



Diplarche and *Menziesia* transferred to *Rhododendron* (*Ericaceae*)

L.A. Craven¹

Key words

Diplarche
Ericaceae
Menziesia
Rhododendron
taxonomy

Abstract The genera *Diplarche* and *Menziesia* have been shown to be nested in *Rhododendron* based upon cladistic analyses of DNA data. Morphologically, the differences between *Diplarche* and *Menziesia* are not so great that their inclusion in *Rhododendron* is inappropriate and the species of these two genera are formally transferred to *Rhododendron*. The following new names are proposed: *Rhododendron benhallii*, *R. chamberlainii*, *R. goyozanense*, *R. × kamatae*, *R. katsumatae*, *R. kroniae*, *R. menziesii*, *R. menziesii* subsp. *glabellum*, *R. multiflorum*, *R. multiflorum* forma *bicolor*, *R. multiflorum* forma *brevicalyx*, *R. multiflorum* var. *purpureum*, *R. pentandrum*, *R. pilosum*, *R. sophistarum*, *R. yakushimense*.

Published on 16 March 2011

INTRODUCTION

Rhododendron L. is a large and morphologically diverse genus and, due to its showy flowers, is often cultivated as ornamental plants for the garden or for sale as flowering potted plants. Plant breeders have been active in hybridising programs aimed at development of novel cultivars and there are many named cultivars available; the International Register and Checklist for *Rhododendron* cultivars that is maintained by the Royal Horticultural Society, United Kingdom, currently contains about 25 500 names (A. Leslie, pers. comm.). As far as I am aware, the only successful hybridisations, i.e., those resulting in progeny that grow reasonably well and produce flowers (whether or not the plants sexually are fully functional), have been obtained from crosses within *Rhododendron*. Consequently, reports of experimental intergeneric hybridisation between *Menziesia* Sm. and *Rhododendron* (Handa et al. 2003, 2006, Kita et al. 2005) stimulated me to consult the literature to learn more about the relationships between these two genera.

Menziesia and *Rhododendron* were placed, with *Diplarche* Hook.f. & Thomson and *Therorhodion* Small, in the tribe *Rhodoreae* by Stevens et al. (2004). *Therorhodion* is often placed in *Rhododendron* (Spethmann 1987, Chamberlain et al. 1996, Kurashige et al. 2001, Fang et al. 2005, Goetsch et al. 2005) which placement is supported by cladistic analysis of molecular data (Kurashige et al. 2001, Goetsch et al. 2005), although one could argue for separate recognition as it is sister to all other *Rhododendron* clades. *Menziesia* has been included in several molecular systematic studies (Goetsch et al. 2005: *M. ciliicalyx* Maxim. and *M. ferruginea* Sm., Kurashige et al. 2001: *M. multiflora* Maxim.). In Goetsch et al. (2005) the genus nested in a clade that includes species of subg. *Candidastrum* Franch., sect. *Sciadorhodion* Rehder & Wilson (incl. *R. schlippenbachii* Maxim.) and *R. vaseyi* A.Gray. In Kurashige et al. (2001, Fig. 3), *M. multiflora* forms a clade with *R. schlippenbachii* and *R. quinquefolium* Bisset & S.Moore. Goetsch et al. (2005) classify the clade that includes *Menziesia* as sect. *Sciadorhodion*. *Diplarche multiflora* Hook.f. & Thomson was

included in phylogenetic studies of *Ericaceae* by Kron et al. (2002) and in an analysis of *matK* data (Kron et al. 2002, Fig. 4A) it formed a clade with *R. stamineum* Franch. An analysis of *rbcL* data (Kron et al. 2002, Fig. 5A) does not give an indication of the position of *Diplarche* as the tree was poorly resolved, however their combined analyses of *matK* and *rbcL* data from smaller sample sets (Kron et al. 2002, Fig. 6, 7) resulted in *Diplarche* forming a clade with *Menziesia* and *Rhododendron*. The number of *Rhodoreae* species in each of the reduced sample sets was too small (7 species in Fig. 6 and 5 species in Fig. 7) for the position of *Diplarche* within *Rhododendron* to be clear. Its association with *R. stamineum* in the *matK* analysis suggests that perhaps it may belong in, or near, subg. *Choniastrum* (Franch.) Drude, but this will require testing using a greater number of species from this subgenus together with a strong sampling of species from the other higher-level taxa of *Rhododendron*, and with datasets preferably drawn from both n- and cpDNA. Chamberlain et al. (1996) list 19 species in subg. *Choniastrum* (as sect. *Choniastrum*) and three species of the subgenus were included in the studies of Goetsch et al. (2005) but these authors did not sample *Diplarche* in their *rpb2* studies.

