ed. 6: "N. Brunswick to Mich. and Ky. (Nat. from Eu.)."[1] The record was taken over by Britton & Brown and in their Illustrated Flora, ed. 2, is entered as "In waste places, New Brunswick to Michigan and Kentucky. Naturalized from Europe."[2] That William Boott and Asa Gray were not quite convinced that the plant they called *B. asper* was really an introduction is shown by the penciled memoranda in Gray's hand, obviously inspired by the field knowledge of Boott, on some of the labels: "native"; nevertheless this pertinent and most important item did not find an entry into the Manual. In his monographic study of the genus in North America, Shear, taking up for *B. asper* Murr. (1770) the earlier name *B. ramosus* Huds. (1762), said: "A species introduced from Europe. It is said in Britton and Brown's 'Illustrated Flora' to be distributed from New Brunswick to Michigan and Kentucky. We have no American specimens in the National Herbarium."[3] Had he realized the sources of Gray's and Britton & Brown's records, Shear could have added that there were no American specimens of *B. ramosus* (*B. asper*) extant and that the original identification was an error; for *B. ramosus* of Europe (FIG. 8) differs from the American plant mistaken for it in its pubescent culms, narrower and much prolonged panicle, more remote and longer lemmas with longer awns, and anthers very much longer (4 mm. long).

EXPLANATION OF PLATE 196

(Figures × 1¾)

FIG. 1, panicle of BROMUS DUDLEYI (from type-number); FIG. 2, spikelet of B. DUDLEYI; FIG. 3, inner face of lemma, showing flat palea; FIG. 4, spikelet of B. CILIATUS, var. GENUINUS from Table-top Mountain, Quebec (*Fernald & Collins*, no. 169); FIG. 5, spikelet of B. CILIATUS, var. INTONSUS from the type; FIG. 6, B. PORTERI from type-locality, Twin Lakes, Colorado (*Wolfe*, no. 807); FIG. 7, B. KALMII from the assumed type, Troy, New York, *Asa Gray;* FIG. 8, B. RAMOSUS (*B. asper*) from Bavaria (*Fl. Exsicc. Bav.* no. 597).

V. SOME VARIETIES OF THE AMPHIGEAN SPECIES OF OSMUNDA

M. L. FERNALD

THREE species of Osmunda are found on both of the northern continental masses, Eurasia and North America. One of them extends into tropical South America, another into subtropical and tropical

[1] Wats. & Coult. in Gray, Man. ed. 6: 670 (1890).
[2] Britton & Brown, Ill. Fl. ed. 2, i. 275 (1913).
[3] Shear, U. S. Dept. Agric. Div. Agrost Bull no. 23: 30 (1900).

Africa, and five additional species are Asiatic endemics and a sixth South American. In a recent attempt to determine the degree of identity or of segregation of the three amphigean species in the Northern Hemisphere certain parallel variations in the three which apparently have not been generally recognized by students of the ferns have come to my attention.

Osmunda regalis and its var. spectabilis. For more than a century systematists have wavered in their estimate of the American *Osmunda regalis* L., sometimes treating it as a species, *O. spectabilis* Willd. Sp. Pl. v. 98 (1810), sometimes as an American variety, *O. regalis*, var. *spectabilis* (Willd.) Gray, Man. ed. 2: 600 (1856), and often as not separable from the European type. In European descriptions *O. regalis* is very generally stated to be 4 to 6 feet (1.2–1.8 m.) high and most accounts tell of exceptional colonies reaching a height of 12 feet (3.6 m.), but in dry or sterile habitats and toward the northern limit of its range the European plant may be only 2–4 feet (0.6–1.2 m.) high, and in the dwarf var. *pumila* Milde it is extraordinarily low, only 9 inches (2.2 dm.) high. The plant of eastern North America (Newfoundland to the Saskatchewan, south to Florida and Texas) certainly reaches no such height as 3.6 m. (12 feet); in fact, the measurements with us were accurately stated by the late D. C. Eaton when he wrote: "The fronds of the royal fern are said to attain the height of ten or eleven feet in the British Islands; but the highest I have ever seen were from the valley of the Connecticut River, and measured six feet from the ground. Fronds four or five feet high are not at all rare; but more commonly the fronds, including the stalk . . . stand from two to four feet high. In dryish marshes they are often not more than a foot or fifteen inches high."[1] Had Eaton seen the American plant at the northeastern limit of its range, in eastern Quebec and Newfoundland, he would have brought his minimum measurements down even lower than those of the European var. *pumila*, for on the barren slopes of western Newfoundland, in eastern Quebec and at the altitudinal limit of the fern on Mt. Katahdin, Maine, it is often less than 8 inches (2 dm.) high. Surely, if there were any truth in the oft-repeated tale of Osmund, the ferryman, hiding his wife and daughter in the shade of the Royal Fern, it is clear that the dramatic incident would find greater probability when linked to the tall extreme of the European plant than it would if visualized as occurring in the tell-tale shade of our low American representative of it!

