy: Sicily, *Buryová 621* (DUKE) |  | KF852355 | KJ802083 |
| *Southbya tophacea* | Italy, *Long 35466* (E) |  |  | KF942954 |
| *Southbya tophacea* | Russia: Krasnodar Terr., *Konstantinova & Savchenko K312-4-11*(KPABG-122707) | **OR611951** | **OR604354** | **OR604344** |
| *Trichotemnoma corrugatum* | New Zealand, *Glenny 8426* |  | AY462333 | AY463591 |
| *Trilophozia quinquedentata* | Russia, *Konstantinova & Savchenko 515-3 -05* (F) |  | KF852302 |  |
| *Trilophozia quinquedentata* | Russia: Kareliya Rep., *Bakalin 02-Jul-1997* (KPABG) | EU791804 |  | AY327786 |
| *Tylimanthus laxus* | Ecuador, *Schaefer-Verwimp & Nebel 32025* (F) |  | JX461053 | JX461095 |
| *Vietnamiella epiphytica* | Vietnam: Lao Cai Prov., *Bakalin V-9-7-17* (VBGI, KPABG- 122594) | MK277316 | MK290986 | MK290984 |