



Recent observations on the genus *Heliamphora* (Sarraceniaceae)

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Abstract. Over the last years we had the opportunity to visit some of the least known of the remote table mountains of the Venezuelan south, the so-called 'Tepuis'. During these visits we made several interesting findings including new *Heliamphora* species and could also gain a better understanding of the species already known.

Introduction

The genus *Heliamphora* is one of three genera of the family *Sarraceniaceae*. Currently *Heliamphora* consists of seven species generally accepted and at least two more await publication.

Most species of *Heliamphora* are growing on the flat tops of a group of remote and isolated table-mountains 2500 to 3000 m high with almost vertical walls, so-called Tepuis. These sandstone mountains are located in the Guayana Highlands of Venezuela near the Borders to Brazil and Guayana.

Many of them have just been explored in recent years, some not at all so far. Due to isolation, a lot of endemic plants and animals, among them the different species of the genus *Heliamphora*, could evolve on their plateaus.

Over the last years, together with some fellow biologists, I had the opportunity to visit several of the remote Venezuelan Tepuis and study the species of *Heliamphora* growing on top, on the foothills and on the faces of these strange and ancient mountains.

Located in the north of the Gran Sabana northwest of Ptari Tepui and east of Auyan Tepui are four table mountains of the Aparaman-group ('Los Testigos'): Aparaman Tepui, Murosipan Tepui, Tereke-Yuren Tepui and Kamarkaiwaran Tepui (Steyermark, 1986; George, 1988). The altitude of these tepuis lies between 2100 meters (Tereke-Yuren) and 2700 meters (Kamarkaiwaran).

We also explored parts of the 'Macizo de Chimanta', the Chimanta Massif in the southwest part of the Gran Sabana. This huge massif covers a total area of 1470 km² and is actually a cluster of tepuis including the central Chimanta Tepui itself. Their peaks range in altitude from 1700 m (at the central part of the massif) to 2698 m (on Eruoda Tepui). The ten tepuis that reach 2000 m above sea level cover an area of some 700 km² in total (Huber, 1992). The size and the diverse altitudes of the Chimanta Massif support numerous habitats including rivers, green valleys and forests as well as rocky plateaus and moist savannas. Starting in the 1950s, various expeditions explored the unique flora and fauna of this area. Many endemic plants and animals were discovered during these expeditions and certainly many more await discovery.

Other mountains we visited are *Kukenam Tepui*, *Roraima Tepui*, *Ilu Tepui*, *Aprada Tepui*, *Tramen Tepui*, *Juruani Tepui* and the extremely remote *Cerro Neblina*.

Results

Last year we published one new species of *Heliamphora* from the Aparaman-group of Tepuis and have just recently submitted another publication of a new species from Chimanta Tepui. This paper currently is in press.

***Heliamphora* on Aparaman-group of Tepuis** On all tepuis of the Aparaman-group we found a very interesting, and previously undescribed species of *Heliamphora* notable for the unique anatomy of its pitcher-appendage. The appendage is fused with the back of the pitcher forming a hollow structure running downwards on the outside of the back of the pitcher,

apparently working as a chamber to store nectar produced by the glands of the appendage. Such a structure has never before been observed in *Heliamphora* or any other member of Sarraceniaceae.

We named this new species *Heliamphora folliculata* (Wistuba *et al.*, 2001). The name '*folliculata*' was chosen to highlight the 'bubble' (=follicle) formed by the nectar spoon, the most distinct characteristic of this species.

We did not observe any other species of *Heliamphora* on any of the Tepuis belonging to the Aparaman-group, however we observed *Heliamphora folliculata* on all four mountains: Aparaman Tepui, Murosipan Tepui, Tereke Tepui and Kamakeiwaran Tepui.

The two other tepuis in the area (Auyan Tepui and Ptari Tepui) are well explored. They are known to house two distinct species (*Heliamphora minor* on Auyan Tepui, and *Heliamphora heterodoxa* on Ptari Tepui) (Maguire, 1978; Steyermark, 1984). Accordingly, we believe that *Heliamphora folliculata* does not occur on these tepuis, and instead is endemic to the table-tops of the Aparaman-group.

