

THE ANATOMY OF THE FLOATS OF *UTRICULARIA FLEXUOSA* VAHL.

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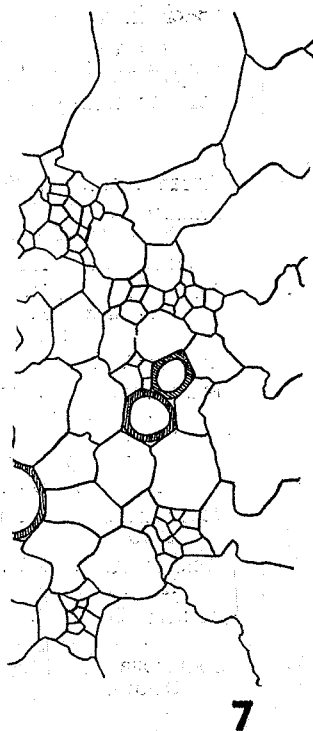
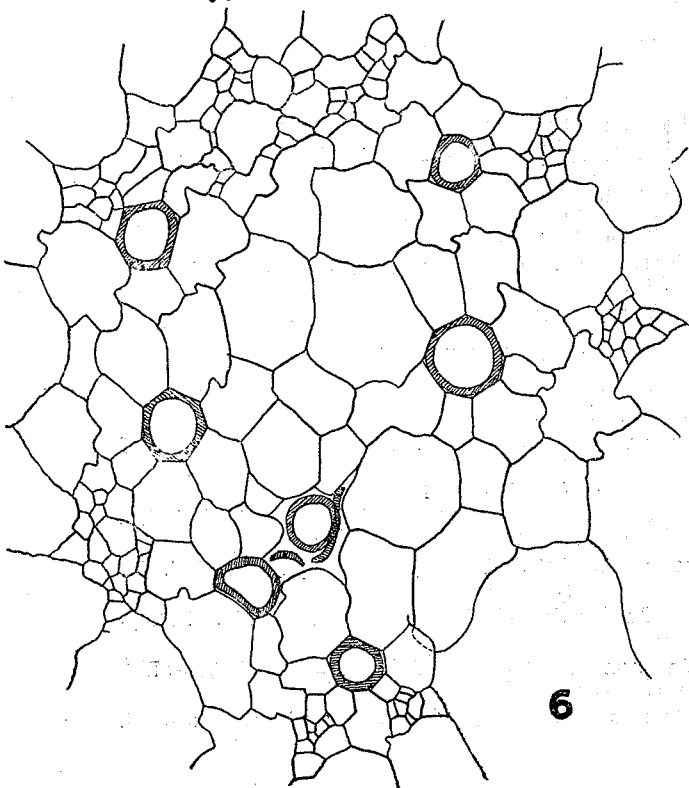
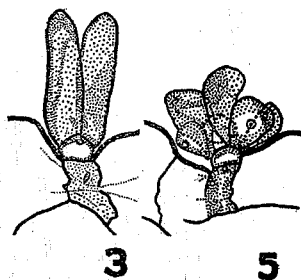
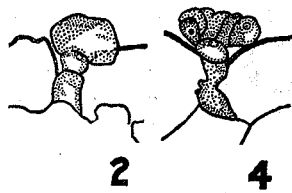
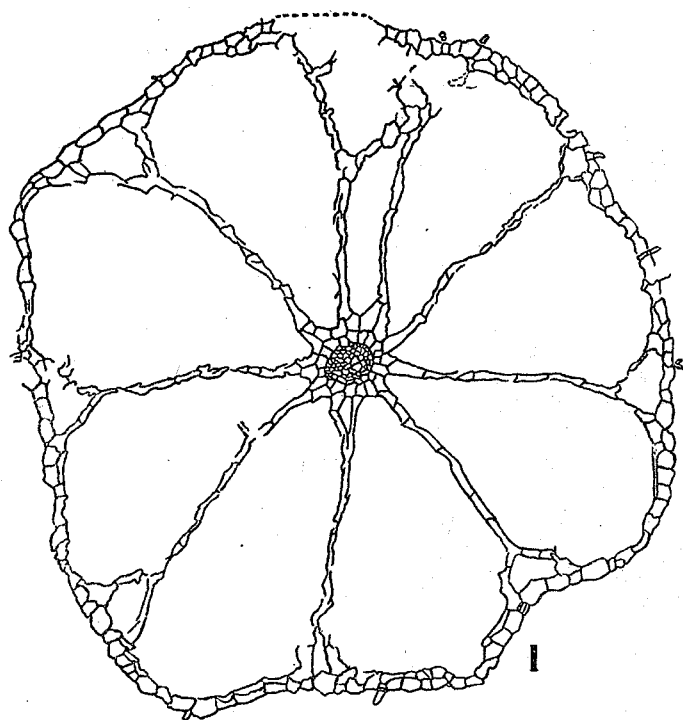
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THE presence of floats, which are swollen and spongy structures, constitutes a characteristic feature of the inflorescence in *Utricularia stellaris*. In *U. flexuosa*, on the other hand, they are usually not known to occur. In exceptional cases, however, they are seen on plants belonging to this species as well. When they are present, they are much larger than those of *U. stellaris*, being 20 mm. in length and 4 mm. in diameter, while those of *U. stellaris* are only 8 mm. long and 3.5 mm. in diameter. They are branched at the tip and the branches are further divided into fine capillary segments. Their number may vary from one to half a dozen on one inflorescence and they are irregular in arrangement.

