



INTERNATIONAL PINGUICULA STUDY GROUP NEWSLETTER

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INTERNATIONAL PINGUICULA STUDY GROUP

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Membership is based upon payment of a subscription in advance of £6 by UK members, £7 by EU members, £8 by members from other countries.

This subscription will entitle you to two Newsletters. Cheques should be made payable to "International Pinguicula Study Group" and send to the membership secretary. For details of rates in other currencies please contact Phil. Phil has stock of back issues, please enquire. Please also notify Phil of any change in address.

Newsletters will be published when sufficient articles have been received by the editor/co-editor. We will aim to produce at least one Newsletter per year. Articles are most welcome from members, covering all aspects of interest including cultivation, taxonomy, ecology and conservation of *Pinguiculas*. Seedlists will only be published when sufficient seed has been donated. Suggestions for other services or activities are welcome.

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EDITORIAL

I'm sat writing this, the final section of IPSG Newsletter 10, the night before departing on a month long expedition with ten sixth-form students to Borneo! Planning, training and fund-raising toward this expedition has occupied most of my 'spare' time during the past eighteen months, and it is unbelievably exciting to think that we are now about to depart! It is also quite remarkable that this tenth issue has finally been completed; a fact largely attributable to the encouragement and assistance offered by our new co-editor Hans Luhrs in master-minding the new and more professional layout. I would like to thank Hans and all our contributors, without whom you would not now be able to satisfy your desire to know more about *Pinguiculas* from such far-away places as Cuba, Central & South America, and Turkey.

If you have enjoyed receiving Newsletter 10 then please let us know and do please consider writing an article for inclusion in Newsletter 11. You can look forward to part 2 of 'New Butterworts from Central America' and the publication of a number of new hybrids.

Stan Lampard

NEW BUTTERWORTS FROM CENTRAL AMERICA

PART I

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"They keep on rolling in! Two more species of *Pinguicula* from old Mexico. Many more and the genus in that country will be ripe for revision."

- Don Schnell (1997) reviewing the paper of Luhrs (1995).

"*Pinguicula mesophytica* is described as a new species These plants from Guatemala, Honduras & El Salvador have been identified with the Mexican *P. moranensis* in the past."

- Jan Schlauer (1998) reviewing the paper of Zamudio (1997).

"The long confused taxon *P. orchidioides* was investigated now considered conspecific with the recently described *P. stolonifera*."

- Jan Schlauer (1999) reviewing the paper of Zamudio (1998).

"*Pinguicula elizabethiae* is similar to the two known ones with round corolla lobes, *P. colimensis* & *P. cyclosecta* like any other addition to the difficult section *Orcheosanthus*, this further increases the urgency of a fundamental revision."

- Jan Schlauer reviewing the paper of Zamudio (1999).

The past five years have most certainly been fruitful in terms of new discoveries and yes Don there are yet more to come! This all sounds very exciting, but how many readers of the Carnivorous Plant Newsletter, (from which the above quotes were taken) have registered the emergence of several new and quite distinct species of Butterwort onto the scene? Why is this?

I have always felt that the Butterworts are of the 'Cinderella genus' amongst carnivorous plants just waiting for someone to notice how beautiful they are. This must be largely due to the lack of material available to cultivation. Neither has this situation been helped by the lack of good photographs revealing their qualities.

Whilst I agree whole-heartedly with Jan that a fundamental revision of the Central American species is urgently required, particularly those of Casper's nightmare the Section *Orcheosanthus*, the aim of this article is not to indulge in botanical descriptions and taxonomic debates which can be awefully difficult to digest; as to do so would result in all but the most ardent connoisseurs of the genus in moving on to the next article. Instead, I simply want to inspire you through the accompanying photographs revealing some of these new species for the first time (see cover and centre page).to be continued.

PINGUICULA MESOPHYTICA

These two stunning images are published by kind permission of Oliver Komar an ornithologist from the University of Kansas Natural History Museum and Biodiversity Research Center. He photographed the plants in 1999 while conducting an inventory of birds in Montecristo National Park, in collaboration with the Salvadoran park service and Salva Natura (Ecological Foundation of El Salvador).

Oliver writes:

"Local park guards at Montecristo National Park refer to the plant as the 'orquidea carnívora' because of it's epiphytic nature and sticky leaves which trap insects. It only occurred on a few trees at the top of one of the peaks in Montecristo National Park in elfin cloud forest, and the park guides claim that it does not occur on any of the other peaks. I do not know if the plant occurs anywhere else in the world, but I suspect that it is highly vulnerable to climate change and perhaps should be considered in danger of extinction.

I only encountered the plant at about 2.300 metres above sea level. The plants were blooming in late July. The red flowers suggest that it could be pollinated by humming birds, but I really do not have any evidence. Hummingbirds are very abundant in the forest, especially *Lampornis amethystinus*, the Amethyst-throated humming bird."

