

37. Shallow water affixed aquatic with the green leafy shoots superficial, the segments terete or flattened.
38. Leaf-segments with apical, but without lateral, setae; quadrifid glands inside the proximal part of the trap with one pair of arms reflexed, so that all four arms point in the same direction. *minor*
38. Leaf-segments with apical and with lateral setae; quadrifid glands not with all four arms pointing in the same direction.
39. Green leaf-segments terete, the margins not toothed, but bearing 3-6 short setae. *striata*
39. Green leaf-segments flattened.
40. Green leaf-segments with apex obtuse, the margins not toothed, but bearing 9-20 short setae; quadrifid glands inside the proximal part of the trap with both pairs of arms parallel. *intermedia*
40. Green leaf-segments with apex acute, the margins with 4-9 distinct teeth, each terminating in a short seta or setae; glands inside the proximal part of the trap with both pairs of arms divergent. *ochroleuca*

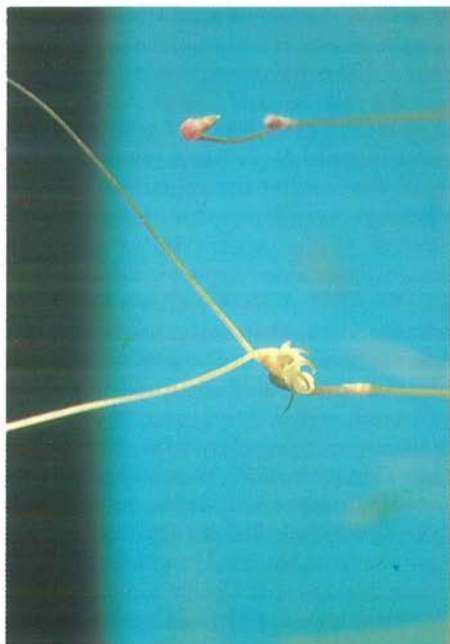
Notes on Distribution of North American *Utricularia*

1. *U. amethystina* St. Hil.

This tropical species has been found on two occasions in peninsular Florida. Elsewhere it has a very wide distribution in America from Mexico to Peru. It grows in wet sand or peat in open vegetation, although it will tolerate more shade than most terrestrial species. First discovered in the USA by Jeanette P. Standley near Fort Meyers and described by Barnhart as *Calpidisca standleyae*. Subsequently it was found again by Len Brass in Collier County. Don Schnell has searched for it in recent years, but has so far failed to locate it. The spatulate leaves, which are almost invariably present at flowering time, and the connate bract and bracteoles, are both diagnostic among North American species.

2. *U. cornuta* Michx

This occurs in north America, Bahamas & Cuba. In Canada it is found from Newfoundland and Nova Scotia westwards to Alberta, and in the United States in all of the eastern states and westwards to Minnesota, Wisconsin, Michigan, Illinois and Arkansas ("Washington" is included in my monograph, but this is a mistake, specimens exist so labelled, but almost certainly in error). It grows in wet soil or shallow water up to about 10 cm deep in fens, marshes and swamps, probably usually on acid soil. This species is very similar to *U. juncea* and often confused with it. Kondo, in his key to the North American *Utricularia* species,



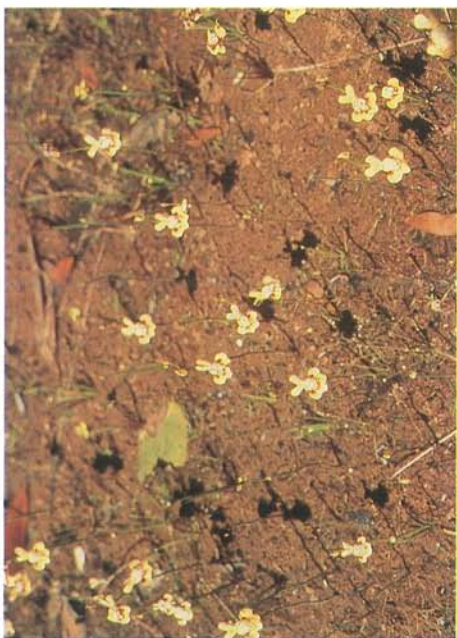
Utricularia capilliflora—Near Darwin, Australia. P. Taylor/Kew photo (with assistance by Dr. Arthur Weston). Note erect corolla appendages in this small, annual terrestrial.



Utricularia dunstaniae—Near Darwin, Australia. P. Taylor/Kew photo (with assistance by Dr. Arthur Weston). Note erect corolla appendages.



Utricularia lasiocaulis—Near Darwin, Australia. P. Taylor/Kew photo.



