

Lu, L., Fritsch, P. W., Bush, C. B., Wang, H., Kron, K. A. and Li, D.-Z. 2019. Allopolyploidization as a driving force in the evolutionary history of the tribe Gaultherieae (Ericaceae) inferred from plastid, ITS, and low-copy nuclear regions. – Nordic Journal of Botany 2019: e2077

Appendix 1

Vouchers of the Gaultherieae and outgroup taxa alphabetized by taxon name, with voucher information and GenBank accession numbers for *waxy* and *leafy*, respectively. ‘—’ indicates that no sequence was obtained. ‘/’ separates the copies and clones of the *waxy* and *leafy* genes. All samples are wild-collected except where indicated as cultivated. Herbarium acronyms for dried specimen vouchers are from Index Herbariorum (<<http://sweetgum.nybg.org/science/ih/>>). RBG = Royal Botanic Garden; RSF = Rhododendron Species Foundation.

Andromeda polifolia L.: RBG Kew accession 1976-6099 (cultivated; no voucher), MK932913, —. *Chamaedaphne calyculata* (L.) Moench: *A. Evans s.n.* (E), MK932914, MK933165. *Diplycosia acuminata* Becc.: RBG Edinburgh accession 1982-0862 (cultivated; no voucher), clone 1: MK932915 / clone 2: MK932916 / clone3: MK932917, MK933166. *Diplycosia apoensis* Elmer: RBG Edinburgh, Cubey 52 825 #13 (cultivated; no voucher), clone 1: MK932918 / clone 2: MK932919, MK933167. *Diplycosia barbiger*a Sleumer: *R. Fuller s.n.* (WFU), clone 1: MK932920 / clone 2: MK932921, —. *Diplycosia chrysothrix* Stapf: *P.W. Fritsch & C.M. Bush 1851* (CAS), clone 1: MK932922 / clone 2: MK932923, MK933168. *Diplycosia ciliolata* Hook. f.: *P.W. Fritsch & C.M. Bush 1844* (CAS), clone 1: MK932924/ clone 2: MK932925, —. *Diplycosia cinnamomifolia* Stapf: *P.W. Fritsch 1842* (CAS), clone 1: MK932926 / clone 2: MK932927 / clone 3: MK932928 / clone 4: MK932929, MK933169. *Diplycosia clementium* Sleumer: *P.W. Fritsch & C.M. Bush 1866* (CAS), clone 1: MK932930 / clone 2: MK932931/ clone 3: MK932932, MK933180. *Diplycosia kinabaluensis* Stapf: *P.W. Fritsch & C.M. Bush 1850* (CAS), clone 1: MK932933 / clone 2: MK932934, MK933170. *Diplycosia luzonica* (A. Gray) Merr. & H.F. Copel.: RBG Edinburgh 2675-HAL47B, 51 825 #15 (cultivated; no voucher), clone 1: MK932935 / clone 2: MK932936, —. *Diplycosia memecyloides* Stapf: *P.W. Fritsch & C.M. Bush 1867* (CAS), clone 1: MK932937 / clone 2: MK932938, MK933171. *Diplycosia penduliflora* Stapf: *P.W. Fritsch & C.M. Bush 1879* (CAS), clone 1: MK932939 / clone 2: MK932940, MK933172. *Diplycosia pinifolia* Stapf: *P.W. Fritsch & C.M. Bush 1871* (CAS), clone 1: MK932941 / clone 2: MK932942, MK933173. *Diplycosia pseudorufescens* Sleumer: *R. Fuller s.n.* (WFU), clone 1: MK932943 / clone 2: MK932944, MK933174. *Diplycosia punctulata* Stapf: *P.W. Fritsch & C.M. Bush 1863* (CAS), clone 1: MK932945 / clone 2: MK932946, MK933175. *Diplycosia rufa* Stapf: *P.W. Fritsch & C.M. Bush 1883* (CAS), MK932947, MK933176. *Diplycosia sanguinolenta* Sleumer: *P.W. Fritsch & C.M. Bush 1898* (CAS), clone 1: MK932948 / clone 2: MK932949, MK933177. *Diplycosia sphenophylla* Sleumer: *P.W. Fritsch & C.M. Bush 1884* (CAS), clone 1: MK932950 / clone 2: MK932951, MK933178. *Diplycosia urceolata* Stapf: *P.W. Fritsch & C.M. Bush 1865* (CAS), clone 1: MK932952 / clone 2: MK932953, MK933179. *Eubotryoides grayana* (Maxim.)