Oliver's stunning images were first sent to me by Kamil Pasek via e-mail and I was straight away sure that this was a new species, quite unlike *P.*

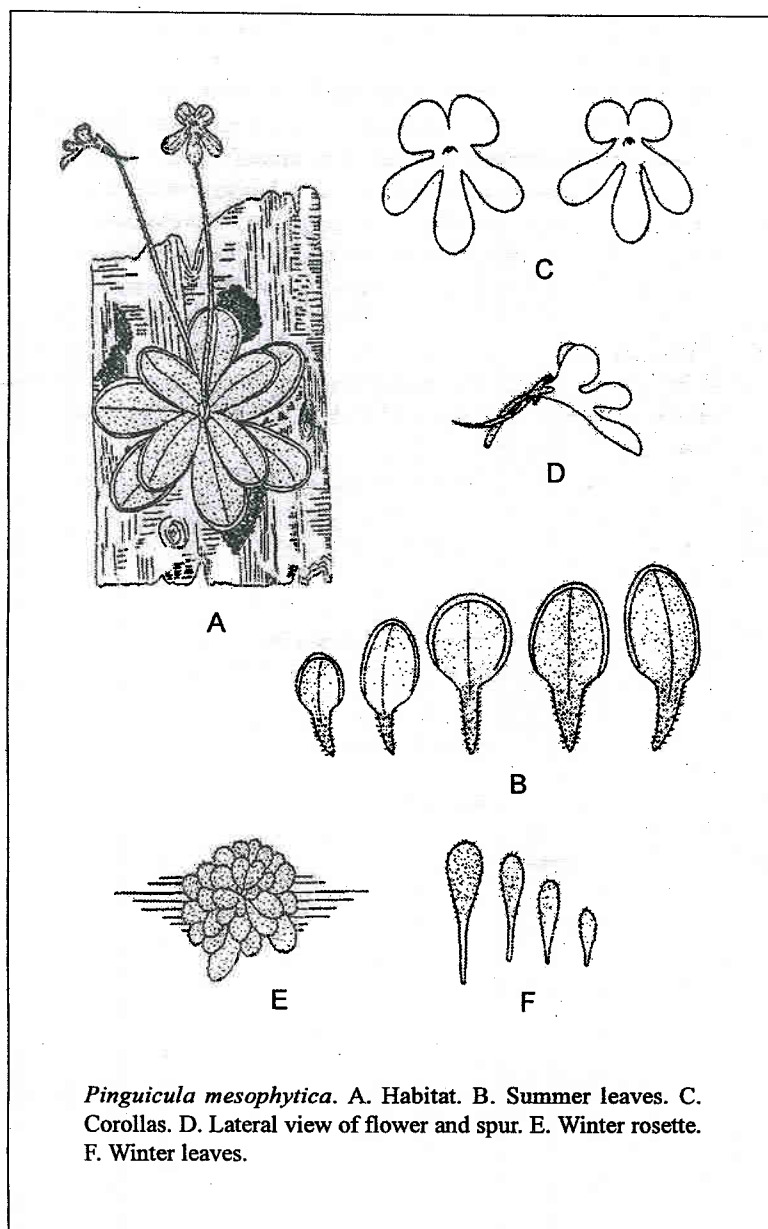
moranensis. My first reaction was to place it in the Section *Longitubus* alongside with *P. laeana*, *P. hemiepiphytica*, *P. crassifolia* and *P. utricularioides*, on the basis of what appears to be a wide opening to the tube as seen from the front. Unfortunately, no close-ups or lateral views of the flowers were available so I could not be sure if the tube was long, funnel-like and continuing smoothly into the spur (*Longitubus*), or whether the tube was short and clearly divided from the spur (*Orcheosanthus*). Indeed the corolla reminded me very much of *P. cyclosecta* and *P. moctezumae* from the latter section so I could not decide for sure.

Working from the starting point of geographical distribution, it was Jan Schlauer who arrived at what must be the correct diagnosis, as this led him straight to the recently described *P. mesophytica* Zamudio (1997). In this article the type locality is described as precisely the area in which Oliver took his photographs!

Oliver is right to express his concern about the future of this plant as it is cited from very few additional locations. This seems to infer that like so many other Meso-American species this Butterwort is a highly localised niche specialist.

If you would like to see larger images of *P. mesophytica* and other amazing shots of El Salvadoran wildlife then why not visit Oliver's website?

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THE *PINGUICULA* OF CUBA...CONTINUED

Paul Temple

on behalf of

Paul Temple, Cristina Panfret Valdez & Hans Luhrs

CUBA REVISITED

I have known Stan Lampard (founder of the IPSG) for many years and through Stan I was introduced to his friend Hans Luhrs as we all share a passion for *Pinguicula*. While they were both visiting my collection, Hans expressed an interest in visiting Cuba should I want to return there. Cuba and my Cuban friends beckoned once again but this time I would take Hans. I planned the trip in liaison with Angela Leiva once again. As always, Angela proved receptive and both Hans and I received a warm invitation to travel to Cuba in 1997. Our plans were to visit Central and Eastern Cuba and I knew in advance that I could look forward to the knowledge and company of my friends Cristina, Jorge and Pedrito as we toured the land.

