located and studied all the species described in the presentation to the 1998 ICPS convention.
Pedrito (Jardin Botanico Nacional) - who as driver for both expeditions, used his skill and knowledge of the Cuban roads and terrain to take us to places that would otherwise have been inaccessible in the time available.
The rest of the staff of the Jardin Botanico Nacional who contributed in various ways including Dr. Angela Leiva, Tito Nunaz and "Pepin" Rosete.
The Cuban Army - for giving us permission to search for plants in areas being used by their forces.
Elsewhere:
Jan Schlauer - for his contribution to our research and understanding of *P. lignicola* and assistance in provision of published information.

Further details of a *Pinguicula crystallina* site in south-east Turkey

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Pinguicula crystallina is a Eurasian evergreen species distributed sparsely in the Mediterranean region only. A site in S.E Turkey has been briefly described in these pages previously, Adamec (1997), we will now describe it in more detail following a return visit in late April 1998.
The site is located on the eastern coast of Iskenderun Bay, 10 km south of the town of Ulucinar, close to the small village Konacik, (36°36'N; 35°51'E), in the foothills of the Nur Daglari Mts. The site is in a deep pass with a stream emptying into the sea approximately 4 km downstream, about 3 km direct distance. In late April the stream's discharge was about twice it's size than in October 1991 and the full discharge reached the sea.
In total we found four *P. crystallina* stands, spread from each other over a distance of about 350 m. The first stand occurred about 20-30 m above the main stream on a tributary to the left, a small brook in a deep bed. Here about 150-200 plants grew in two small stands about 10 m apart. Here the plants grew in dense shade below overhanging rocks, further shaded by overhanging tufts of long, dense grass, quite atypical of other stands we have seen. The butterworts grew directly on the rock wall bare of other vegetation. Water trickled gently through the plants and on the leaves of the neighbouring grasses. Here the plants were large and dark green as an adaptation to excess shade. Though the plants were vigorous, only one was in flower.
A further 50 m upstream from the tributary we found the second stand. About 250 plants grew in two groups on the vertical rock surface of the left bank, only 2 m above the stream. The plants grew in mild shade and, in all, about 75 plants were in flower. At this location small local carbonate springs emerged over the rock surface. They coloured the normally dark rock to a light ochre by precipitated sinter. A proportion of the plants grew directly on the sinter, covering a total area of about 1 m^2.
Further progress upstream was rather dangerous as the violent torrent of water filled the bed of the pass forcing us to traverse the banks with great difficulty. At one point where there were no banks we were forced to cross a deep pool on a floating tree trunk, Kamil slid off the tree into the water up to his shoulders; fortunately he was able to save his camera from a similar soaking!

The smallest *P. crystallina* stand was found some 80 m beyond the pool. About 30-40 small light green plants were growing exposed to bright light on an oblique sloping rock only 1m above high rapids. Patches of green filamentous algae grew over the wet rock surface around the plants. This was the site with the least favourable habitat factors.
A further 150 metres on the left bank we arrived at the largest stand close to the high waterfall as described in our previous paper.. Here, about 1000 plants grew in one patch with an area of about 3x2 m. The smaller stand observed in 1991 closer to the waterfall was lacking. The main stand area was densely packed with plants. In spite of the west facing aspect of the vertical wall the plants were relatively well shaded. Small numbers of plants grew in a thin layer of soil whereas the majority grew on bare dark rock or a green-black organic substrate created by the growth of gelatinous blue-green algae.

The butterworts may possibly have derived some nutritional benefit from

the decomposition of these blue-green algae. Water percolated through the substrate between the plants. In total about 80 plants were in flower, mostly located in the brighter higher parts of the stand. The plants in this stand had captured many prey, unlike the other stands. Mostly small flies about 2-3 mm long, but we also observed a large mosquito as well as a butterfly 12 mm long had fallen prey. As it was growing dark soon we were forced to leave this remarkable site, convinced never the less that there were further stands located above the waterfall, along the upper reaches of the stream in the pass.

After we had returned home we tried to analyze some natural samples collected from the last microsite. Geology experts determined that the rocks on which the plants grew were volcanic basalt whilst stones from the river bed were serpentine; it is likely that the latter were carried downstream from the upper reaches of the canyon. The water trickling through the plants had a pH of 8.48, conductivity (20C) 472 S/cm, and total alkalinity of 5.15 meq/l i.e. ca. 310 mg/l HC0. Thus, the water was very alkaline and very hard reflecting the alkaline character of the rock. The pH of the organic matter at the roots was 7.5.
The determination of the organic substrate revealed a great surprise. Prof. J. Komarek from the Institute of Botany at Tebo, Czech Republic, the greatest world expert on the taxonomy of blue-green algae determined the gelatinous substrate to be a new species of the genus *Chloroglea* from the family *Entophysalidaceae!* In the Algal Collection at the Institute of Botany this new species has been growing well in a Zehnder medium, which is used routinely for blue-green algae, with the addition of limestone. In addition, as a minor component, a filamentous blue-green algae of the genus *Microcoleus* was also determined. Neither of these species occuring in the rooting medium contain heterocysts and thus they are incapable of fixing atmospheric nitrogen. The fact that they covered the short roots of the butterworts makes it possible to assume there may be some tight mutual nutritional relationships between the roots and the algae.

P. crystallina grows poorly in pot culture, usually declining over winter. With some difficulty, it is possible to grow it in a soft porous travertine. The butterwort needs a mildly alkaline, wet substrate (pH ca. 8), high air humidity, and occasional misting with tap water. It needs partial shade

and protection to avoid over-heating above 28-30 °C. During the growing season it will thrive best outdoors in a wet shaded place, with a good fluctuation in temperature between day and night.
The butterworts of the Cyprus population seem to be more resistant. Plants sometimes flower in cultivation and set viable seed by self-pollination.

Literature cited:

Adamec, L. (1997): IPSG Newsletter - 8: 9-10

My experiences with the southernmost Butterwort *Pinguicula antarctica*

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In 1997 I was lucky enough to obtain a plant that was labelled *Pinguicula antarctica.* Not so familiar with the growing conditions of that species, I decided to find literature giving me perhaps more information. The first article I found was by R. Lamb in CPN where he described his trip to South America and showing some pictures of *P. antarctica* (Lamb, 1992). My plant closely resembled those in his photographs, convincing me that my plant was correctly labelled! Unfortunately, the article contains little information on the habitat or growing conditions.
I was sure to find more about my plant in J. Casper's monograph on the genus *Pinguicula* (Casper, 1966). Described for the first time by Vahl in 1827, the distribution of this species ranges from Tierra del Fuego (Cape Horn) to the island of Chiloe in Chile (48 degrees southern latitude). Casper wrote that the habitat can be either sphagnum bogs, wet bare rocks or open swampy pine forests.
I therefore decided to cultivate *P. antarctica* in pure peat mixed with a little fine quartz sand, keeping the soil wet all year round. I kept the pot outside through the summer for maximum ventilation, whilst in winter I