***Heliamphora* on Chimanta Tepui** During our exploration of the Chimanta Massif we found a previously undescribed species of *Heliamphora* most notable for its pitcher shape and the spoon shaped lids.

The pitchers are infundibulate in the lower half, slightly ventricose in the middle and cylindrical to slightly infundibulate in the upper third. The lids are spoon-shaped, upright and end with a sharp tip. The two lobes of the lid are compressed from the sides near the tip, often touching each other at the front, forming a quasi-helmet. The lobes are expanded in the lower part of the lid and narrowed sharply near the base. Interestingly the inner side of the lid carry prominent irregularly shaped patches of glands which measure up to 5 mm across.

In comparison to the species found on the plateaus of the various tepuis, where the surface usually is much more rocky and sandy and plants often can grow only on 'islands' of debris, highly limited in space, the moist savannah-like habitat *H. chimantensis* prefers allows the formation of huge clumps. We have visited many tepuis on this and other expeditions, and had never before seen clumped *Heliamphora* colonies of comparable in size to the ones typical of *H. chimantensis*. Vegetative reproduction seems to play an important role as the seedling activity we observed was very low.

The discovery of this species on Chimanta which, by now, seems to be restricted to Chimanta Tepui and its characteristics came as quite a surprise, as they clearly indicate that it is much more closely related to the southern *H. tatei*, than to any of the northern species known to be growing in the Gran Sabana. The flowers of all other species known from the Gran Sabana have 10-15 anthers, while the new species as well as *Heliamphora tatei* var. *tatei* and *H. tatei* var. *neblinae* from the Amazon have about 20; however, while the anthers of *H. tatei* and *H. tatei* var. *neblinae* are 7-9 mm long, those of the new species from Chimanta just reach 5 mm in length (Maguire, 1978; Steyermark, 1984).

A paper is submitted and has been accepted for publication In Carnivorous Plant Newsletter (Wistuba *et al.*, 2002).

Two other taxa of *Heliamphora* have been recorded from Chimanta Tepui: *Heliamphora minor* and *Heliamphora heterodoxa* var. *exappendiculata*.

The *H. minor* plants on Chimanta are notable for the long and prominent bristles inside the pitchers. This variant form of *H. minor* is actually fairly widespread and has been found on many tepuis of the Chimanta Massif as well as on Aprada Tepui, but not Auyan Tepui. Meanwhile, the typical form of *H. minor* is only known from Auyan Tepui. The differences between these two forms of *H. minor* may indeed merit further taxonomic study. The new species sometimes grows together with *H. minor*. As a consequence, hybrids frequently could be found. However, *H. chimantensis* seems to prefer valleys growing at around 2000 m while *H. minor* also has been found in higher altitudes and usually prefers more open habitats.

While we found *Heliamphora heterodoxa* var. *exappendiculata* on Aprada Tepui, we could not locate it on Chimanta.

Discussion

During our studies we found the pitcher-lids or so called nectar-spoons of *Heliamphora* to be highly elaborate structures for the attraction of prey. Apparently various strategies have been developed by the different species of *Heliamphora* all using the lids in altered ways. The

diversity of the pitcher nectar spoon in the various species of *Heliamphora* - *H. minor* which has a highly differentiated helmet-like structure, *H. tatei* which has a rather primitive flag-like structure, *H. heterodoxa* var. *exappendiculata* with its rudimentary lid, and *H. folliculata* as described - illustrate the various ways the nectar spoon is shaped in order to function as the predominant structure for the attraction of prey (Jaffe *et al.*, 1995). Being morphologically fairly constant organs, the lids offer superb, yet previously under-utilized, characters of taxonomic relevance (Nerz and Wistuba, 2000; Wistuba *et al.*, 2001; Wistuba *et al.* 2002).