Communications with Cuba are tedious with telephony being difficult and letters taking up to 6 weeks to arrive in either direction. So despite knowing I had friends there I knew not what to expect as I arrived at Havana Airport with Hans. But our small insecurities vanished as I first saw Pepin (who manages finances and foreign visits to the Gardens) and then Jorge and Cristina (Jorge first simply because he's much taller!). The warm smiles were the best I could have hoped for. Finally Pedrito appeared and the "team" was whole once again. No time was wasted getting to the Botanic Gardens and our first full day was spent planning. This immediately resulted in a change of plans. With our extended time in Cuba (3 weeks) there were two or three spare days at the beginning and we all quickly agreed to spend these in Western Cuba. Great, we would visit all the *Pinguicula* regions.

SOME LIKE IT HOT.....

We left for Pinar del Rio in the extreme West as soon as possible. Within the day we were there and knocking on Armando Urquiola's door once again. On my last (first) visit he had given me a precious slide of *P. albida* taken in the wild. I now returned the favour by presenting

transparencies of our discoveries last time in Cuba. We then set out for the *P. filifolia* site. In the car, we heard from Cristina that the sites I had visited earlier where now cleared of *Pinguicula* as a result of farming. The primary culprit was the creation of Citrus groves (oranges). This was especially sad as citrus grows poorly in the soil preferred by *P. filifolia* while the Citrus will last a few years before it becomes useless or too expensive to maintain. The presence and spread of Citrus farming and the lesser risk from pig farming, means that *P. filifolia* should be considered endangered. Other sites do exist and we visited one such place. The field was fairly typical and yet again showed the presence of grasses, sedges and *Selaginella* on a sandy soil containing much white silicate. The whole area was exposed to full overhead tropical sun and the presence of a lake nearby ensured the soil was always damp. Hans and I had already searched the Herbarium records and confirmed from past collections that flowering in *P. filifolia* occurs at all times of the year. So it was no surprise to find flowering plants varying from blue to white including intermediate shades. However, this time, I discovered that the silicate rich soil was a thin layer over a dark peaty soil. Apparently the pockets of lakes in Las Ovas which so resembled a peatland habitat did indeed reflect the presence of such a soil. *P. filifolia* likes its' roots to be in the damp or wet peat while the stem and leaves are held high and dry and bombarded with intense light, just about as hot as you could hope to find for a non-succulent habitat. A few sundews dotted the ground once again resembling bright red jewels as they glowed in the sunlight. A nearby field proved to be a worthy distraction as it was full of *Drosera* and *Utricularia*, especially where the soil changed from being damp to sodden on the edges of small streams.

.....SOME DON'T!

Within the same area of Pinar del Rio, *P. albida* can be found to, this time with Hans, the team returned to the site we had first visited in 1995. The area was still rich in palm trees and still reminded me of Green Swamp (Carolina, USA). As the time of year was different to my first trip, we were hopeful of better luck. The area is suitable for walking, though dense thickets of palms mean that paths are circuitous. The area is large, and we searched for ages, but at last we were rewarded. There were literally thousands of *P. albida* plants. They grew in small groups,

each group carefully hugging the deep shade created by one or more young palm trees. Slightly older palms had no butterwort colonies beneath them, presumably as the taller growth permitted more light to filter through. This explanation makes perfect sense once you see a *P. albida* plant close up. The leaves are very fine, only a few cells thick and almost transparent (filmy ferns make a reasonable comparison). This small plant, barely 2 inches in diameter, grows as a ground hugging rosette, often partly covered by plant debris. Flowering appears to occur as long as the plant is growing and until seeds develop. So these were an annual species, short lived as they were dependent not just on shade but on very high humidity created and maintained only during the rainy season. We took many photographs but this was made difficult by sudden heavy tropical downpours which weighed down the pure white flowers as well as forcing them to close. Seed was collected and plants are now in cultivation and flowering under conditions mimicking the wild (sandy peaty soil, very high humidity, no direct sunlight, high temperatures).

Interestingly, we failed to find many examples of plants growing under alternative shade, probably because the palms were the only large shade plants with leaves robust enough to survive storms in the area. *P. albida* grows near to *P. filifolia* but not (apparently) next to it (i.e. not sharing the same site) so even a shaded part of a site occupied by *P. filifolia* showed no presence of *P. albida*. This almost certainly reflects *P. albida*'s need for secure shade, found in areas rich in mature shade plants that produce reliable juveniles to create deep shade or where the adult shade plant is itself dense enough to create deep shade. These are usually in areas less suited to cultivation of Citrus or other food crops. Thus, the plant would appear to be less threatened than *P. filifolia*. However, should the area ever be farmed more intensively (crops or animals) or drained for housing, it would quickly threaten the Pinar del Rio colonies. There are reports and records for *P. albida* in other locations within Cuba but we have not been able to find examples in the wild. It is certain (from recent records) that *P. albida* still grows in some mountain areas between Pinar del Rio and Havana (in the Cordillera de Guaniguanico), especially by river banks, using various species of large plants to provide shade. Thankfully these mountain regions currently appear to be under less pressure to covert to farmed land. The ability of *P. albida* to grow at various altitudes (unlike *P. filifolia* which is only found at very low altitude) means it is far less threatened. From inspection of reported

locations, *P. albida* is also able to grow on the red laterite soils of Cuba, a common soil in the Cordillera de Guaniguanico. But these soils are generally poisonous to most plants.