Hara: *DGH 486*, RSF (cultivated; no voucher), MK932954, —. *Eubotrys racemosa* (L.) Nutt.: *K.A. Kron & E.A. Powell s.n.* (WFU), MK932955, —. *Eubotrys recurva* (Buckley) Britton: *C. Moretz s.n.* (WFU), clone 1: MK932956 / clone 2: MK932957 / clone 3: MK932958, —. *Gaultheria acuminata* Schldt. & Cham.: *L.M. Kelly 1293* (CAS), clone 1: MK932959 / clone 2: MK932960, —. *Gaultheria amoena* A.C. Sm.: *J.L. Luteyn 15333* (NY), clone 1: MK932961 / clone 2: MK932962, clone 1: MK933181 / clone 2: MK933182. *Gaultheria antarctica* Hook. f.: *K.A. Kron s.n.* (WFU), clone 1: MK932963 / clone 2: MK932964, clone 1: MK933183 / clone 2: MK933184. *Gaultheria antipoda* G. Forst.: *C.M. Bush et al. 424* (WFU), clone 1: MK932965 / clone 2: MK932966 / clone 3: MK932967 / clone 4: MK932968, MK933185. *Gaultheria appressa* A.W. Hill: *D. Crayn 1131* (WFU), clone 1: MK932969 / clone 2: MK932970 / clone 3: MK932971, —. *Gaultheria borneensis* Stapf: *S.P. Vander Kloet 2101092* (ACAD), MK932972, —. *Gaultheria bradeana* Sleumer: *F. Almeda et al. 9785* (CAS), clone 1: MK932973 / clone 2: MK932974, MK933186. *Gaultheria buxifolia* Willd.: *J.L. Luteyn 15618* (NY), clone 1: MK932975 / clone 2: MK932976, —. *Gaultheria caespitosa* Poepp. & Endl.: *G. Sancho & C.M. Bush 114* (WFU), clone 1: MK932977 / clone 2: MK932978, MK933187. *Gaultheria cardiosepala* Hand.-Mazz.: *L. Lu et al. 060022* (CAS), copy A - clone 1: MK932979 / copy A - clone 2: MK932980, copy B - clone 1: MK933188 / copy B - clone 2: MK933189. *Gaultheria ciliisepala* Airy Shaw ex P.W. Fritsch & Lu Lu: *L. Lu et al. 0615* (CAS), —, copy B: MK933254. *Gaultheria colensoi* Hook. f.: *C.M. Bush & S.J. Wagstaff 487* (WFU), clone 1: MK932981 / clone 2: MK932982, MK933190. *Gaultheria corvensis* (R.R. Silva & Cervi) G.O. Romão & Kin.-Gouv.: *F. Almeda et al. 9854* (CAS), clone 1: MK932983 / clone 2: MK932984, MK933191. *Gaultheria crassa* Allan: *C.M. Bush et al. 416* (WFU), clone 1: MK932985 / clone 2: MK932986 / clone 3: MK932987 / clone 4: MK932988, MK933192. *Gaultheria cuneata* (Rehder & E.H. Wilson) Bean: *S.D. Zhang & L. Lu 031543* (CAS), MK932989, clone 1: MK933193 / clone 2: MK933194 / clone 3: MK933195. *Gaultheria depressa* Hook. f., New Zealand accession: *C.M. Bush et al. 417* (WFU), —, MK933196. *Gaultheria depressa* Hook. f., Tasmanian accession: *C.M. Bush 415* (WFU), —, MK933197. *Gaultheria discolor* Nutt. ex Hook. f.: *Gaoligong Shan Biodiversity Team 32542* (KUN), copy A - clone 1: MK932990 / copy A - clone 2: MK932991, copy B - clone 1: MK933198 / copy B - clone 2: MK933199. *Gaultheria