Utricularia fulva—Near Darwin, Australia. P. Taylor/Kew photo. A group of plants.

uses as his primary character for distinguishing the two species the color of the peduncle (scape), that of *U. cornuta* being said to be 'green to yellowish-green' and of *U. juncea* 'greenish-purple to purple'. I have not seen the latter species flowering in the USA and cannot vouch for the reliability of this character, and I have seen *U. juncea* flowering in Trinidad, West Indies with a green peduncle. The pollen grains of *U. cornuta* are larger than those of *U. juncea*. Where the two species are sympatric the former usually flowers earlier than the latter.

3. *U. floridana* Nash

This most interesting species is endemic in the United States, where it occurs in Florida, Alabama, Georgia and the Carolinas. It grows in water up to 1 m deep in oligotrophic lakes. The habit of this species is unique in the genus. It has an interesting history; the earliest collections known were made by Rugel from Lake Iamonia, near Tallahassee, in 1845, and were founded by me, unnamed, in the herbarium of the British Museum. Until quite recently, apart from fragments of the type specimen of Nash (described from Lake County in 1896, about 50 years after Rugel collected it), no other specimens existed in European herbaria, and only a few in United States herbaria. During my stay in Florida in 1972 I did not find it in Lake Iamonia, which is now largely silted and quite unsuitable, but I was shown it in the relatively recently man-made Lake Seminole, and found it also in several lakes in the vicinity of Orlando and in White Lake, Bladen County, in N. Carolina.

4. *U. foliosa* L.

From North America I have seen specimens of this essentially tropical species from N. Carolina, Georgia, Florida, Louisiana, Mississippi and Texas. It seems unlikely that it does not also occur in S. Carolina and Alabama. Elsewhere it is very widespread in C and S America and also in tropical Africa and Madagascar. It grows in shallow to quite deep water in ditches, lakes and swamps. In the past it has been confused, by some North American authors, with *U. macrorhiza*, but the vegetative parts and especially the fruits and seeds are very different. The flattened stolons are unique in the genus.

5. *U. geminiscapa* Benj.

Endemic in North America, where it occurs in eastern Canada and in the United States from Maine to north-eastern N. Carolina, also extending westwards to Wisconsin, Iowa, Michigan and W. Virginia. It grows (according to Fernald) in pools, ponds and sluggish streams. In the sterile condition this species is not easily distinguished from some forms of *U. macrorhiza*, although the leaf-segments usually bear fewer setae than are generally found in that species and the quadrifid glands inside the traps are quite different. *U. radiata* and *U. inflata* are the only other North American aquatic species in which the chasmogamous corolla has a 3-lobed lower lip, and those two both invariably have a whorl of floats on the peduncle.

6. *U. gibba* L.

In North America this species is widespread in Canada (Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia) and in the United States it is absent only from Alaska and the great plains and Rocky Mountain states (that is, N. and S. Dakota, Nebraska, Iowa, Montana, Wyoming, Colorado, New Mexico,

Arizona, Utah, Idaho and Nevada). It has also been found, relatively recently, in Hawaii. Elsewhere it is more or less pan-tropical, and is found as a weed in botanic gardens and probably in collections of cultivated carnivorous plants. It grows in a great variety of wet habitats (I have even seen it, in the Everglades, growing as an "epiphyte" on a floating mossy log, some considerable distance above water-level), but does not usually flower in deep water unless supported by a floating mat of living or dead vegetation. It is a very variable species and has formerly, by most North American authors, been treated as two species - *U. gibba* proper, with a short obtuse spur to the corolla, and *U. biflora* Lam., with somewhat larger flowers with a relatively longer, more slender spur. However, many intermediate forms exist, and a study of the species throughout the world, both in the field and the herbarium, induced me to unite these two (and many others) under the earliest name. The relative proportions of the lips of the corolla, the sparse leaf-segments and the distinctive seeds, distinguish this from all other species in the region except the allied *U. striata* and *U. floridana*; for differences from these two, see key. In the sterile condition, which is very commonly found, sometimes suspended in deep water, it may resemble non-flowering plants of *U. minor*, and I have seen the two growing together in Michigan. However, the leaf-segments in that species are usually more numerous and differ from those of *U. gibba* in usually, (but not invariably), having lateral setae on the ultimate segments - those of *U. minor* never do. The two species can always be distinguished with certainty by the very different quadrifid glands inside the traps.

7. *U. inflata* Walter

Endemic in the United States, where it occurs in the eastern coastal plain states from New Jersey to Texas, extending westwards into Kentucky, Tennessee and Arkansas, with a single recent record from Washington state. It grows in shallow to very deep water in lakes, ponds and ditches. This species has been confused with the similar *U. radiata*, but the two species are quite distinct. When stranded by falling water level it produces a rather puzzling form (it does not seem to flower in this condition), which produces, at the end of stolon branches, distinctive tuber-like organs which are buried in the substrate. This form is easily induced in cultivation, but I was unable to induce it in *U. radiata*.

