PHYTOGEOGRAPHY.—*The eastern and the western migrations of Smilax into North America.* J. B. NORTON, Bureau of Plant Industry.

It is generally recognized by students of that group that Smilax and its allies must have spread over the earth from a point somewhere in southeastern Asia. This conclusion is borne out by several facts, particularly by the presence in that region of all the related genera with their subgenera, and by the breaking down there of certain group characters separating sections of the large genus Smilax, the last circumstance indicating a survival of the links that are often mourned as missing in other groups of organisms, but which are a source of trouble to a key maker when present. The evidence offered by paleontology likewise leads to the above conclusion.

In addition to these reasons for considering the region east of the Himalaya as the home of this group, the distribution of the species of Smilax in North America has a very distinct bearing on the question. *Smilax hispida* Michx. and *S. rotundifolia* L. are often confused by collectors, so closely do they resemble each other in some characters. *S. rotundifolia* and the related *S. Walteri* Chapm. have their nearest relatives in the Azores, the Canary Isles, the Mediterranean region, Asia Minor, Turkestan, and western India This chain is broken in a few places from the complex group of spieces in northern India including *S. ferox* Wall., through *S. excelsa* L. and *S. canariensis* Willd. to *S. Walteri* and *S. rotundifolia* in America. The trail across the Atlantic is partly hidden, as the Bermudian species, *S. Bonanox* L., is apparently connected with the other European species, *S. aspera* L. But the relationship of *S. roiundifolia* to *S. excelsa* from the Azores is too striking to overlook. Throughout this group the stems have few large spines, which are never at the nodes. In *S. hispida* and its allies, on the other hand, the spines are slender and needle-like and numerous, at least below, where they often make a definite ring at the node. In *S. hispida* and its allies the berries are always greenish-black without a glaucous bloom, while in the *rotundifolia* group the berries are red or blue, with a distinct glaucous coat.

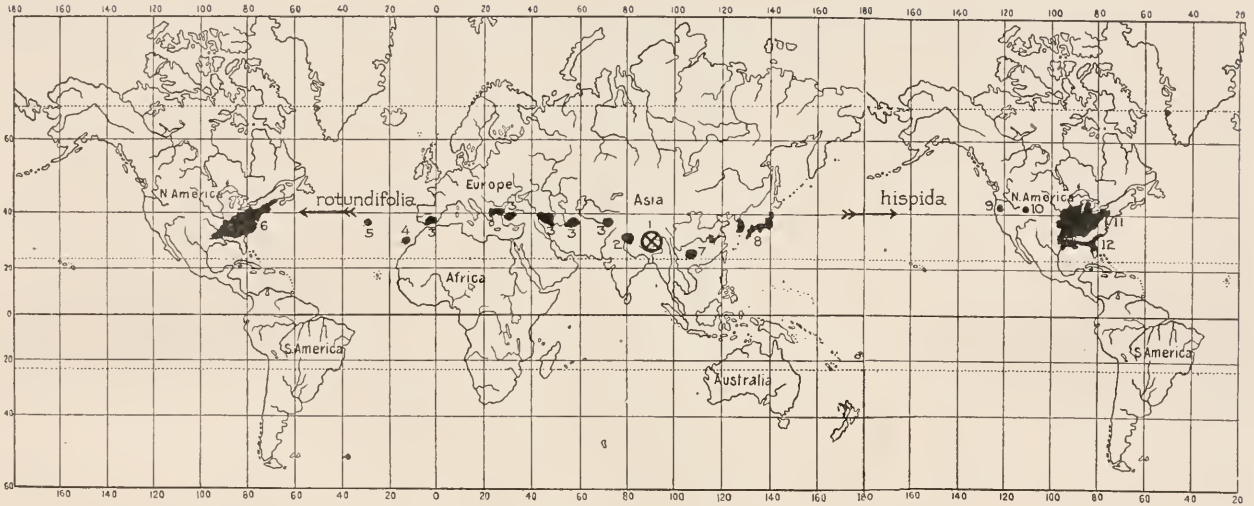

FIG. 1. Map showing the distribution of *Smilax rotundifolia* and *S. hispida*, with their allies, in relation to the supposed original home and distribution center of the genus at (1), in southeastern Asia; at (2), the region occupied by *S. ferox* and several other species which show a blending of group characters, but suggest a relationship to *S. rotundifolia;* at (3, 3, . . .), reported localities for *S. excelsa;* at (4) the related *S. canariensis*, which occurs on Teneriffe and in a varietal form extends to (5), the Azores, where also occurs a plant that is apparently true *S. excelsa*, while (6) shows the present distribution of *S. rotundifolia* in America. The eastern extension of Smilax, culminating in *S. hispida*, begins at (7), *S. scobinicaulis*, the south China species nearest the primitive type. In Japan and Korea, (8), is found *S. Sieboldi*, which shows a decided advance toward *S. hispida*. At (9) this group reappears in California and Oregon in *S. californica*, the nearest living relative of *S. hispida;* but a fossil form, *S. lamarensis*, which is apparently intermediate between its living American relatives, is found in Wyoming at (10). Finally, at (11) is indicated the region occupied by typical *S. hispida*, and at (12) that of its formal variety which splits away from the type in Texas and extends eastward in the coastal plain.

Smilax hispida has no European relatives but can, however, be traced back to India in another direction. *S. californica* Gray, a closely allied form, is found in a small area in northern California and southern Oregon, where it was apparently stranded when its connection with the rest of the world was destroyed by some disturbance in the past. The next species in point of relationship is *S. Sieboldi* Miq. of Japan and Korea. South of Korea we find no near relatives until we reach Yunnan, where *S. scobinicaulis* Wright fills in a space in the trail, both geographically and phylogenetically. *S. scobinicaulis* links up closely with the imaginary primitive types that can be constructed from the maze of inter-related species in the home area of the genus. In this migration we have a fine case of simple orthogenetic progression, with each successive step set off from the last by a barrier and with its nearest relatives in their proper places in the sequence.

Smilax herbacea L. and its relatives have followed the same path taken by *S. hispida* but have spread further, both in area and in differentiation of characters. While the other American groups have not left so plainly the tracks of their migrations from their Asiatic home, there can be little doubt that careful research will connect them all with the original stem.

The eastern and western migrations of Smilax have met and overlapped in the eastern United States, but it is probable that both waves are still moving. *S. hispida* has not as yet reached the Atlantic ocean, while *S. rotundifolia* is plainly stretching west through Texas to the Pacific. Eventually it is to be supposed that the waves will meet again in China. When this has occurred in any group the geologic record is necessary in tracing the course of the migration. In this connection it is interesting to note that the type of the fosssil *S. lamarensis* Knowlton, from the Yellowstone, has been examined and found to show an undoubted intermediacy between *S. californica* and *S. hispida*. To complete the geographic trail it is only necessary to find a fossil form from the North Pacific coast. In the accompanying chart (fig. 1), based on Mercator's projection of the globe, the longitudinal separation of the successive steps in the northern zones is greatly exaggerated.