As a final reminder of the climatic needs of *P. albida*, just before we left the area Cristina and I visited a nearby *Utricularia* lake only to be drenched by a downpour. The two sorry creatures that returned to the car resembled aliens more than humans but a change of clothes, some drinks (there was an endless supply of soft drinks) and food soon revitalised us.

MYSTERIOUS MOA

Moving east, one passes Havana and heads toward central Cuba. We passed the Trinidad Mountains at a distance to head due East and travel most of the length of the island. In the east, Cuba becomes very mountainous especially in the region between and south of the towns Moa and Barracoa. Records report *P. albida* in this eastern area of Cuba but we never located any specimens. However, we were there to search for both *P. albida* & *P. benedicta* and we set about that task with gusto.

Within the area around Moa we searched for and found a mountain road used only by miners, forestry employees and, of course, botanists! This was more a track than a road and certainly with a driver less skilled than Pedrito it would have proved impassable. As it was we had left behind the car (actually a minibus) at the hotel and rented a 4 wheel drive vehicle instead, a decision that higher altitudes proved was thoroughly necessary. Travelling up the mountain we passed first secondary jungle and then a forest rich in tree ferns and bromeliads. Still higher we eventually crossed a river and stopped. I quickly found a small oddity growing by the track, the quaint and interesting *Psilotum nudum* which heralds from the times before plants had flowers. We broke through undergrowth and branches, by now my excitement left me oblivious to the scratches my skin was suffering, and descended the steep river bank to find a narrow ledge running along it's edge. It was almost immediately that the shout went up,*Pinguicula benedicta*!

Sure enough, *P. benedicta* is a plant of high altitude, requiring much humidity and damp soil, so this site was typical. No plants were found actually in or just above the river although we were unsure as to why. It could be that flood water drowns plants lower on the bank, or they could simply be washed away or the plants may be intolerant of waterlogged

soil. It seems likely that the force of the river in flood keeps the low edges of the river bank clear of butterworts no matter what else is true. However, some 1 metre above the river and spreading over a band some 1 metre wide, a mass of *P. benedicta* plants could be found spreading for at least several hundred yards. We know because the ever intrepid Hans decided to follow the trail to find where the plants ended, and we subsequently lost all trace of Hans for what seemed like hours! The plants we found were small, barely 1-2 cm in diameter, forming a tight rosette with leaves turned up at their edges. Most were not in flower but two flowering specimens revealed the full glory of the deep purple flowers. However, there was a mystery. Our ability to find this site so quickly was no accident as Jorge and Cristina had been there the previous month. At that time all the plants were flowering. But along with flowers, the plants had all been much larger, at least double the size. How could all of the plants have reduced in size by 50% in one month?

By way of thinking aloud, perhaps:

- the parent plants had died and those we were looking at were new immature specimens grown from seeds within the last month
- *P. benedicta* has a dormancy period during which the plants shrink in size by 50% but retain all other characteristics of form
- larger plants had somehow been ripped from the site leaving only smaller plants
- larger previously mature plants had died leaving a second generation that was already growing and beyond seedling stage one month previously

Unfortunately, none of these possibilities is fully supported by the evidence. It seemed unlikely that seeds could germinate and grow into 1-2 cm plants in just 1 month (and this is further supported by new evidence that this species is not a fast grower). I'm personally not aware of a dormancy period for a plant that results in such a significant change in size but does not affect any other feature of the plant (including its ability to flower). I can not demonstrate how mature plants would or could be ripped from a high bank leaving no other signs of disturbance above or below yet allowing smaller plants to remain. And no sign of the death of an entire generation could be discerned (though with the levels of tropical heat and humidity and, no doubt and abundant wildlife, it does seem



Pinguicula mesophytica, a tree dwelling species inhabiting one of the high mountains of Montecristo National Park in El Salvador.



Pinguicula lignicola with enlarged pedicel.



Flower of *Pinguicula antarctica*.



Detail of the densest and largest *Pinguicula crystallina* stand in the Daglari Mountains, Turkey.

possible, if unlikely, that such debris could be cleared naturally). This remains a fascinating mystery that both Hans, Cristina, Jorge and I would love to resolve.

