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## *Coleogeton* (Potamogetonaceae), a New Genus of Pondweeds

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**ABSTRACT.** *Potamogeton* subg. *Coleogeton* is elevated to generic level. A combination of morphological and anatomical features readily distinguishes the new genus *Coleogeton* from both *Groenlandia* and *Potamogeton*, the two other genera recognized in the Potamogetonaceae. All new combinations for taxa that occur in North America are proposed for use in the *Flora of North America*. These new combinations include *Coleogeton striatus*, *C. pectinatus*, *C. filiformis*, *C. filiformis* subsp. *alpinus*, *C. filiformis* subsp. *occidentalis*, and *C. vaginatus*.

***Coleogeton*** (Reichenbach) D. H. Les & R. R. Haynes, stat. nov. Based on: *Potamogeton* L. [subg.] *Coleogeton* Reichenbach, *Icones fl. Germ. et Helv.* VII. 10. 1845. TYPE: *Coleogeton pectinatus* (L.) D. H. Les & R. R. Haynes (basionym: *Potamogeton pectinatus* L.).

Aquatic herbs propagated by seeds, tubers, or rhizomes; stems terete, nodes without oil glands; turions absent. Leaves submersed, alternate, opaque, sessile, linear, canaliculate, turgid, subulate to obtuse at apex, acute at base, margins entire, veins 1–5; stipules tubular, sheathing stem and young inflorescences connate or convolute, adnate to base of blades for  $\frac{2}{3}$  or more of stipule length. Inflorescence a capitate or cylindrical spike with 1–20 whorls of flowers, compact or moniliform, with 2–4 flowers in each whorl, submersed; peduncles flexible. Flowers with perianth of 4 free, rounded, short-clawed segments; androecium of 4 stamens, filaments adnate to the perianth claw, anthers 2-locular; gynoecium of 4 carpels. Fruit abaxially rounded, turgid, beaked; embryo with less than one full coil. Chromosome number:  $x = 13$ .

Two genera, *Potamogeton* L. and *Groenlandia* J. Gay, in addition to *Coleogeton* comprise the Pot-

amogetonaceae. Traditional taxonomic treatments of the Potamogetonaceae have virtually always recognized the distinctness of *Coleogeton* species by consistently segregating them as either a separate subgenus (e.g., *Coleogeton*; Raunkiær, 1896) or at least section (e.g., *Coleophylli*; Ascherson & Graebner, 1907). Vegetatively, *Coleogeton* resembles *Potamogeton* by its alternate leaves, and differs from *Groenlandia*, which has opposite leaves. The stipules of *Coleogeton* are adnate to the blade for at least two-thirds the length of the stipule. The few species of *Potamogeton* with fused stipules are adnate less than half the length of the stipule, mostly less than 4 mm. Submersed leaves of both *Potamogeton* and *Groenlandia* are translucent, flat, and without grooves or channels, whereas those of *Coleogeton* are opaque, channeled, and turgid.

*Coleogeton* can further be separated from *Potamogeton* and *Groenlandia* by its flexible peduncle and elongate stigmatic papillae. Hagström (1916) ascribed the latter feature as a mechanism that prevents hybridization between *Coleogeton* and *Potamogeton* species. Thus, even Hagström, who recognized a multitude of *Potamogeton* hybrids, could produce no evidence of hybridization between these genera. Preston (1995) recently affirmed that no hybrids are known to occur between *Potamogeton* and *Coleogeton*. Peduncles of both *Potamogeton* and *Groenlandia* also possess a hypodermis, which is usually absent in *Coleogeton* (Tomlinson, 1982). The flexible peduncle of *Coleogeton* results from an evident endodermis of “U-cells” (Ogden, 1974), which is lacking in both *Potamogeton* and *Groenlandia*. The peduncle bends at the water surface, keeping the spike in the water. Pollination in *Coleogeton* is apparently autogamous and can involve flowers that occur either underwater or at the water surface (Guo & Cook, 1989). The absence of an endodermis in *Potamogeton* and *Groenlandia* results in a stiff pe-

duncle that protrudes above the water surface and pushes the spike into the air to facilitate aerial pollination. Both *Potamogeton* and *Coleogeton* differ from *Groenlandia* by having curved embryos but not the highly coiled cotyledons of the latter, a feature that also occurs in *Zannichellia* L. (Tomlinson, 1982).

Pollen ultrastructural features further distinguish the three genera of Potamogetonaceae. *Coleogeton* and *Groenlandia* each possess a pollen type that is different from any of those found in *Potamogeton* (Sorsa, 1988). The pollen morphology of *Groenlandia* is intermediate between *Coleogeton* and certain subsections of *Potamogeton* (Sorsa, 1988).

All members of *Coleogeton* for which chromosome counts have been published possess the chromosome number of  $2n = 78$ ; however, this group exhibits an impressive aneuploid range including counts of  $2n = 42, 66, 70, 71$ , and every number from  $2n = 73-88$  (Les & Philbrick, 1993). *Coleogeton* has an essentially cosmopolitan distribution, mostly due to the widespread occurrence of *Coleogeton pectinatus* (L.) D. H. Les & R. R. Haynes (St. John, 1916, as *Potamogeton pectinatus*).