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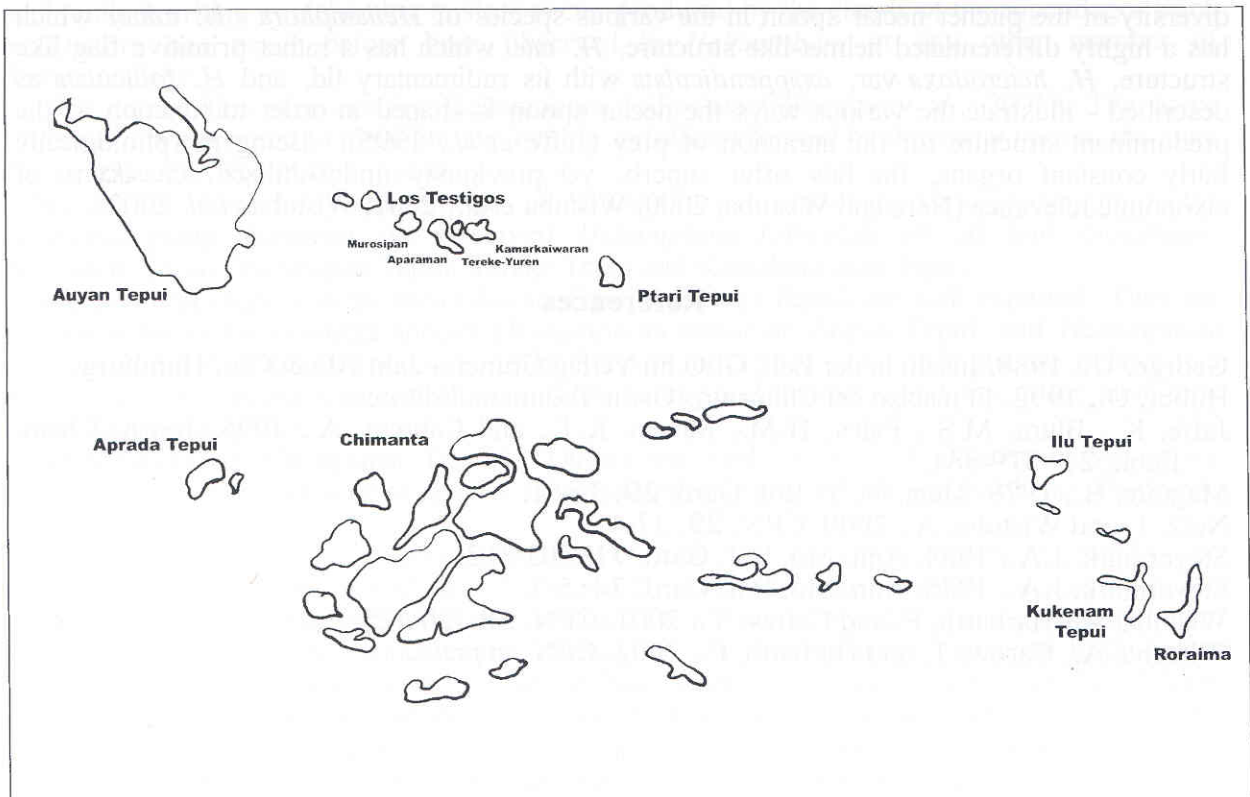


Fig.1 Map indicating the peaks in the complex of tepuis. The indicated peaks have elevations of more than 1500 meters higher than the surrounding plains.