At first sight there would appear to be no threat to this type of location. However, the mountain air would present the greatest threat. The east of Cuba is an important mining area, particularly for Nickel but also for other minerals. The factories working with the raw ores produce thick smoke that pollutes the air causing acid rain. There was no evidence that this was causing a problem to *P. benedicta* but any damage to the surrounding forest could be disastrous. Direct mining seems unlikely to be an immediate risk as plenty of areas present easier targets than rivers and river banks, but should communism end or relax in Cuba, the consequential influx of US Dollars and business could rapidly change this view. Similarly, the use of timber is not currently a direct threat but political changes could see this change too. Happily, the Cuban government is a good example of a government willing to apply pragmatic conservation plans to sensitive areas as evidenced by the large number and size of conservation areas in Cuba.

THANK HEAVEN FOR BROKEN FAN BELTS!

Within the same Moa to Barracoa mountain area, a host of mountains and separate mountain groups create a botanical wonder, rich in endemic flora. So it isn't really a surprise that yet another butterwort is found here. But the type of *Pinguicula* found here is a surprise, as it is one of a tiny number of epiphytic species found in this genus. This is the species *P. lignicola*, found growing on trees using its roots to hold fast to the tree bark. The opportunity of finding this plant created great excitement with both Hans and myself and this heightened as we heard that Cristina and Jorge had visited a *P. lignicola* site last month too.

The story was that Cristina and Jorge were out botanising in the mountains when their vehicle broke down. They of course left the vehicle leaving the driver, as expert, to repair it. As keen botanists, both felt disinclined to miss this unplanned opportunity to look around. So both stepped off the road immediately beside the vehicle into the first available clearing. Their to their astonishment they found themselves amidst an incredibly rare colony of *P. lignicola*!

One day after visiting *P. benedicta*, having again taken out the insurance

of using the 4 wheel drive, we ascended to this known *P. lignicola* site. This proved fairly easy to find though once again challenged even Pedrito's driving skills to their limit (and indeed even Pedrito could not get the 4 wheeler to go further than this site as the track became treacherous rock with deep gullies and fissures.

Ascending the final stretch of this climb, we entered a very high altitude mountain clearing. Within the clearing grew a half dozen trees and on two of these we found *P. lignicola*. The plants we found were less than 2 inches in size, with many sword shaped leaves originating from a central crown (resembling a sea urchin with flattened spines). The plant was growing attached directly to bare bark, with no sign of moss on the bark. Experience with a similar species (*P. casabitoana* from the Dominican Republic) suggested that the absence of moss exposed *P. lignicola* as intolerant of water and this later proved to be true. Plants grew in all aspects, horizontally and vertically, some partly shaded by trunk or branch and others exposed to direct sunlight. Although all were a bright green colour (typical of most *Pinguicula*), a single red-brown plant was found, probably a single freak of nature but very attractive. The plants were not in flower though they had been the previous month. However, seed pods were seen, though attempts to grow plants from these failed (this was tried in England and Holland).

At this high altitude, temperatures are remarkably high during the day but fall rapidly at night. This results in cloud cover enveloping the area each and every night creating a zone of 100% humidity. The altitude also results in a constant breeze, especially at night. This is important as the breeze and daytime heat both help dry out the *P. lignicola* plants while the 100% night humidity provides all the moisture the plant requires. Again, the plants in this area are not yet threatened by farming or indeed by much else. However, the risk of acid rain damaging the trees on which *P. lignicola* grows must be considered to be very real. Arguably more of a threat, *P. lignicola* is a niche grower and any change to the climate could quickly result in conditions the species can not tolerate. This is beyond doubt Cuba's most stunning and rarest *Pinguicula*. Very few colonies are known and few plants are found in a colony. A search of this site revealed plants on only two or three trees plus a single additional plant some 300 metres away! No reasons could be found for why the plants were so restricted but it is likely that either micro-climates, distribution mechanisms or both of these play some part in the limited

distribution and numbers of this species.