- 1. *Coleogeton striatus*** (Ruíz & Pavón) D. H. Les & R. R. Haynes, comb. nov. Basionym: *Potamogeton striatus* Ruíz & Pavón, Fl. Peruv 1: 70. 1798. SYNTYPES: "Habitat in aquis vivis Chancay, et Limae Provinciarum; abunde in Lurin lacubus et paludibus." TYPE: Peru. Lima: Chancay near Torreblanca, 24 July 1778, *H. Ruíz & J. Pavón s.n.* (lectotype, selected here, MA; isolectotype, P).

*Potamogeton pectinatus* L. var. (?) *latifolius* J. W. Robbins, in S. Watson, Bot. King's Explor. 338. 1871. Syn. nov. *Potamogeton latifolius* (J. W. Robbins) Morong, Mem. Torr. Bot. Club 3: 52. 1893. TYPE: U.S.A. Nevada: Humboldt River below Humboldt Lake, *W. W. Bailey 1142* (holotype, GH).

- 2. *Coleogeton pectinatus*** (L.) D. H. Les & R. R. Haynes, comb. nov. Basionym: *Potamogeton pectinatus* L., Sp. Pl. 1: 127. 1753. TYPE: Austria. *Celsius 29* (lectotype, designated by Haynes (1986), UPS, Burser Herb. X: 124).

- 3. *Coleogeton filiformis*** (Persoon) D. H. Les & R. R. Haynes, comb. nov. Basionym: *Potamogeton filiformis* Persoon, Syn. Pl. 1: 152. 1805. TYPE: Denmark. Sjælland: frequent in lakes, *C. F. Schumacher s.n.* (holotype, P? not seen).

- 3a. *Coleogeton filiformis*** (Persoon) D. H. Les & R. R. Haynes subsp. **alpinus** (Blytt) D. H. Les & R. R. Haynes, comb. et stat. nov. Basionym: *Potamogeton marinus* f. *alpinus* Blytt, Norges Flora 1: 370. 1861. *Potamogeton filiformis* Persoon var. *β alpinus* (Blytt) Ascherson & P. Graebner, Synop. mitteleurop. Fl. I: 353. 1897. SYNTYPES: Norway. Dovre: Johnsvandet near Trondheim, in Lake Vola, *M. N. Blytt s.n.* (syntype, O not seen); Dovre: Hviddalsvandene, *Lindblom s.n.* (syntype, Karlstad?, probably destroyed by fire in 1865); Laurgaard: Selsvand, *N. G. Moe s.n.* (syntype, C not seen); Lomsvand, *N. G. Moe s.n.* (syntype, C not seen).

*Potamogeton borealis* Rafinesque, Med. Repos., Hexade 2, 5: 354. 1808. Syn. nov. *Potamogeton marinum* ? Michaux, auct. non L., Fl. Bor.-Amer. 1: 102. 1803. *Potamogeton filiformis* Persoon var. *borealis* (Rafinesque) H. St. John, Rhodora 18: 134. 1916. TYPE: Canada. St. Lawrence River, *A. Michaux s.n.* (holotype, P not seen).

*Potamogeton marinus* L. var. *macounii* Morong ex Macoun, Cat. Can. Pl. 4: 88. 1888. Syn. nov. *Potamogeton filiformis* Persoon var. *macounii* (Morong ex Macoun) Morong, Mem. Torr. Bot. Club 3(2): 50. 1893. TYPE: Canada. Alberta: Old Wives Lakes, and in Crawling Valley, S of the Hand Hills. 22 Aug. 1879, *John Macoun s.n.* (holotype, CAN not seen).

- 3b. *Coleogeton filiformis*** (Persoon) D. H. Les & R. R. Haynes subsp. **occidentalis** (J. W. Robbins) D. H. Les & R. R. Haynes, comb. et stat. nov. Basionym: *Potamogeton marinus* L. var. (?) *occidentalis* J. W. Robbins, in S. Watson, Bot. King's Explor. 339. 1871. *Potamogeton filiformis* Persoon var. *occidentalis* (J. W. Robbins) Morong, Mem. Torr. Bot. Club 3(2): 51. 1893. *Potamogeton interior* Rydberg, Fl. Colorado p. 13. 1906. TYPE: U.S.A. Nevada: Ruby Lake, *S. Watson 1143* (holotype, US; isotypes, GH, YU not seen).

*Additional specimens.* U.S.A. **Utah:** Uintas, head of Bear River, *S. Watson 1144* (paratype, US; isoparatypes, GH, YU not seen). **Nevada:** Truckee Pass, *S. Watson 1145* (paratype, US; isoparatypes, GH, YU not seen); brackish waters of the Lower Humboldt, *S. Watson 1146* (paratype, US not seen).

- 4. *Coleogeton vaginatus*** (N. Turczaninow) D. H. Les & R. R. Haynes, comb. nov. Basionym: *Potamogeton vaginatus* N. Turczaninow, Fl. Baicalensi-Dahurica 2: 162. 1856. TYPE: Russia. Siberia: in lacubus subsalsis, prope Selenginenses [subsalsine lake near Selenginsk S of Lake Baikal], *N. Turczaninow s.n.* (holotype, L not seen).

*Potamogeton moniliformis* H. St. John, Rhodora 18: 130. 1916. Syn. nov. TYPE: Canada. Saskatchewan: between Cumberland House and Hudson Bay, Aug., *T. Drummond s.n.* (holotype, GH).

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