8. *U. intermedia* Hayne

This species occurs throughout Canada and in all of the northern states of the USA, southwards to California, Montana, N. Dakota, Iowa, Illinois, Indiana, Ohio, Pennsylvania and Delaware. Elsewhere it occurs throughout the cooler parts of the northern hemisphere. It usually grows in shallow water in acid fens and bogs. Confusion is likely with *U. ochroleuca* but *U. intermedia* can usually be distinguished by the untoothed margins and obtuse apices of the green leaf-segments, which usually bear no traps. The traps are also usually larger, and in fact, probably the largest found in any North American species.

9. *U. juncea* Vahl

In North America this is confined to the United States eastern coastal plain, from New Jersey to Texas. To the south it extends from the Bahamas, Cuba and Mexico southwards to Brazil. Its distribution is thus quite different from that of the very similar *U. cornuta*. The usual habitat is wet sand or peat or in shallow water in

marshes, bogs and by ponds. The two species may usually be distinguished by the smaller, more numerous and more widely spaced flowers of *U. juncea*. A cleistogamous form, with very small flowers that do not open, is frequently found and has been recognised as a distinct species (*U. virgatula* Barnhart). Intermediate forms, however, often occur, and sometimes both chasmogamous and cleistogamous flowers may be found on the same inflorescence.

10. *U. macrorhiza* Le Conte

The distribution of this species is of some interest. It occurs throughout Canada and in most of the United States (including Alaska), being absent only in the warmer southeastern coastal plain states, although an occasional sterile specimen has been found in S. Carolina and Florida and it has been found a few times, at high altitude, in the mountains of Mexico. It also occurs on the other side of the Bering Straits in easternmost Soviet Union, and in Mongolia and parts of China. It grows in shallow to deep water in ponds, lakes and wet fens. It has, in the past been confused with the European *U. vulgaris*, and has sometimes been treated as a variety (var. *americana*), or as a subspecies (subsp. *macrorhiza*), although the earliest epithet available in the varietal rank is *robbinsii*. I believe that it is correctly regarded as a distinct species, and seeing it in flower in the field recently in Michigan (with the kind assistance of Don Schnell) reinforced this view. It has also been confused with *U. foliosa*, (for example in Fassett (1940), Muenscher (1944) and in Kondo's key (1973), and, partly at least, in the "Flora of the Carolinas"), but the two species are only very superficially similar and the terete stolons of *U. macrorhiza* will always serve to distinguish them.

11. *U. minor* L.

This species has a distribution in North America very similar to that of *U. intermedia*, and the two species often grow together. Elsewhere it occurs throughout the cooler part of the northern hemisphere and is also found in a few places further south, for example in the mountains of Burma and New Guinea. It grows in shallow, usually acid, water in bogs and fens. When in flower this is a very distinct species, the very short spur of the corolla distinguishing it from all other North American species but *U. olivacea*, but that species has very much smaller white flowers and no free-ending leaf-segments.

12. *U. ochroleuca* Hartm.

This species has only relatively recently been much noticed as a North American plant, although it was collected, and described as *U. occidentalis* A. Gray in 1883. So far it has been recorded from a number of Canadian provinces and from several northern states in the USA (Alaska, Washington, Oregon, Colorado, Ohio, Illinois, Michigan and Minnesota), and probably occurs in others, and should be looked for. Elsewhere it occurs in Europe and temperate Asia, where it is also probably under-recorded. It is very similar to *U. intermedia* and grows in similar habitats, (although possibly not with it). Unlike that species, which reproduces sexually, it is a vegetative apomict; that is, it never produces fruit, and reproduction and dispersal is by vegetative fragments or by turions. When in flower it has a shorter spur than in *U. intermedia*, but the toothed margins of the green leaf-segments, coupled with the presence of some traps on the latter, furnish the best characters for distinguishing the two species when not in flower. If all else fails, the quadrifid glands inside the traps always have diverging, not parallel, pairs of arms.

13. *U. olivacea* Wright ex Griseb.

In North America this is known only from the eastern coastal plain states of New Jersey, N. and S. Carolina, Georgia and Florida, although it is easily overlooked, especially when not in flower, and probably occurs in other eastern states. Elsewhere it extends from Cuba to Brazil and Bolivia. It grows in still or slowly flowing water in ponds, lakes, ditches and streams, often intertwined with other plants, including other *Utricularia* species. This is one of the smallest of *Utricularia* species, and one of the few aquatic species which have not free-ending leaf-segments, the thread-like stolons bearing only shortly-stalked traps.

14. *U. purpurea* Walt.