dolichopoda* Airy Shaw: *L. Lu et al. 060005* (CAS), copy B: MK932992, copy A - clone 1: MK933200 / copy A - clone 2: MK933201. *Gaultheria domingensis* Urb.: *W.S. Judd 8157* (FLAS), clone 1: MK932993 / clone 2: MK932994, —. *Gaultheria dumicola* W.W. Sm.: *Gaoligong Shan Biodiversity Team 32478* (CAS), copy A - clone 1: MK932995 / copy A - clone 2: MK932996, copy B - clone 1: MK933202 / copy B - clone 2: MK933203. *Gaultheria erecta* Vent.: *J.L. Luteyn 14813* (NY), MK932997, MK933204. *Gaultheria eriophylla* (Pers.) Mart. ex Sleumer, Andean accession: RBG Edinburgh 763043 (cultivated; no voucher), MK932998, clone 1: MK933205 / clone 2: MK933206. *Gaultheria eriophylla* (Pers.) Mart. ex Sleumer, Brazilian accession: *F. Almeda et al. 8795* (CAS), MK932999, —. *Gaultheria foliolosa* Benth.: *J.L. Luteyn 15075* (NY), clone 1: MK933000 / clone 2: MK933001 / clone 3: MK933002 / clone 4: MK933003, —. *Gaultheria fragrantissima* Wall.: RBG Edinburgh 792542 (cultivated; no voucher), copy A - clone 1: MK933004 / copy A - clone 2: MK933005, copy A - clone 1: MK933207 / copy A - clone 2: MK933208 / copy B - clone 1: MK933209 / copy B - clone 2: MK933210. *Gaultheria glomerata* (Cav.) Sleumer: *J.L. Luteyn 15327* (NY), MK933006, —. *Gaultheria griffithiana* Wight: *L. Lu et al. 060026* (CAS), MK933007, —. *Gaultheria hapalotricha* A.C. Sm.: *J.L. Luteyn 15619* (NY), clone 1: MK933008 / clone 2: MK933009, —. *Gaultheria hispida* R. Br.: *C.M. Bush 414* (WFU), clone 1: MK933012 / clone 2: MK933013 / clone 3: MK933014 / clone 4: MK933015 / clone 5: MK933016, MK933213. *Gaultheria heteromera* R.C. Fang: *L. Lu 07316A* (CAS), copy A: MK933010 / copy B: MK933011, copy B - clone 1: MK933211 / copy B - clone 2: MK933212. *Gaultheria hispidula* (L.) Muhl.: *S.P. Vander Kloet s.n.* (ACAD), MK933017, —. *Gaultheria hookeri* C.B. Clarke: *S.D. Zhang & L. Lu 031500* (CAS), copy A: MK933018 / copy B: MK933019, copy A - clone 1: MK933214 / copy A - clone 2: MK933215. *Gaultheria humifusa* (Graham) Rydb.: *P.W. Fritsch 1837* (CAS), clone 1: MK933020 / clone 2: MK933021 / clone 3: MK933022, MK933216. *Gaultheria hypochlora* Airy Shaw: *Y.*

Song Y0010 (CAS), copy B: MK933023, copy A - clone 1: MK933217 / copy A - clone 2: MK933218 / copy A - clone 3: MK933219 / copy B: MK933220. **Gaultheria insana** (Molina) D.J. Middleton: RBG Edinburgh 1992-4312 (cultivated; no voucher) except *trnS-trnG*, RBG Edinburgh 1934-0432A (cultivated; no voucher), clone 1: MK933024 / clone 2: MK933025 / clone 3: MK933026 / clone 4: MK933027 / clone 5: MK933028, —. **Gaultheria