[1] Eaton, Ferns N. Am. 1. 213 (1879).

Numerous characters, narrower and more remote pinnules without basal auricle, finer serrulation, the presence of a bloom, and more slender fruiting panicles, have been emphasized as distinguishing *O. spectabilis* from *O. regalis;* but, although extreme specimens are easily separated, these points are by no means constant and apparently identical pinnules with or without auricles can be found on either continent, while bright-green and glaucous plants are both common with us. The generally lower stature and generally more slender or more delicately branched panicle of the American plants seem to be real tendencies; and in studying the plants of the two continents I find another character which has either been overlooked or not much stressed. On the rachises of the fruiting panicles of true *Osmunda regalis* I find numerous rather persistent black scale-like trichomes; on the rachises of the panicles of *O. spectabilis* I find none of them or, at most, a few elongate axillary hairs. This difference is so real in all material fit for comparison that, combined with the other strong, though far from constant tendencies of the plants it may be taken as the diagnostic character of a reasonably good geographic variety. I am, therefore, maintaining our plant as O. REGALIS L., var. SPECTABILIS (Willd.) Gray.

O. CLAYTONIANA AND ITS VAR. VESTITA. It is generally stated that *Osmunda Claytoniana* L. has three disrupted areas of distribution: eastern North America (Newfoundland to Lake Mistassini and Lake Winnepeg, south to North Carolina, Kentucky and Missouri), eastern Asia (Japan and Corea to the Himalayas) and Brazil. The plant of North America has the very young fronds more or less wooly with whitish-brown tomentum. This is promptly deciduous and persists on the older fronds only as cobwebby remnants, but always of a pale-brown color. The plant of the Himalayan region, however, has more abundant and, apparently, more persistent wool of a strong ferruginous color.

The name of the Himalayan variety is OSMUNDA CLAYTONIANA, var. VESTITA (Wall.) Milde, Monogr. Gen. Osmundae, 102 (1868). Wallich, Cat. no. 52 (1829) had the *nomen nudum: "Osmunda monticola,* Wall. Kumoon, R. B.," followed by "*β. vestita, frondibus apice fertilibus.*" In 1833, Wallich's no. 52, recorded by him as *O. monticola,* collected in Kumoon by Robert Blinkworth ("R. B."), was formally described by Greville & Hooker as

3. O. pilosa *Wall.*
Frondibus ovato-lanceolatis pinnatis (junioribus densissime ferrugineo-lanatis) . . . —*Wall. Cat. No.* 52.