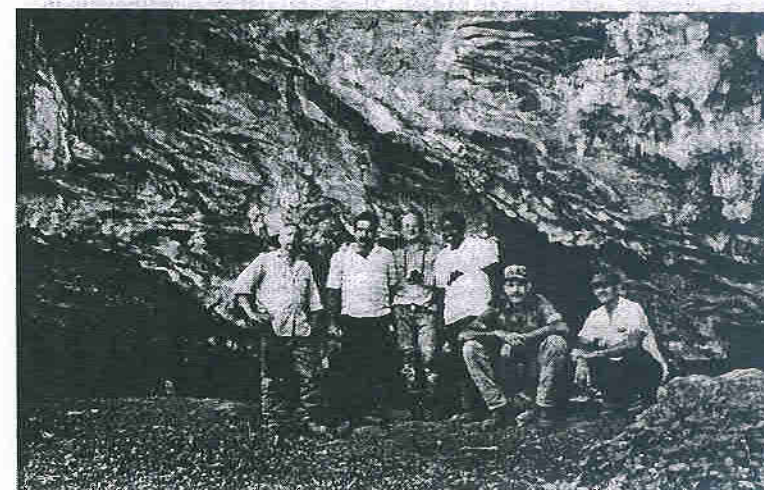
THE ESCAMBRAY MOUNTAINS

And so we left the Moa-Barracoa district stopping only for a short amount of sightseeing. This then saw us travelling West again, back toward Havana but not before we went to the Escambray or Trinidad Mountains. Our first stop was Cienfuegos. One day of hard driving saw us arrive here fairly tired, hot and ready to relax. Fortunately we were made welcome in the charming guest House of the Cienfuegos Botanic Gardens, a rare and gratefully received treat. A recent hurricane had done some damage to the gardens but this did not prevent both Hans and I from being impressed at the large palm collection on show. There is a particularly nice grouping of *Microcycas* plants by a lake that bodes well for the future of this plant that is threatened in the wild (the Havana Botanic Gardens also has an intensive rescue plan for *Microcycas* and has had tremendous success in germinating and growing this sensitive plant).

But returning to our subject, we set out the next day to the site Jorge, Cristina and I already knew. Hurricane and storm had damaged the area making travel by road very difficult. Soldiers guarding the area watched in amusement hoping Pedrito would commit to driving down an impassable road but Pedrito failed to be ensnared by such a trap! After some false trails we eventually met up with and engaged the services of a steward responsible for the protection of this area. Since my last visit the protection on this area had increased and our new companion now allowed us the freedom to search the area without risk of being challenged and excluded by the army (who were rightly doing their job). So with full permission and the guardian in tow, we proceeded via a new route to the cliffs. Naturally enough they were still there, but horror of horrors they were terribly overgrown. The surrounding land was deeply overgrown and the cliffs themselves were covered in brush. We searched. No luck. We searched some more. No luck. Hans tried looking at the furthest extremity of the cliff (where we had not seen *Pinguicula* ever before) and again found nothing. So I climbed the cliff from its rear end and then, using a caving ladder borrowed in England I descended (I hate heights!) to search the cliff face for plants where they had been two years before. Nothing. And then, helplessly hanging on at some height whilst being unable to move quickly in any direction, up came the shout "aqui"



Fast running Rio Jaguani, habitat of *Pinguicula benedicta* growing on the river's steep and rocky banks.



Left to right; Hans, Pedrito, Paul, Christina, Jorge and guide, in front of what was one of the few known sites of *Pinguicula jackii*. Due to drought over the years this site had become a 'lost' one.

(over here). Jorge or Cristina had found a plant. Pausing only for Hans to take a photograph of me hanging close to sudden death, I climbed back and both Hans and I descended on the sorry specimen of a plant. It looked pathetic, nothing like the juicy specimens we had seen two years since (and even they were clearly not in full leaf). This site appeared less than healthy and somehow I thought that another visit in two more years would herald sad news.

SUMMARY

And with that, the field trip was over. It may seem to readers that the trip ended on a low note but that really would not be true to say. For Hans, in a single visit he had managed to see all the Cuban butterworts he had hoped to see. We had both seen and/or made friends. And I, of course, had had the opportunity to revisit sites, compare differences over two years, and see species I had previously not seen.

It was a fantastic opportunity by any standards. And it was successful in many different ways. *P. filifolia* is already in cultivation and it is possible that other Cuban species will be introduced too. Plans for this are under discussion constantly between myself, Hans and the relevant people in Cuba, most importantly with Cristina.

All the Cuban plants are very difficult to locate in the wild. The laws of Cuba prohibit entry into many of the national parks unless a licence (or permission) is obtained in advance. Such licences are difficult to obtain. In addition, the national parks are guarded by the army and inappropriate access would not be tolerated. Access to plants can be gained through the direct assistance of the Botanic gardens when co-operating in field trips. However, the current status of the Cuban economy means that visitors need to be prepared to fully fund expeditions including all costs of those accompanying from the Botanic gardens. In any event, while visits to the plants may be possible, removal of any type of plant material (plants, seeds, cuttings) is forbidden.

Access to all the plants is far more difficult in the rainy season. Indeed, while *P. filifolia* & *P. albida* are accessible then if suitable clothing is worn (or if you don't mind getting very wet!), other species may be impossible to visit as roads can be flooded, too soft to travel (especially in Eastern Cuba) or washed away.

All the *Pinguicula* of Cuba, with the exception of *P. lignicola*, can be

seen at the Jardín Botánico Nacional, Cuba, although this would normally require agreement in advance of any visit. Some species may also be available for viewing at the British National Collection of *Pinguicula* (c/o Paul Temple), though again this would only be by appointment. No seeds or plants sourced from the expeditions described above are currently available for distribution unless advertised through legitimate retail outlets.

