NOTE.

THE ANATOMY OF THE STAMENS IN CERTAIN INDIAN SPECIES OF PARNASSIA.—The present note forms a supplement to a paper on the structure of the androecium in *Parnassia* which appeared in 1913 in the 'Annals of Botany'.¹ At that time the only members of the genus whose stamen-anatomy I had had the opportunity of examining were the European *Parnassia palustris*, L. and certain American species. However, since the paper was published, I have received through the kindness of Mr. G. H. Cave, Curator of the Lloyd Botanic Garden, Darjeeling, herbarium material of four species of *Parnassia* from the Himalayas—namely, *P. ovata*, Ledeb., *P. nubicola*, Wall., and *P. pusilla*, Wall., from a height of 14,000 feet, and *P. Wightiana*, Wall., collected at a height of 13,000 feet. I desire to express my gratitude to Mr. Cave and also to Mrs. Howard of Pusa, and Mr. C. C. Calder, Curator of the Herbarium, Royal Botanic Garden, Sibpur, who have rendered it possible for me to extend my study of the stamen-anatomy of *Parnassia* to the Indian species. The herbarium material received was treated according to the plan described in my previous paper.² It was again found that by this method serial sections, showing the detailed anatomy of the stamens, could be obtained from dried flowers.

P. nubicola, *P. Wightiana*, *P. ovata*, and *P. pusilla* all belong to the Section *Nectarotrilobos* of Drude,³ whereas all the species studied in my previous paper were members of the Section *Nectarodroson*. It was thus of some interest to ascertain whether the Indian species showed the same anatomical peculiarities as those which I have recorded for *P. palustris* and its allies, or whether those peculiarities were confined to the Section *Nectarodroson*. The conclusion which I have reached is that, as regards the anatomy of the filament, these four Himalayan species closely recall those previously examined from other parts of the world. They present a series, which I regard as a reduction series, parallel with that which I have described in the American species *P. fimbriata*, Banks, *P. montanensis*, Fern. et Rydb., and *P. parviflora*, DC.⁴

Parnassia nubicola, which is a well-developed plant with relatively large flowers, shows features in the anatomy of the filament comparable with those observed in *P. fimbriata* and *P. palustris*, which it also resembles in size and habit. The xylem in the connective spreads and branches, while, in the filament below the attachment of the anther, the wood is roughly circular in transverse section, with protoxylem elements and sometimes a few thin-walled parenchyma cells occupying an internal

¹ Arber, A.: On the Structure of the Androecium in *Parnassia* and its Bearing on the Affinities of the Genus. Ann. Bot., vol. xxvii, 1913, p. 491.

² Arber, A.: l. c., p. 492.

³ Drude, O.: Ueber die Blüthengestaltung und die Verwandtschaftsverhältnisse des Genus *Parnassia*. Linnaea, Bd. xxxix, N. F., Bd. v, 1875, p. 314.

⁴ Arber, A.: l. c., pp. 495-7.

position. In herbarium material, the phloem cannot be recognized with certainty. As regards the xylem, the bundle closely recalls certain forms assumed by the vascular structures in the filament of *P. palustris*, as may be seen by comparing the figure of the present note with Pl. XXXVI, Fig. 1 of my previous paper. (In both these figures the adaxial side of the stamen lies to the right of the diagram.)

In the next species, *P. Wightiana*, the bundle is small, and, though the xylem opens out in the connective, no other sign of complexity can be detected, except that there are occasional indications of a centrally-placed protoxylem in the filament. This Indian species has thus reached a stage of reduction in the stamen-anatomy comparable with that obtaining in the American form *P. montanensis*.

In *Parnassia ovata* and the minute species *P. pusilla*, the bundle is very small.

Parnassia nubicola, Wall.
Transverse section of xylem group in filament a short distance below insertion of anther. The adaxial surface of the stamen would lie to the right of the diagram. *cfx.* = centrifugal xylem; *px.* = protoxylem; *cpx.* = centripetal xylem. ($\times 636$.)

I have found no trace here of the anatomical complexity in the filament, which seems to be confined to the larger members of the genus with stouter stamens. These two species may thus be compared with the American form *P. parviflora*, whose slender filaments are traversed by a simple bundle. It may be recalled that Hooker and Thomson¹ have suggested that *P. pusilla* and *P. ovata* may perhaps prove to be merely forms of *P. nubicola*. If this were so, it would confirm the view that their stamen-anatomy represents a stage in reduction from the more complex type found in *P. palustris*, *P. fimbriata*, and *P. nubicola*.

Since the presence of additional xylem elements on the adaxial side of the filament bundle has now been recorded in three species belonging to two different Sections of the genus *Parnassia*, and natives, respectively, of Europe, America, and Asia, and since, in the only cases so far examined in which this complexity is absent, the bundle may reasonably be regarded as having undergone reduction, we may infer that the structure in question was probably characteristic of the common progenitor of the genus. As I have previously suggested, the unique features observed in the anatomy of the androecium may be interpreted as indicating that the single stamen of *Parnassia* has been derived by reduction from an ancestral stamen-fascicle.

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June 5, 1914.

¹ Hooker, J. D., and Thomson, T.: Praecursores ad Floram Indicam. Journ. of Proc. Linn. Soc. Bot., vol. ii, 1858, p. 78.

Arber, Agnes Robertson. 1915. "The anatomy of the stamens in certain Indian species of Parnassia." *Annals of botany* 29, 159–160.

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