insipida** Benth.: J.L. Luteyn 15328 (NY), clone 1: MK933029 / clone 2: MK933030 / clone 3: MK933031, clone 1: MK933221 / clone 2: MK933222. **Gaultheria itatiaiae** Wawra: F. Almeda et al. 9790 (CAS), clone 1: MK933032 / clone 2: MK933033, —. **Gaultheria jingdongensis** R.C. Fang: L. Lu et al. 0619A (CAS), —, copy A - clone 1: MK933223 / copy A - clone 2: MK933224. **Gaultheria lanceolata** Hook. f.: C.M. Bush 403 (WFU), clone 1: MK933034 / clone 2: MK933035 / clone 3: MK933036 / clone 4: MK933037, —. **Gaultheria lanigera** Hook. f.: J.L. Luteyn 15062 (NY), MK933038, —. **Gaultheria leucocarpa** Blume: Forest Research Institute 53367 (E), clone 1: MK933039 / clone 2: MK933040, MK933225. **Gaultheria macrostigma** (Colenso) D.J. Middleton: C.M. Bush & S.J. Wagstaff 456 (WFU), clone 1: MK933041 / clone 2: MK933042 / clone 3: MK933043 / clone 4: MK933044, MK933226. **Gaultheria malayana** Airy Shaw: Forest Research Institute 56011 (KEP), copy A - clone 1: MK933045 / copy A - clone 2: MK933046, copy A: MK933227. **Gaultheria megalodonta** A.C. Sm.: J.L. Luteyn 15359 (NY), clone 1: MK933047 / clone 2: MK933048, MK933228. **Gaultheria mucronata** (L. f.) Hook. & Arn.: RBG Edinburgh, Cubey 54 825 #7 (cultivated; no voucher), clone 1: MK933049 / clone 2: MK933050 / clone 3: MK933051, MK933229. **Gaultheria myrsinoides** Kunth, accession 1: J.L. Luteyn 14814 (NY), copy A - clone 1: MK933052 / copy A - clone 2: MK933053 / copy A - clone 3: MK933054 / copy B - clone 1: MK933055 / copy B - clone 2: MK933056, copy B - clone 1: MK933230 / copy B - clone 2: MK933231. **Gaultheria myrsinoides** Kunth, accession 2: University of California Botanical Garden at Berkeley 90.2275 (cultivated; no voucher), copy A: MK933057 / copy B: MK933058, —. **Gaultheria myrtilloides** Cham. & Schltld.: F. Almeda et al. 9757 (CAS), clone 1: MK933059 / clone 2: MK933060, clone 1: MK933232 / clone 2: MK933233. **Gaultheria notabilis** J. Anthony: L. Lu et al. 07005 (KUN), copy A - clone 1: MK933061 / copy A - clone 2: MK933062, —. **Gaultheria nubigena** (Phil.) B.L. Burtt & Sleumer: C.R. Villamil 10407 (NY), clone 1: MK933063 / clone 2: MK933064 / clone 3: MK933065, MK933234. **Gaultheria nummularioides** D. Don: S.P. Vander Kloet 2241092 (ACAD), copy B - clone 1: MK933066 / copy B - clone 2: MK933067, copy A: MK933235. **Gaultheria oppositifolia** Hook. f.: C.M. Bush & P.W. Fritsch 440 (WFU), clone 1: MK933068 / clone 2: MK933069 / clone 3: MK933070 / clone 4: MK933071, MK933236. **Gaultheria ovatifolia** A. Gray: P.W. Fritsch 1838 (CAS), clone 1: MK933072 / clone 2: MK933073, —. **Gaultheria paniculata** B.L. Burtt & A.W. Hill: C.M. Bush & P.W. Fritsch 442 (WFU), clone 1: MK933074 / clone 2: MK933075 / clone 3: MK933076 / clone 4: MK933077 / clone 5: MK933078 / clone 6: MK933079, MK933237. **Gaultheria parvula** D.J. Middleton: C.M. Bush et al. 433 (WFU), clone 1: MK933080 / clone 2: MK933081, MK933238. **Gaultheria paucinervia** P.W. Fritsch & C.M. Bush: P.W. Fritsch & C.M. Bush 1860 (CAS), —, copy B - clone 1: MK933239 / copy B - clone 2: MK933240 / copy B - clone 3: MK933241. **Gaultheria phillyreifolia** (Pers.) Sleumer: G. Sancho & C.M. Bush 110 (WFU), clone 1: MK933082 / clone 2: MK933083, MK933242. **Gaultheria poeppigii** DC.: K.A. Kron s.n. (WFU), clone 1: MK933084 / clone 2: MK933085 / clone 3: MK933086, MK933243. **Gaultheria praticola** C.Y. Wu & T.Z. Hsu: L. Lu et al. 060056 (CAS) except *trnS-trnG* and ITS, Gaoligong Shan Biodiversity Team 16928 (CAS), copy A - clone 1: MK933087 / copy A - clone 2: MK933088, copy B: MK933244. **Gaultheria procumbens** L.: E.A. Powell s. n. (WFU) except *trnS-trnG*, RBG Edinburgh 1977-2645A (cultivated; no voucher), clone 1: MK933089 / clone 2: MK933090, MK933245. **Gaultheria prostrata** W.W. Sm.: S.D. Zhang & W.B. Yu 011 (CAS), clone 1: MK933091 / clone 2: MK933092, MK933246. **Gaultheria pseudonotabilis** H. Li ex R.C. Fang: Gaoligong Shan Biodiversity Team 16565 (CAS), copy A: MK933093 / copy B: MK933094, —. **Gaultheria pumila** (L. f.) D.J. Middleton: K.A. Kron s.n. (WFU), clone 1: MK933095 / clone 2: MK933096 / clone 3: MK933097, MK933247. **Gaultheria pyrolifolia** Hook. f. ex C.B. Clarke: L. Lu et al. 07161 (CAS), copy A - clone 1: MK933098 / copy A - clone 2: MK933099, copy B: MK933248. **Gaultheria pyroloides**

Miq. accession 1: Arnold Arboretum 1636-77 (cultivated; no voucher), clone 1: MK933100 / clone 2: MK933101, MK933249. *Gaultheria pyroloides* Miq. accession 2: RBG Edinburgh 1974-1510A (cultivated; no voucher), clone 1: MK933102 / clone 2: MK933103, —. *Gaultheria reticulata* Kunth: *J.L. Luteyn 15605* (NY), clone 1: MK933104 / clone 2: MK933105, —. *Gaultheria rupestris* (G. Forst.) D. Don: *C.M. Bush et al. 426* (WFU), clone 1: MK933106 / clone 2: MK933107 / clone 3: MK933108 / clone 4: MK933109 / clone 5: MK933110 / clone 6: MK933111, MK933250. *Gaultheria schultesii* Camp: RSF (cultivated; no voucher), clone 1: MK933112 / clone 2: MK933113 / clone 3: MK933114, MK933251. *Gaultheria sclerophylla* Cuatrec.: *J.L. Luteyn 15331* (NY), clone 1: MK933115 / clone 2: MK933116 / clone 3: MK933117 / clone 4: MK933118 / clone 5: MK933119, MK933252. *Gaultheria semi-infera* (C.B. Clarke) Airy Shaw: *L. Lu et al. 06103* (CAS), copy A: MK933120 / copy B: MK933121, —. *Gaultheria serrata* (Vell.) Sleumer ex Kin.