Hopefully work will continue in this. Hans already concentrates on the *Pinguicula* of Mexico. I have made my speciality the Caribbean and both Cristina and I are trying to formalise opportunities to work together on Cuban and Caribbean CP studies. There is plenty of opportunity for co-operation on ideas, projects, etc. between Cristina, Hans and myself and possibly elsewhere in the Caribbean. All these are under discussion as and when time allows. And already some interesting discussions have led to new understandings which may themselves lead to further articles in the near future.

ACKNOWLEDGEMENTS

We would like to express sincere thanks to the various people who have assisted in some way, such that our understanding of the Carnivorous Plants of the Caribbean, and notably the *Pinguicula* of Cuba, has been expanded. These people include:

In Cuba (Jardín Botánico Nacional).

Cristina Panfret Valdes is a botanist working for the Jardín Botánico Nacional, Cuba. Although Cristina works on various families and genera of plants, her main passion is for Carnivorous Plants. Cristina is the only Carnivorous Plant specialist in Cuba & is credited with the discovery and identification of *Drosera moaensis*, a new and endemic species found in the East of Cuba.

Dr. Angela Leiva (Jardín Botánico Nacional) - director of the Jardín Botánico Nacional, who has been instrumental in facilitating the relationship between Paul Temple and the Botanic Garden, as well as allocating staff's time and effort to the subsequent and ongoing work on the carnivorous plants of Cuba.

Dr. Jorge Gutierrez Amaro (Jardín Botánico Nacional) - botanist and expert on the distribution and locations of Cuban plants in the wild. Dr. Gutierrez was the local expedition leader of both the 1995 and 1997 field trips that

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 m².

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 (20°C) 472 S/cm, and total alkalinity of 5.15 meq/l i.e. ca. 310 mg/l HCO₃. 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 occurring 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:

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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

placed the plant inside under artificial light at temperatures between 10-15°C in a small propagator to maintain humidity.

In June 1998 a flower appeared for the first time rousing my curiosity and hopes to produce the first photograph of the flower of this rare species. When the flower opened it fitted exactly the description of Casper (1966) and Ernst (1961). The corolla reminds me of *P. lusitanica*, though Casper talks of "the *P. alpina* of the Southern Hemisphere" a point of view I do not share!

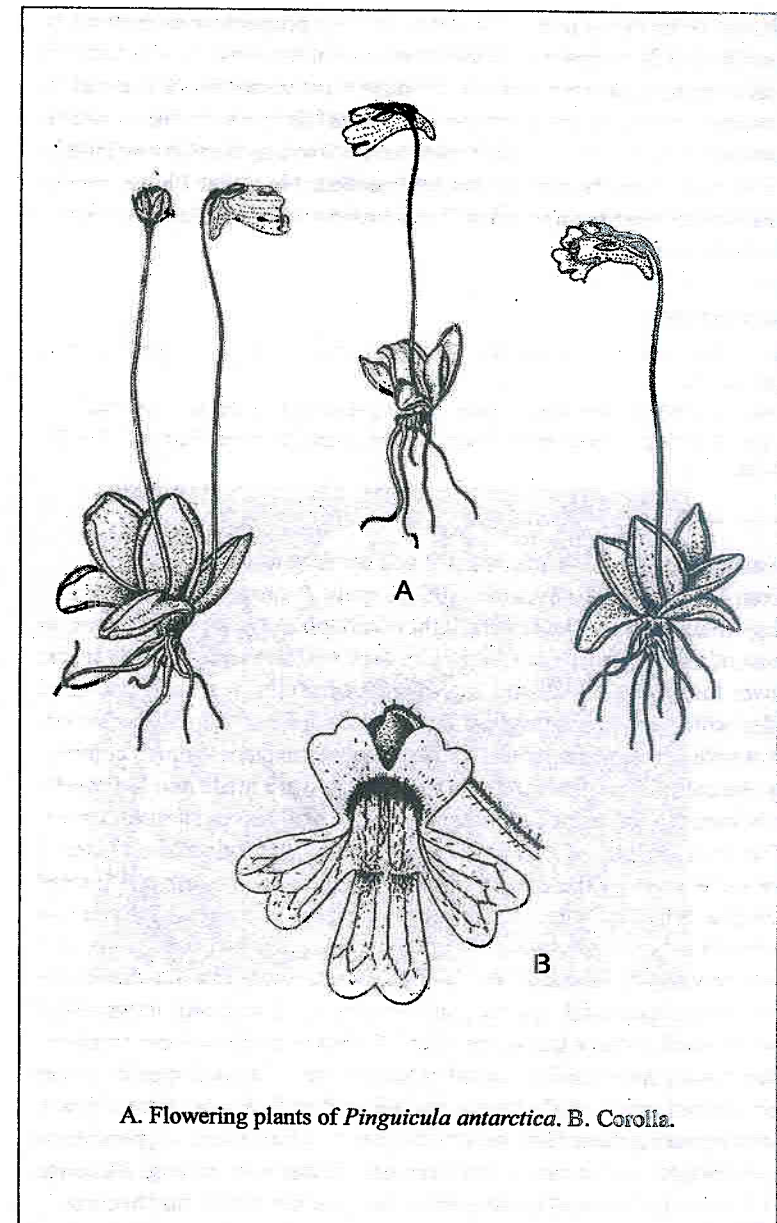
The rosette comprises 6-10 leaves, up to 2 cm long and 1 cm wide, with an up-turned margin. When exposed to direct sunlight the veins turn almost black. Interestingly, the roots are quite thick and up to 3-4 cm long.