This very distinct species has a wide distribution in eastern North America from eastern Canada (Ontario, Quebec, New Brunswick and Nova Scotia), through all of the eastern coastal plain states from Maine to Texas and extending westwards into Michigan, Illinois and Indiana. Elsewhere it is found from the Bahamas and Cuba to Costa Rica and is replaced by a similar species in S. America. It grows in lakes and pools, ditches and slow-flowing streams. Not likely to be confused with any other species in North America, in any condition, the verticillate leaf-segments and the shape of the corolla being diagnostic.

15. *U. radiata* Small

This species has a somewhat wider distribution in the eastern states than the similar *U. inflata*, occurring from Nova Scotia in Canada and from Maine through all of the coastal plain states to Louisiana, extending westwards into Indiana, Tennessee and Arkansas. It grows in similar habitats to *U. inflata*, and sometimes, as I have seen in Florida, the two may be found growing together. The shape of the floats and bract provide the best characters for distinguishing the two species.

16. *U. resupinata* Greene ex Bigelow

This species is found in eastern Canada (Ontario, Quebec, New Brunswick and Nova Scotia) and eastern USA from Maine to Delaware, apparently absent from Virginia and, even more inexplicably, the Carolinas, reappearing in Georgia and Florida, with westward extensions to Michigan, Indiana and Wisconsin. Elsewhere it has been recorded from Cuba, Belize and Nicaragua. It grows in shallow water or in wet sand or mud at the margins of pools. It would be of interest to know if a clone from, say, Florida, would be hardy in the cold winters of the north. It may pass the winter as a seed in the cooler parts of its range, and thus behave as an annual, although it may be perennial in the warmer south. A possible explanation of the distribution gap is that there is not a continuous cline but that two forms have evolved in the two regions, neither of which, for some reason, occurring in the intermediate area. It may also be possible that no suitable habitats are to be found in this area, although I have seen what appeared to me to be likely terrain in N. Carolina. At least in the northern part of its range, it is said to flower only under simultaneous conditions of low water level and higher than normal temperatures. The septate, subulate leaves are unique in the genus, and make certain identification of sterile material possible. The curious tubular bract is shared only with the other species in the section, which occurs in South America, and has quite different leaves.

17. *U. simulans* Pilger

This species has been collected in a number of localities in southern Florida (I have seen specimens from 10 counties), where it is (or was), said to grow in damp sandy flats. Elsewhere it has a wide distribution in Central and South America from Cuba to Paraguay, and also in various parts of tropical Africa. Don Schnell has recently located it in Florida, although many or perhaps most of the localities as recorded on herbarium specimens have now been destroyed by urban development and drainage. The fimbriate calyx lobes and bracts are unique among north American species, and although it is not likely to be noticed when not flowering, the traps (which measure only 0.2-0.3 mm long) are similarly unique.

18. *U. striata* Le Conte ex Torrey

Endemic in the United States, where it is restricted to the eastern coastal plain from Massachusetts to Texas and Oklahoma. It grows in shallow water in bogs and marshes, or sometimes in deeper water, supported by floating mats of other vegetation. This species (which goes under the name of *U. fibrosa* Walt. in most north American floristic works) is quite similar to the larger forms of *U. gibba*, but in the field at least it is distinguished by the two very different types of leaves, which are invariably present, although they are not always obvious in badly prepared herbarium specimens. It is probably more closely allied to *U. floridana*, which grows in deeper water and has a flexuose submerged peduncle and much longer leaf-segments. Plants which appear to be in some ways intermediate, which I observed in SE N. Carolina, should be investigated.

19. *U. subulata* L.

This species is recorded from Canada (Nova Scotia) and all the coastal plain states from Massachusetts to Texas and also Tennessee and Arkansas. Elsewhere it is almost pan-tropical, and I have personally collected it in America (both north and south), Africa and Australia. It grows in wet sand in a variety of open vegetation types—roadside borrow-pits are often quite yellow with it in NW Florida. The peltate bracts distinguish it from all other North American species. *U. subulata* is a common weed of glasshouses in which carnivorous plants are cultivated. It commonly occurs in such situations (and in the field) as a cleistogamous form, with the whole plant, and especially the corolla, much reduced in size and forming fruits and seeds without opening.

The Genus *Genlisea*

By Peter Taylor

Introduction

The genus *Genlisea* currently comprises 19 species, 8 of which occur in tropical and South Africa (one of these occurring also in Madagascar), the remaining 11 being found in Central and South America. None of the species occurs in both continents. It differs from *Utricularia* in having a 5- (not 2-) lobed calyx and in its traps, which are very different. Unlike *Utricularia*, the trapping mechanism is passive, and works on the principle of a lobster-pot; that is, the prey can enter the trap but is prevented from leaving by inward-pointing bristles, and once inside can move only towards the