Hab. Rio Janeiro, *Dr. Wallich.*—This is very closely allied to *O. interrupta* of North America, which differs, however, ... in its glabrous fronds; but, if we are not mistaken, the latter is covered in a young and recent state with a ferruginous down, in which case we scarcely know how the present plant is to be distinguished, except by its larger size, and denser pinnae, ..."[1]

Osmunda monticola Wall. was unquestionably a *nomen nudum* but his var. *vestita* of it had a phrase of description. Greville & Hooker definitely described no. 52, not as *O. monticola*, but as *O. pilosa* (ascribed to Wallich), "Frondibus . . . junioribus densissime ferrugineo-lanatis." This characterization is correct for all Himalayan material I have seen; and since Milde, although not distinguishing the Himalayan plant in general from the American, took up *O. monticola*, *β. vestita* Wall. Cat. no. 52 as *O. Claytoniana*, var. *vestita* (Wall.) Milde, Monogr. Gen. Osmund. 102 (1868), we may use that varietal name for all the Himalayan plants. Var. *vestita* was intended technically as the name for an unusual form hardly worthy varietal recognition, but, here extended, it covers the Himalayan plant with rufescent wool, as contrasted with true *O. Claytoniana*, in which the wool is whitish-brown. Whether the plant of easternmost Asia is all the same as the Himalayan I cannot say, as the Asiatic material in the Gray Herbarium is all from the Himalayan area; but the Asiatic plant is presumably all of a single variety. The material from the high mountains of Yunnan, at least, seems to be var. *vestita*, for Dr. Christensen, taking it to be a new variety, has published it as var. *lanosa* Ch. Christens. in Levéillé, Cat. Pl. Yun-nan, 107 (1916), with the description identical in substance ("Rachis ut in O. cinnamomea L. tomento rufo densissime tecta") with that of the earlier *O. pilosa* Wall. which was based on Wallich's no. 52, which was also the type of *O. Claytoniana*, var. *vestita* (Wall.) Milde.

The habitat "Rio Janeiro," given by Greville & Hooker for Wallich's plant has been thoroughly misleading. In his *Monographia Generis Osmundae* (1868), Milde gave the range of *O. Claytoniana* as **"Nord America: . . . Süd Amerika:** Rio Janeiro. (Wallich). **Asia"**; and in his *Ferns of North America* (1879), Eaton said "has been attributed to Brazil, near Rio Janeiro, though probably by an error of Wallich's."[2] The error was not Wallich's, however, but Greville & Hooker's. Wallich clearly gave his no. 52 as coming from Kumoon; but the next following, no. 53, *Aneimia flexuosa*, was listed as coming from "Rheo Janeiro 1807." It is obvious that, in copying, Greville

[1] Grev. & Hook. in Hook. Bot. Misc. iii. 229 (1833).

[2] Eaton, Ferns N. A. i. 220 (1879).

& Hooker passed over the correct locality and collector of no. 52, the basis of *O. pilosa* and of *O. Claytoniana*, var. *vestita*. It is also evident that the Brazilian record of *O. Claytoniana* may safely be dropped.

O. CINNAMOMEA AND ITS GEOGRAPHIC VARIETIES. *Osmunda cinnamomea* L., like *O. Claytoniana*, occurs in eastern America (Newfoundland to Georgian Bay, Ontario and Wisconsin, south to northern Florida, Alabama and Texas; with var. *imbricata* from the Bermuda Islands and Florida to Louisiana, south to tropical Mexico and Brazil) and *O. cinnamomea* is usually said to occur in eastern Asia (Amur, Manchuria and Sachalin Island to Yunnan). But just as the Eurasian *O. regalis* differs from the eastern American *O. regalis*, var. *spectabilis* in having black scale-like trichomes on the rachises of the fruiting panicle and the Himalayan *O. Claytoniana*, var. *vestita* differs from the eastern American plant in having much darker and more persistent wool, so the eastern Asiatic *O. cinnamomea* is at once distinguished from typical *O. cinnamomea* of temperate eastern America by having the tomentum of the stipes, rachises and fertile fronds rufescent, that of the fertile fronds with many black trichomes intermixed, the tomentum of typical *O. cinnamomea* being whitish-brown without any black admixture.

The plant of tropical and subtropical eastern America, O. CINNAMOMEA, var. IMBRICATA (Kunze) Milde, Mongr. Gen. Osmund. 95 (1868), has the tomentum more rufescent than in typical *O. cinnamomea* but it, likewise, lacks the black admixed trichomes of the Asiatic plant.