-Gouv.: *F. Almeda et al. 8793* (CAS), clone 1: MK933122 / clone 2: MK933123 / clone 3: MK933124, —. *Gaultheria shallon* Pursh: Whidbey Is., Washington, U.S.A. (no voucher), clone 1: MK933125 / clone 2: MK933126, MK933253. *Gaultheria sleumeriana* Kin.-Gouv.: *F. Almeda et al. 9829* (CAS), clone 1: MK933127 / clone 2: MK933128, MK933255. *Gaultheria straminea* R.C. Fang: *L. Lu et al. 07306* (CAS), copy A: MK933129 / copy B: MK933130, copy B: MK933256. *Gaultheria suborbicularis* W.W. Sm.: *L. Lu et al. 07307* (CAS), —, MK933257. *Gaultheria tasmanica* (Hook. f.) D.J. Middleton: RBG Edinburgh 1970-5050 (cultivated; no voucher), clone 1: MK933131 / clone 2: MK933132 / clone 3: MK933133, MK933258. *Gaultheria tenuifolia* (Phil.) Sleumer: *G. Sancho & C.M. Bush III* (WFU), clone 1: MK933134 / clone 2: MK933135, MK933259. *Gaultheria thymifolia* Stapf ex Airy Shaw: RSF, Cubey 61 825 #12 (cultivated; no voucher), copy B - clone 1: MK933136 / copy B - clone 2: MK933137, —. *Gaultheria tomentosa* Kunth: *G. Lewis 3516* (no voucher), clone 1: MK933138 / clone 2: MK933139, —. *Gaultheria trichophylla* Royle: *L. Lu et al. 060019* (CAS), copy B - clone 1: MK933140 / copy B - clone 2: MK933141 / copy B - clone 3: MK933142, copy A - clone 1: MK933260 / copy A - clone 2: MK933261. *Gaultheria vaccinioides* Wedd.: *J.L. Luteyn 15637* (NY), clone 1: MK933143 / clone 2: MK933144, —. *Gaultheria viridicarpa* J.B. Williams: *D. Crayn 1132* (WFU), clone 1: MK933145 / clone 2: MK933146 / clone 3: MK933147 / clone 4: MK933148, MK933262. *Gaultheria wardii* C. Marquand & Airy Shaw: *L. Lu et al. 07301* (CAS), clone 1: MK933149 / clone 2: MK933150, copy A: MK933263. *Leucothoe davisiae* Torr. ex A. Gray: RSF (cultivated; no voucher), clone 1: MK933151 / clone 2: MK933152 / clone 3: MK933153, —. *Leucothoe fontanesiana* (Steud.) Sleumer: *K.A. Kron 1876* (WFU), —, MK933264. *Leucothoe griffithiana* C.B. Clarke: *Gaoligong Shan Biodiversity Team 32580* (CAS), clone 1: MK933155 / clone 2: MK933154, MK933265. *Tepuia cardonae* A.C. Sm.: *W.R. Anderson 13870* (MICH), clone 1: MK933156 / clone 2: MK933157 / clone 3: MK933158 / clone 4: MK933159, —. *Tepuia venusta* Camp: *F.A. Michelangeli 535* (NY), clone 1: MK933160 / clone 2: MK933161 / clone 3: MK933162 / clone 4: MK933163, —. *Zenobia pulverulenta* (W. Bartram ex Willd.) Pollard: Arnold Arboretum 21087 (cultivated; no voucher), MK933164, —.