The morphological differences between *Diplarche*, *Menziesia* and *Rhododendron* are not so great that the molecular evidence supporting inclusion of the two first-named genera in *Rhododendron* should be rejected. Given the dwarf habit and microphyllous nature of plants of *Diplarche* (Fang et al. 2005), the lack of perulae may be the result of the developing reproductive or vegetative growth being adequately protected by the dense foliage and pulvinate habit. In contrast, in *Rhododendron* the plant is often relatively large and the buds may be more exposed to the vagaries of climate; perulae presumably provide the developing organs with protection from cold and/or desiccation. Anther dehiscence by slits occurs in all three genera although slits are less common in *Rhododendron* in which dehiscence by pores is the more common condition. Viscin threads occur among the pollen grains in *Rhododendron* and presumably play a role in pollen removal from the anthers and its adhesion to pollinators. *Menziesia* is reported by Stevens et al. (2004) and Kita et al. (2005) to lack viscin threads although Copeland (1943: 543) reports them to occur. Stevens et al.

¹ Australian National Herbarium, CPBR, CSIRO Plant Industry, GPO Box 1600, Canberra, ACT 2601, Australia; e-mail: Lyn.Craven@csiro.au.

(2004: 162) also differentiate *Menziesia* from *Rhododendron* by capsule shape, it being subspheroidal in *Menziesia* and longer than wide in *Rhododendron*. The capsule in *Diplarche* is spheroidal also (Fang et al. 2005). However, the capsule in *Rhododendron* may be very short, e.g., *R. maddenii* Hook.f., in which species the capsule is about as long as wide, and this character may not be significant for classification. In *Diplarche*, the antesealous stamens are epipetalous and this may be an autapomorphy for the taxon with respect to *Menziesia* and *Rhododendron*.

In the following section, those taxa of *Diplarche* and *Menziesia* accepted in Fang et al. (2005) and Yamazaki (1993), respectively, together with three North American *Menziesia* taxa, are transferred to *Rhododendron*.

TAXONOMY

Rhododendron sect. *Sciadorhodium* Rehder & Wilson

Menziesia Sm. (1791) t. 56.

1. *Rhododendron behallii* Craven, *nom. nov.*

Replaced synonym: *Andromeda ciliicalyx* Miq., Ann. Mus. Bot. Lugduno-Batavi 1 (1863) 30. — *Menziesia ciliicalyx* (Miq.) Maxim. (1871) 10.

Note — A new name is required as the epithet *ciliicalyx* is pre-empted in *Rhododendron* by *R. ciliicalyx* Franch. The new name honours Benjamin D. Hall (1932–), University of Washington, whose studies into the evolutionary relationships of several groups of organisms, including *Rhododendron*, have greatly informed taxonomists.

2. *Rhododendron goyozanense* (M.Kikuchi) Craven, *comb. nov.*

Basionym: *Menziesia goyozanensis* M.Kikuchi, J. Jap. Bot. 37 (1962) 355.

3. *Rhododendron* × *kamatae* (Mochizuki) Craven, *comb. nov.*

Basionym: *Menziesia* × *kamatae* Mochizuki, J. Phytogeogr. Taxon. 29 (1981) 108.

4. *Rhododendron katsumatae* (M.Tash. & H.Hatta) Craven, *comb. nov.*

Basionym: *Menziesia katsumatae* M.Tash. & H.Hatta, Bot. Mag. (Tokyo) 99 (1986) 29.

5. *Rhododendron kroniae* Craven, *nom. nov.*

Replaced synonym: *Menziesia purpurea* Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 11 (1867) 431.

Note — A new name is required as the epithet *purpureum* is pre-empted in *Rhododendron* by *R. purpureum* (Pursh) G.Don. The replacement epithet honours Kathleen Anne Kron (1956–), Wake Forest University, who has contributed significantly to our understanding of the evolutionary and systematic relationships of *Ericaceae*.

6. *Rhododendron menziesii* Craven, *nom. nov.*

Replaced synonym: *Menziesia ferruginea* Sm., Pl. Icon. Ined. 3 (1791) t. 56.

Note — A new epithet is required as *ferrugineum* is pre-empted in *Rhododendron* by *R. ferrugineum* L. The replacement epithet honours Archibald Menzies (1754–1842), the collector of the type material of *M. ferruginea*, itself the type species of *Menziesia*.

7. *Rhododendron menziesii* subsp. *glabellum* (A.Gray) Craven, *comb. nov.*

Basionym: *Menziesia glabella* A.Gray, Syn. Fl. N. Amer., ed. 2 (1878) 39. — *Menziesia ferruginea* var. *glabella* (A.Gray) M.Peck (1941) 135. — *Menziesia ferruginea* subsp. *glabella* (A.Gray) Calder & Roy L.Taylor (1965) 1398.