The three geographic varieties may be distinguished as follows:

O. CINNAMOMEA L., var. **typica.** *O. cinnamomea* L. Sp. Pl. ii. 1066 (1753). *Struthiopteris cinnamomea* (L.) Bernh. Schrad. Journ. 1800[2]: 126 (1801). *Osmundastrum cinnamomeum* (L.) Presl., Abh. Böhm. Ges. Wiss. ser. 5, v. 326 (1848).—Tomentum of stripes, rachises and fertile fronds whitish-brown: mature sterile pinnae 1.5–3.5 cm. broad, membranaceous, translucent; the veinlets scarcely elevated beneath.—Temperate eastern North America.

Var. IMBRICATA (Kunze) Milde, Mongr. Gen. Osmund. 95 (1868). *O. bipinnata* L. Sp. Pl. ii. 1065 (1753).[1] *O. imbricata* Kunze, Farnkr. ii. 29, t. cxii. (1849).—Tomentum brown to rufescent: mature sterile pinnae 1–2.3 cm. broad, subcoriaceous, opaque; the veinlets somewhat prominent beneath.—Tropical and subtropical eastern America.

Var. **asiatica**, var. nov., lamina fertili plus minusve nigricanti-villosa; stipitum rhachiumque vestimento rufescenti.—Amur, Man-

[1] *O. bipinnata* was published by Linnaeus on the page preceding the publication of *O. cinnamomea*. By those who accept the principle of "priority of position" *O. bipinnata* should be used instead of the more familiar *O. cinnamomea*.

churia and Sachalin Island to Yunnan; the following are characteristic. Amur: without designation of locality, *Maximowicz;* Amur medius, 1891, *S. Korshinsky* (type in Gray Herb.). Manchuria: between Mukden and Tungche-shien, 1886, *H. E. M. Jones.* Sachalin: without designation of locality, *Augustinowicz.* Japan: Hokodati, 1853–56, *J. Small* (U. S. No. Pacif. Expl. Exped.); Yokohama, 1862, *Maximowicz.*

It is perhaps not without interest to note that the very marked tendency of the Eurasian varieties of *Osmunda regalis, Claytoniana* and *cinnamomea* to have deeper-colored trichomes or darker and firmer scales than the eastern American plants is quite parallel with the situation in some other varieties or closely allied species of ferns. It has long been recognized that the Eurasian *Thelypteris spinulosa* (Muell.) Nieuwl. var. *dilitata* (Hoffm.) St. John has firm blackish scales on the stipe and that these often extend well along the rachis or even to the rachillas, while the eastern American representative, *T. spinulosa,* var. *americana* (Fischer) Weath. has thin and translucent soft and pale-brown scales which are more promptly deciduous.[1] Again, in European *Polystichum Braunii* "The largest scales of the stipe-bases . . . are rather firm . . . ; in the eastern American [var. *Purshii* Fernald] they are much thinner."[2] Other cases (European *Polypodium vulgare* L. and eastern American *P. virginianum* L., European *Asplenium Ruta-muraria* L. and eastern American *A. cryptolepis* Fernald; etc.) could be cited, in which species of eastern America and their representatives in Europe have apparent differences in the texture and often the depth of coloring of their scales. These characters are small but the scales seem to have evolved along quite definite lines on the two continental masses; and doubtless study of other ferns will bring to light parallel situations in other groups.

VI. POTAMOGETON ALPINUS AND P. MICROSTACHYS

M. L. Fernald

(Plate 197)

In 1827 Wolfgang, receiving material from the Aleutian Islands of a plant related to the European *Potamogeton alpinus* Balbis (1804) or *P. rufescens* Schrader (1815), proposed it as a new American species:

[1] For detailed discussion see Fernald, Rhodora, xvii. 45–47 (1915).
[2] Fernald, Rhodora, xxx. 29 (1928).