Fig. 1 shows the main body of the float in transverse section. This has a circular outline. The epidermis is studded here and there with glandular hairs. The stalk of the hair is short and consists of only two cells, a long basal and a short upper cell (Figs. 2-5). The gland consists either of two cells only which are very much elongated (Fig. 3), or of several cells some of which become larger than others (Figs. 4 and 5). The cortex contains many air chambers which are arranged more or less in a ring and constitute the main bulk of the float. On the outer side they are limited directly by the epidermis; only in certain regions a layer of cells may be present on the inner side of the epidermis. The chambers are separated from one another laterally by partitions which are mostly only one cell thick. On the inner side the chambers extend almost to the centre, leaving a very small space for the stele and pith. Only two layers of cells, which are parenchymatous, intervene between the chambers and the stele. The endodermis could not be recognized and there was no indication of the presence of a sclerenchymatous pericycle.

The vascular bundles are essentially arranged in a ring. The noteworthy feature of the bundles is the dissociation of xylem and phloem from each other at various levels. Consequently, a transverse section shows the two tissues forming separate bundles in addition to others

FIGS. 1-7. *Utricularia flexuosa*.—Fig. 1. T. S. of the float, $\times 71$. Fig. 2. Three-celled stage of glandular hair, $\times 340$. Fig. 3. Hair with gland consisting of two elongated cells, $\times 340$. Figs. 4 and 5. Hair with gland consisting of several cells, some of which become larger than others. Fig. 4, $\times 340$. Fig. 5, $\times 366$. Fig. 6. T. S. of the stelar region of float, showing dissociation of xylem and phloem in most bundles, $\times 523$. Fig. 7. Portion of the T. S. of the stelar region showing phloem-like cells on the inner side of the xylem vessels, $\times 523$.



FIGS. 1-7

which show the usual conjoint condition (Fig. 6). Even after dissociation the phloem is seen in the peripheral region and the xylem towards the centre (Fig. 6), although in one case a few phloem-like cells were seen on the inner side of the xylem cells as well (Fig. 7). The conducting elements are very much reduced and the cambium is absent. These features, together with the presence of air chambers, seem to be associated with aquatic habit.

As we pass to the branches of the floats, the vascular elements, pith and the air chambers of the cortex go on diminishing. Eventually the entire stele is represented by a single xylem cell associated with a few phloem-like cells occupying the central region. This is surrounded by only two layers of cells, the outer of which is the epidermis.

The dissociation of the xylem and phloem has been described by earlier workers in the stem of *Polypompholyx* (Lang, 1901), *Genlisea* (see Solereder, 1908), and *Utricularia* (Schenk, 1887 and Merz, 1897). It seems, however, that the floats have not been studied so far from this point of view. There is also some controversy regarding the morphological nature of the floats. Haines (1922), Rendle (1925) and Lloyd (1942) regard them as leaves. Arber (1920), on the other hand, has discussed them under the heading of shoots. Barnhart (1916) regards them as modified scales. They show no trace of dorsiventrality and the stele is typically that of a stem. It is interesting to note in this connection that McIntyre and Chrysler (1943) regard even the leaf-like photosynthetic organs of *Orchyllium endresii* as specialized branches or cladodes on the basis of their anatomical study.

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