

On *Utricularia prehensilis*, E. Meyer.

BY

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With Plate LVII.

UTRICULARIA PREHENSILIS—a sub-aquatic species found in various localities in Tropical and South Africa, and Madagascar—is of considerable interest, as it presents many important differences from such truly aquatic species as *U. emarginata*, recently described by me.*

The material used in the following description was grown from a seed taken from the herbarium by Mr. L. Stewart, Foreman of the Glass Department, Royal Botanic Garden, Edinburgh. He made the following notes: "Sown in the last week of June the seed germinated in the second week of July 1909. The first flowers appeared on the first of June 1910. By October a mass of flowering material was obtained." Natural pollination and fertilisation are not so easy or so speedy processes in this as in other species of *Utricularia*, but some seed has been procured through artificial pollination, sufficient to give promise of a satisfactory examination of the germination later on, as well as of the determination of the position of the species in Glück's Classification.†

In its general appearance *Utricularia prehensilis* (Fig. 1) presents some striking differences from the aquatic species, for its leaves are riband shaped, not terete and linear like those of *U. vulgaris*, *emarginata*, and others. The riband leaves float on the surface of the water, which covers the mud in which the plant thrives. The flower-stalks are aerial, rising to a considerable height, and, as the name of the plant suggests, twine round a support. The direction seems always to be dextrorse.

A short general description of the plant, with figures, is given by Stapf‡, and he mentions that this species is

* Chandler in Ann. Bot., xxiv (1910).

† Glück, Biologische und morphologische Untersuchungen über Wasser-und Sümpfgewächse, Teil ii. Jena, 1906.

‡ Stapf in Hooker's Icones Plantarum, t. 2798.

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known under various synonyms—*U. lingulata*, *U. hians*, *U. madagascariensis*.

FLOWER STALK.—The origin of the flower stalk of *U. prehensilis* does not differ from that of *U. vulgaris*. It bears also at its base a mass of water shoots, leaves, and rhizoids. The flower shoot is twining, and the average length about 25 cm., sometimes longer. The flowering is more profuse than in *U. vulgaris*, and the flowers (see Fig. 1 and Stapf's figures*) are yellow in colour. At the base of a flower stalk we find, as in other species of *Utricularia*, a number of rhizoids (Figs. 2 and 3). A limited number, usually three or four, are to be found also at some distance up the stalk. The rhizoids in *U. prehensilis* are not so rudimentary as in *U. vulgaris*, but are fairly well developed. The difference in habitat in the two species would account for the fact that in *U. prehensilis* the rhizoids are more developed, their use in the greater sub-stratum of mud being very much greater. As Glück † has pointed out, the anchoring function of rhizoids is, to a large extent, lost in wholly submerged species, and the development of these organs is consequently not so great as in the sub-aquatic species. The rhizoids in appearance (Fig. 4) are very similar to those of *U. neglecta* figured by Glück, ‡ but whereas in *U. neglecta* the leaves and rhizoids are alike, in *U. prehensilis* the appearance of the leaves, which are long and flat, in no way resembles that of the rhizoids. The rhizoids are divided into segments, the usual number being nine or ten on each side. The segments are simple, straight, and usually undivided, though occasionally at the base of an older rhizoid, division of the segment itself takes place (Fig. 4a) giving the rhizoid of this species there the general appearance of that of *U. neglecta*. The rhizoid segments are given off regularly and alternately at right angles to the main axis. Unlike *U. vulgaris* the tips of these segments do not possess circinate ptyxis, but are straight like the growing points of the water shoots. The segments are covered entirely with glands, except at the very tip and base (Fig. 4). Glands also are present at intervals on the main portion of the rhizoids. These rhizoids measure some two to three times the length of the rudimentary rhizoids of *U. vulgaris*. Whereas, too, in this latter species, metamorphosis of the rhizoids into ordinary water shoots is common, in *U. prehensilis* the rhizoids are organs apart from the water shoots, and in no case was metamorphosis observed.

MORPHOLOGY.—In diameter the flower stalk is about 1–1.5 mm., and is characterised by a reduction of aerenchyma compared to the water shoot. The amount of aerenchyma is naturally greatest at the base of the flower stalk which is under water.

* Stapf in Hooker's *Icones Plantarum*, t. 2798.

† Glück, loc. cit.

‡ Glück, loc. cit. Taf. 4.

A section across the middle of an aerial flower stalk shows (Fig. 5) a distinct epidermis, composed of large cells somewhat thickened on their outer walls, bounding the section. A small amount of aerenchyma and large round cells, loosely arranged, form the cortex. The endodermis is composed of large clear cells thickened on their radial walls. A ring of xylem surrounds the pith with small scattered patches of phloem. There are also one or two irregularly distributed patches of vascular tissue in the ground tissue, as in *U. emarginata* * and *U. brachiata*.† The pith cells are small in the vicinity of the xylem ring, but very large towards the centre of the section.

As well as rhizoids, a great number of ordinary water shoots, bearing leaves and bladders, are to be found at the base of an aerial flower stalk, and the leaves are often found springing immediately from the base. In structure the water shoots are simple, having a central vascular strand, surrounded by air tissue and epidermis (Fig. 7a). As in all other parts of the plant, the water shoots are covered at intervals with small projecting glands.

The leaves are given off as branches of the water shoots. At their base they do not differ in any respect from the shoots themselves, but when the flattening of the leaf begins, the main nerve divides into three, so that a section of a leaf shows three vascular strands surrounded by air tissue, and an epidermis composed of slightly thicker and polygonal rather than brick-shaped cells, as at the base, or in a section of the water shoot (Figs. 6 and 7). Stomata with two guard cells are found at intervals on the leaves with the glands.