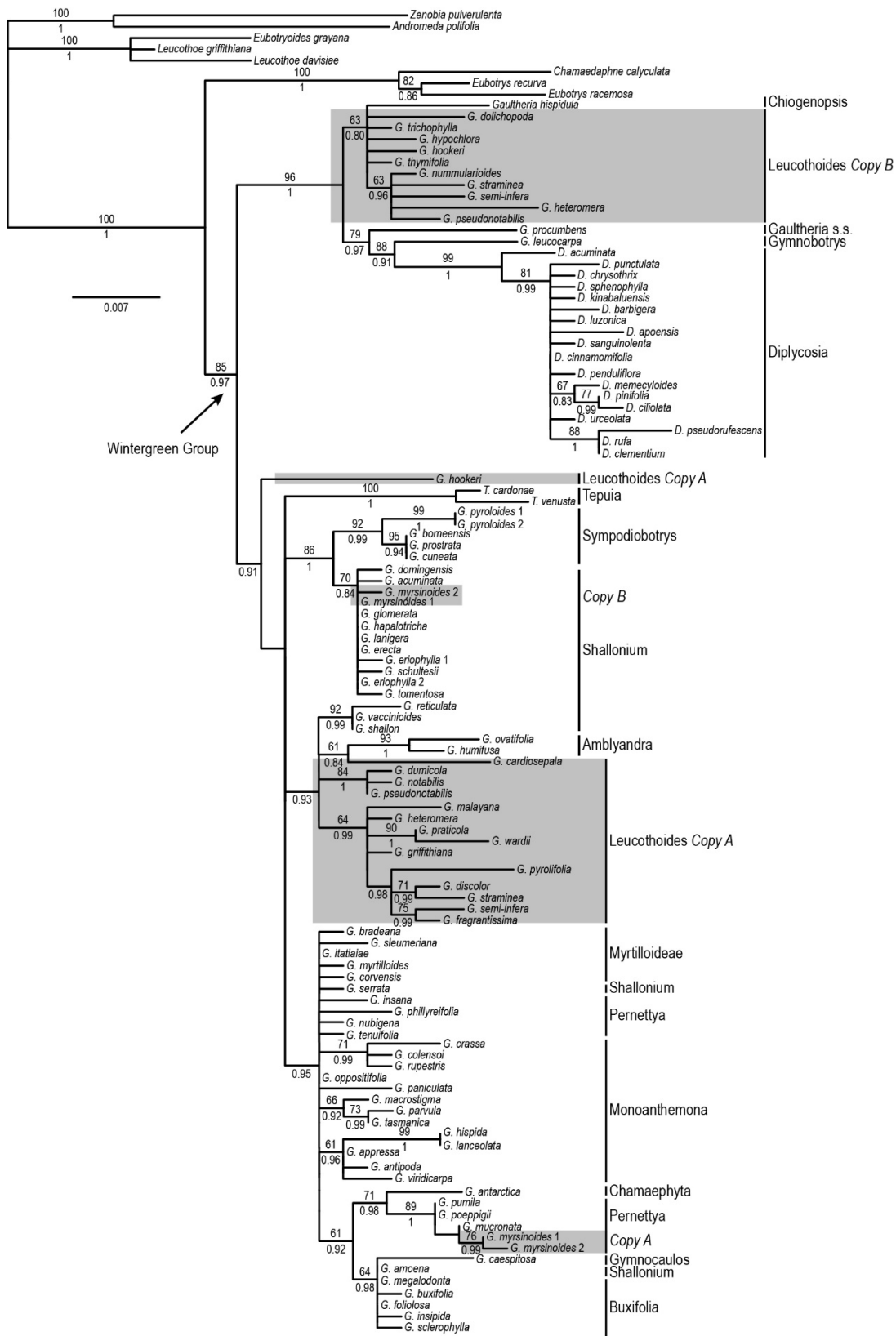


Figure A1. Best tree from a maximum likelihood (ML) analysis of the *waxy* gene with 114 cloned samples representing 102 species of the Gaultherieae plus two outgroup species from the Andromedaceae. Numbers above branches are ML bootstraps (BP); those below branches are posterior probabilities (PP) from a separate Bayesian inference analysis as mapped onto the ML tree. Only values ≥ 60 BP or ≥ 0.80 PP are shown. Clades involved in duplicated *waxy* genes and their two distinct copies (A and B; see text) are indicated with shading. Clade names are as in Appendix 1.