8. *Rhododendron multiflorum* (Maxim.) Craven, *comb. nov.*

Basionym: *Menziesia multiflora* Maxim., Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 7, 16, 9 (1871) 11.

9. *Rhododendron multiflorum* forma *bicolor* (Makino) Craven, *comb. nov.*

Basionym: *Menziesia ciliicalyx* Maxim. α *bicolor* Makino, J. Jap. Bot. 1 (1916) 10. — *Menziesia multiflora* Maxim. var. *bicolor* (Makino) Ohwi (1953) 883. — *Menziesia lasiophylla* Nakai forma *bicolor* (Makino) Hiyama (1964) 126. — *Menziesia multiflora* Maxim. forma *bicolor* (Makino) T.Yamaz. (1993) 13.

10. *Rhododendron multiflorum* forma *brevicalyx* (Hiyama) Craven, *comb. nov.*

Basionym: *Menziesia multiflora* forma *brevicalyx* Hiyama, J. Jap. Bot. 39 (1964) 127.

11. *Rhododendron multiflorum* var. *purpureum* (Makino) Craven, *comb. nov.*

Basionym: *Menziesia ciliicalyx* Maxim. β *purpurea* Makino, J. Jap. Bot. 1 (1916) 10. — *Menziesia multiflora* Maxim. var. *purpurea* (Makino) Ohwi (1953) 883.

12. *Rhododendron pentandrum* (Maxim.) Craven, *comb. nov.*

Basionym: *Menziesia pentandra* Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 11 (1867) 431.

13. *Rhododendron pilosum* (Michx. ex Lam.) Craven, *comb. nov.*

Basionym: *Azalea pilosa* Michx. ex Lam., J. Hist. Nat. 1 (1792) 410. — *Menziesia pilosa* (Michx. ex Lam.) Pers. (1805) 420.

14. *Rhododendron yakushimense* (M.Tash. & H.Hatta) Craven, *comb. nov.*

Basionym: *Menziesia yakushimensis* M.Tash. & H.Hatta, Bot. Mag. (Tokyo) 99 (1986) 33.

Rhododendron incertae sedis

Diplarche Hook.f. & Thomson (1854) 382, t. 11.

Note — As discussed above, the position of *Diplarche* within *Rhododendron* is uncertain and a formal taxonomic disposition for the following two species is not possible.

15. *Rhododendron chamberlainii* Craven, *nom. nov.*

Replaced synonym: *Diplarche multiflora* Hook.f. & Thomson, Hooker's J. Bot. Kew Gard. Misc. 6 (1854) 383, t. 11A.

Note — A new name is required as the epithet *multiflorum* is pre-empted in *Rhododendron* by *R. multiflorum* (Maxim.) Craven (see above). The replacement epithet honours David Franklin Chamberlain (1941–), Royal Botanic Garden, Edinburgh, who has contributed significantly to our understanding of the taxonomy of *Rhododendron*.

16. *Rhododendron sophistarum* Craven, *nom. nov.*

Replaced synonym: *Diplarche pauciflora* Hook.f. & Thomson, Hooker's J. Bot. Kew Gard. Misc. 6 (1854) 383, t. 11B.

Note — A new name is required as the epithet *pauciflorum* is pre-empted in *Rhododendron* by *R. pauciflorum* King & Gamble. The new epithet is derived arbitrarily from the Greek, *sophistes*, master, expert, and is intended to honour those persons who strive to understand the natural world around them, to delve into the intricacies of the species on this planet, and to determine the evolutionary relationships and systematic positions of these species, etc. At a time when such knowledge is increasingly required, due to increasing pressure on natural and seminatural habitats, it is regrettable that the number of investigators is reducing around the world due to inadequate funding by governments.

Acknowledgements Victoria McLeod, Missouri, Jeremy Bruhl, Armidale, and Michelle Hearn, Canberra, are thanked for their cooperation in obtaining copies of certain references for me. Alan Leslie, RHS U.K., provided information on the number of rhododendron cultivars. The directors and curators of the herbaria CANB and MEL are thanked for the opportunity to examine collections in their care.