The bladders differ in shape from those of *U. vulgaris* (Fig. 8). Their origin and development are as in other species of *Utricularia*, each one arising as a roundish knob on a stalk, which is comparatively long when fully developed. The bladders of *U. prehensilis* do not possess hairs at the mouth, but two horn-like elongations of the bladder itself (Fig. 8a). The interior of the bladder is characterised by the absence of quadrifid processes, and is covered only with bifid processes (Fig. 9). The collar is densely covered with stalked glands all of the same shape, while other glands, bicellular in construction, form a transition near the exterior to the projecting glands without stalks, with which the whole exterior of the bladder and the stalk is covered, as are all other submerged parts of the plant. Inside the bladder, decayed brown matter is found, but no distinct entire micro-crustacea. The fact that the bladders of this species are sunk in mud, and therefore more liable to decay, would explain this.

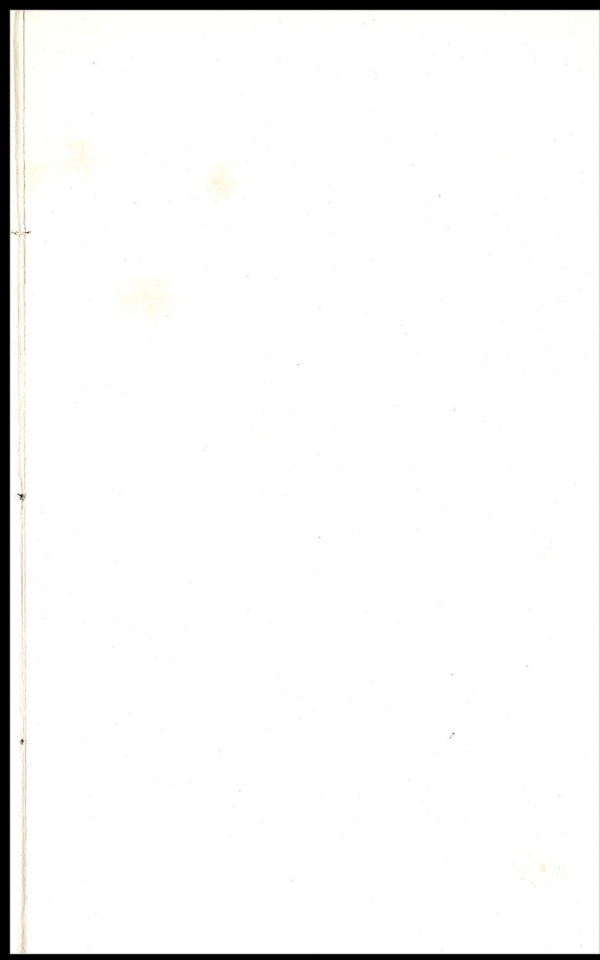
* Chandler, in Ann. Bot., xxiv (1910).

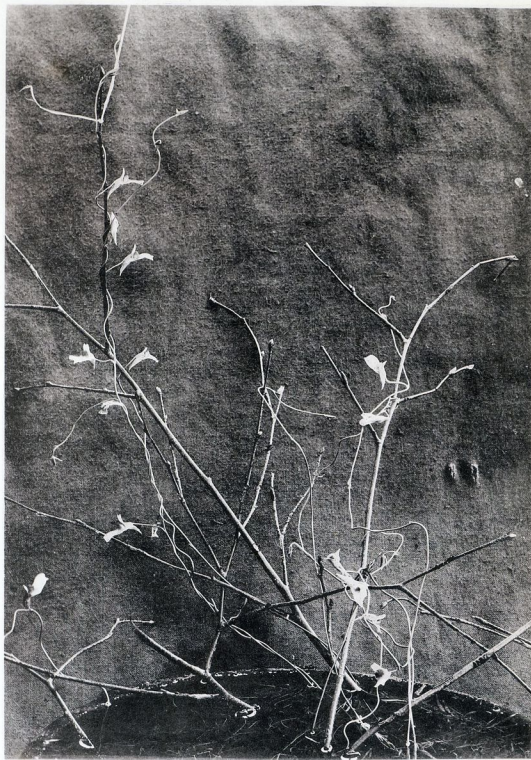
† Compton, in New Phytologist, April 1909.

EXPLANATION OF FIGURES IN PLATE LVII.

Illustrating Miss Chandler's paper on "*Utricularia prehensilis*, Meyer."

- FIG. 1. *Utricularia prehensilis*. Nat. size. From a photograph by Mr. R. Adam.
- FIG. 2. Base of flower stalk. Nat. size, showing rhizoids.
- FIG. 3. Same magnified. ($\times 17$.)
- FIG. 4. Rhizoid with rhizoid segments. ($\times 75$.)
 a. Secondary branch of rhizoid segment.
- FIG. 5. Flower stalk in transverse section showing ($\times 74$)—
 a. Epidermis.
 b. Aerenchyma.
 c. Endodermis.
 d. Ring of xylem.
 e. Pith.
 f. Scattered vascular tissue.
- FIG. 6. Portion of flat part of leaf, showing internal structure ($\times 14$)—
 a. Stomata.
 b. Glands.
- FIG. 6A. Corresponding portion of leaf. ($\times 4$.)
- FIG. 7. Narrower part or petiole of leaf, showing structure. ($\times 14$.)
- FIG. 7A. Corresponding portion of leaf and water-shoot. ($\times 4$.)
- FIG. 8. Bladder, showing hornlike processes (*a*). ($\times 45$.)
- FIG. 9. Bifid processes inside the bladder. ($\times 500$.)
- FIG. 10. Glands at the mouth of the bladder. ($\times 500$.)





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Utricularia prehensilis, Meyer — Chandler.