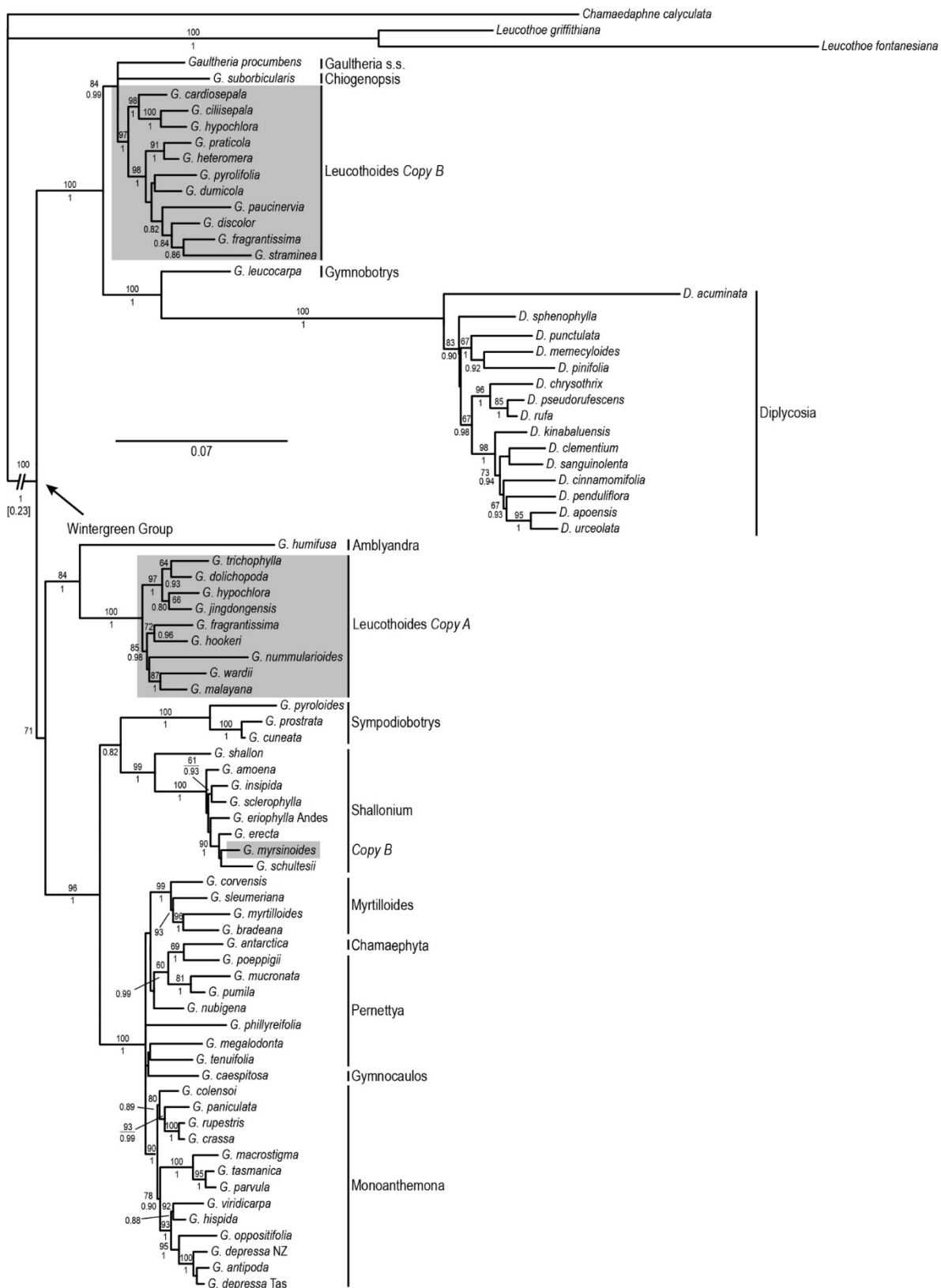


Figure A2. Best tree from a maximum likelihood (ML) analysis of the *leafy* gene with 79 clones and 76 species of the Gaultherieae, with the tree rooted on *Leucothoe*. Numbers above branches are ML bootstraps (BP); those below branches are posterior probabilities (PP) from a separate Bayesian inference analysis as mapped onto the ML tree. Only values ≥ 60 BP or ≥ 0.80 PP are shown. Clades involved in duplicated *leafy* genes and their two distinct copies (A and B) are indicated with shading (copy A of *Gaultheria myrsinoides* was not recovered in *leafy*; see text). Clade names are as in Appendix 1. Because of its long length, the branch subtending the Wintergreen Group clade has been truncated; the number in brackets indicates the length of this branch.