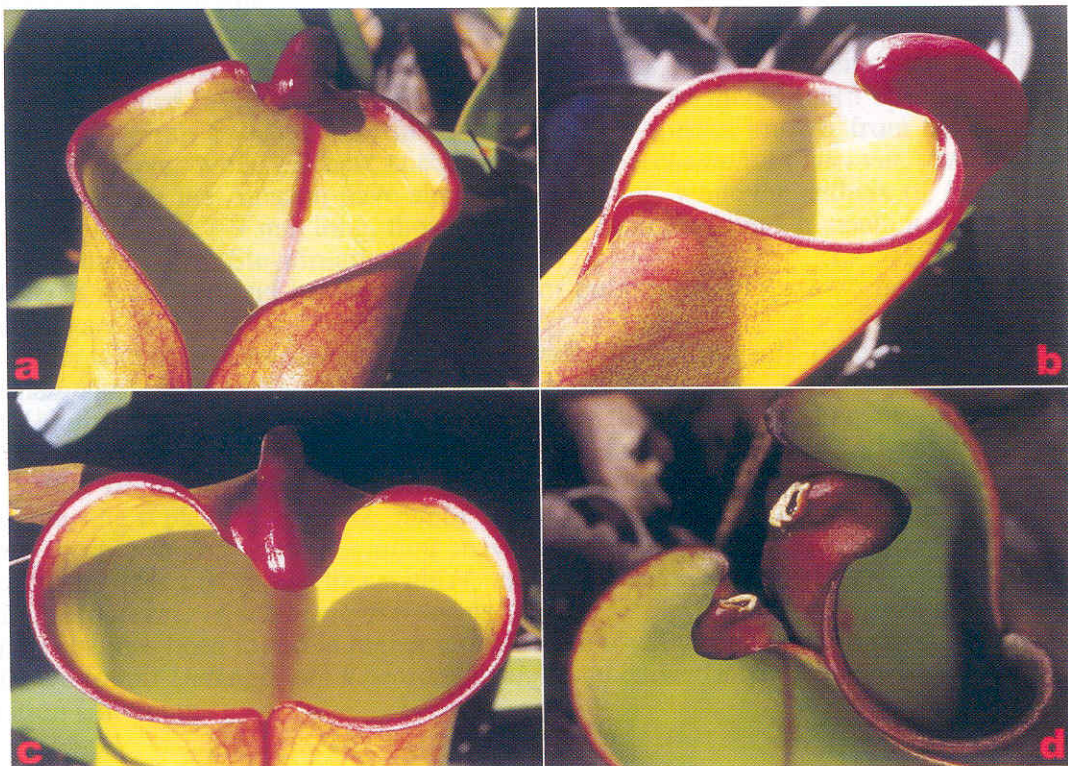


Fig.2 Details of *H. folliculata* pitchers.

- a) Nectar running down from the lid (dark red).
- b) Lid showing the hollow hunchback-like structure.
- c) Pitcher being compressed between front and back leading to kidney shaped mouth.
- d) Nectar reservoirs opened by insects.



Fig.3 *H. folliculata* pitchers on Aparaman Tepui.

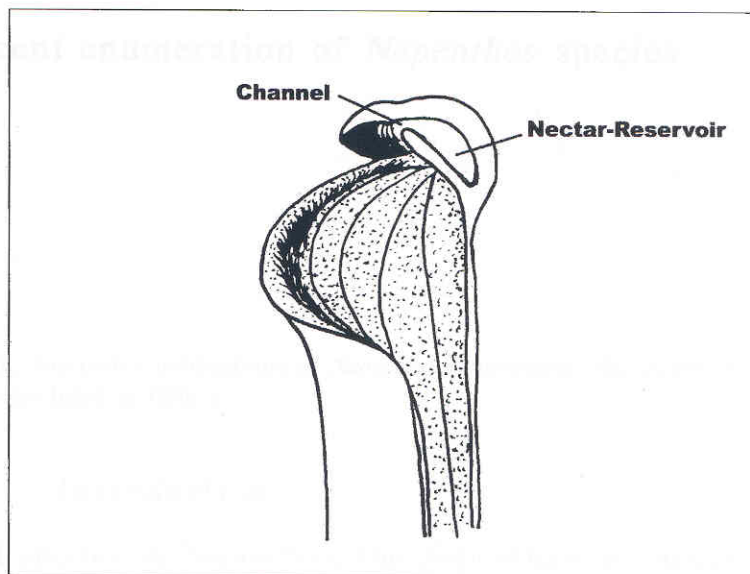


Fig.4 Drawing of the top of a *H. folliculata* pitcher in cross section showing the nectar channel under the lid appendage and the nectar reservoir



Fig.5 *Heliampora* spec. nov. (publication submitted) from Chimanta Tepui -
a) Spoon-shaped lid with big nectar glands.
b) Group of plants.