REFERENCES

- Calder JA, Taylor RL. 1965. New taxa and nomenclatural changes with respect to the flora of the Queen Charlotte Islands, British Columbia. *Canadian Journal of Botany* 43: 1387–1400.
- Chamberlain D, Hyam R, Argent G, Fairweather G, Walter KS. 1996. The genus *Rhododendron*: its classification and synonymy. Royal Botanic Garden, Edinburgh.
- Copeland HF. 1943. A study, anatomical and taxonomic, of the genera of *Rhododendroideae*. *American Midland Naturalist* 30: 533–625.
- Fang M-Y, Fang R-Z, He M-Y, Hu L-C, Yang H-P, Qin H-N, Ming T-L, Chamberlain DF, Stevens PF, Wallace GD, Anderberg A. 2005. *Ericaceae*. In: Wu Z, Raven PH, Flora of China 14: 242–517. Science Press, Beijing; Missouri Botanical Garden Press, St. Louis.
- Goetsch LA, Eckert AJ, Hall BD. 2005. The molecular systematics of *Rhododendron* (*Ericaceae*): A phylogeny based upon RPB2 gene sequences. *Systematic Botany* 30: 616–626.
- Gray A. 1878. *Menziesia*. *Synoptical Flora of North America* 2: 39. Ivison, Blakeman, Taylor & Co., New York; Wesley, London; Weigel, Leipzig.
- Handa T, Kita K, Wongsawad P, Kurashige Y, Yukawa T. 2003. Molecular phylogeny as a guide for breeding of ornamentals: the case study of *Menziesia* and *Dendrobium*. *Acta Horticulturae* 612: 155–163.
- Handa T, Kita K, Wongsawad P, Kurashige Y, Yukawa T. 2006. Molecular phylogeny-assisted breeding of ornamentals. *Journal of Crop Improvement* 17: 51–68.
- Hiyama K. 1964. Miscellany from Makino Herbarium. *The Journal of Japanese Botany* 39: 124–128.
- Hooker JD, Thomson T. 1854. On *Maddenia* and *Diplarche*, new genera of Himalayan plants. *Hooker's Journal of Botany and Kew Garden Miscellany* 6: 380–384, t. 11, 12.
- Kikuchi M. 1962. A new species of the genus *Menziesia* from Japan. *The Journal of Japanese Botany* 37: 353–356.
- Kita K, Kurashige Y, Yukawa T, Nishimura S, Handa T. 2005. Intergeneric hybridization between *Menziesia* and *Rhododendron* based on molecular phylogenetic data. *Journal of the Japanese Society for Horticultural Science* 74: 51–56.
- Kron KA, Judd WS, Stevens PF, Crayn DM, Anderberg AA, Gadek PA, Quinn CJ, Luteyn JL. 2002. Phylogenetic classification of *Ericaceae*: molecular and morphological evidence. *The Botanical Review* 68: 335–423.
- Kurashige Y, Etoh JI, Handa T, Takayanagi K, Yukawa T. 2001. Sectional relationships in the genus *Rhododendron* (*Ericaceae*): evidence from *matK* and *trnK* intron sequences. *Plant Systematics and Evolution* 228: 1–14.
- Lamarck MM. 1792. *Azalea pilosa*. *Journal d'Histoire Naturelle* 1: 410.
- Makino T. 1916. A contribution to the knowledge of the flora of Japan. *The Journal of Japanese Botany* 1: 9–10.
- Maximowicz CJ. 1867. Diagnoses breves plantarum novarum Japoniae et Mandshuriae. *Bulletin de l'Academie Imperiale des Sciences de Saint-Petersbourg* 11: 430–431.
- Maximowicz CJ. 1871. *Menziesia*. *Mémoires de l'Académie Impériale des Sciences de Saint-Petersbourg, Sér. 7, 16, 9: 7–12.*
- Miquel FAW. 1863. *Ericaceae Iaponicae*. *Annales Musei Botanici Lugduno-Batavi* 1: 28–35.
- Mochizuki R. 1981. A new hybrid of *Menziesia* (*Ericaceae*). *The Journal of Phytogeography and Taxonomy* 29: 108–109.
- Ohwi J. 1953. *Menziesia*. *Flora of Japan*: 882–883. Shibundo, Tokyo.
- Peck ME. 1941. Combinations proposed in "The higher plants of Oregon". *Madroño* 6: 133–137.
- Persoon CH. 1805. *Menziesia*. *Synopsis Plantarum* 1: 419–420.
- Smith JE. 1791. *Menziesia*. *Plantarum Icones Hactenus Ineditae* 3: t. 56.
- Spethmann W. 1987. A new infrageneric classification and phylogenetic trends in the genus *Rhododendron* (*Ericaceae*). *Plant Systematics and Evolution* 157: 9–31.
- Stevens PF, Luteyn J, Oliver EGH, Bell TL, Brown EA, Crowden RK, George AS, Jordan GJ, Ladd P, Lemson K, McLean CB, Menadue Y, Pate JS, Stace HM, Weiller CM. 2004. *Ericaceae*. In: Kubitzki K, The families and genera of vascular plants 6: 145–194. Springer, Berlin & Heidelberg.
- Tashiro M, Hatta H. 1986. Two new species of the genus *Menziesia* from Japan. *The Botanical Magazine, Tokyo* 99: 29–36.
- Yamazaki T. 1993. *Ericaceae*. In: Iwatsuki K, Yamazaki T, Boufford DE, Ohba H, Flora of Japan 3: 6–63. Kodansha, Tokyo.