The corolla consists of two lips; the upper lip further divided into two roughly rectangular lobes which are white, about 2.5 mm long and slightly notched; whilst the lower is divided into three rectangular to obovate, white notched lobes which are about 4 mm long and 3 mm wide. The flower has a pale yellow palate, located at the base of the centre lobe of the lower lip. Quite unique is the colouration of the corolla tube strikingly marked with dark violet parallel venation. The spur is short, up to 3 mm long, forming an angle of about 90 degrees to the tube, and is yellow coloured with violet veins.

Although I have not pollinated the flower myself, a seed capsule formed. I cannot be sure that the species is naturally self pollinating, but as no other butterwort was flowering at the time cross-pollination could not have occurred. The black seeds were sown soon after harvesting and showed a high rate of germination (90%).

Similar to all other species of *Pinguicula* from the Andean mountain range *P. antarctica* is homophyllous; that is it forms only one type of leaf, and does not produce hibernacula. This fact led Casper to the conclusion that the species from South America have retained their "tropical heritage" (1966). To elaborate, most of the temperate species of Europe/Asia/North America have adapted their life-cycle to the climate of winter by producing a bud (hibernaculum) to survive the cold. Since the temperate species of South America have not done so it implies they have evolved independently from the homophyllous ancestors from the Mesoamerican/Caribbean region.

I do not know if the plants die in winter or if they survive with the complete rosette covered by snow. My plants grew well through the summer. In



A. Flowering plants of *Pinguicula antarctica*. B. Corolla.

autumn I decided to house my plants inside a propagator as previously described. After some weeks the formation of new leaves was reduced both in terms of number and size, then the plant turned black and rotted. I'm not sure if this was a natural end to the life cycle or due to wrong cultivation conditions. I didn't want to risk leaving the plant outside in winter due to the lack of habitat information. Now that I have several new plants raised from seed I will experiment with one plant by leaving it outside in winter.

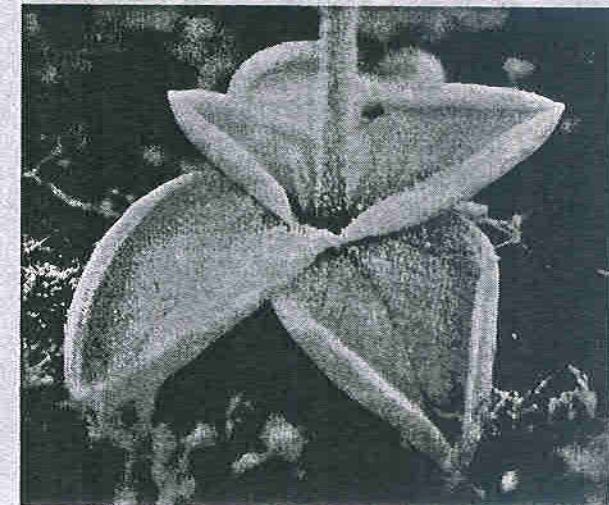
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 Ernst, A. (1961): Revision der Gattung *Pinguicula* - Bot. Jb. 80: 145-194
 Lamb, R. (1992): Carnivorous Plant Tour of South America, Part 2 - CPN 21: 91-94

In addition to Oliver's article I will add the following experience. From July 1998 till November 1999 I grew *P. antarctica* outside in a large shade tunnel. The filtered light is enough to grow healthy plants, as most of my *Sarracenia purpurea* turn dark red, and temperatures are far lower than those in full sun. I grow it successfully in a large container filled with pure living sphagnum. In the mild winter of '98 with occasional frost with temperatures up to -8 °C the plant seemed not too much bothered by the cold. During this time no new leaves were made and the rosette remained the same until early spring, when new leaves started to grow. This reminded me of *P. hirtiflora*, a species that survives the winter in the same way. By the end of spring flowers fail to appear and instead new plants had appeared around the old rosette like a cluster. Later that year as I took the plants out of the container, I was surprised to see that each new rosette (already full grown) was born from a stolon attached to the short rhizome of the parent plant, and provided with one or two single roots a small distance from each other. No rests of gemmae were observed. This is very much unlike the other known stoloniferous species where they indeed grow out of gemmae including *P. orchidioides* from México. After repotting them I had moved the plants to the unheated greenhouse to overwinter just in case.... but from here things went wrong. Although all the plants flowered in late spring this year the leaves had become

infected by mould due to lack of enough airmovement. On top of that it was already too late for most of the plants when I found out that the sphagnum I had used for repotting was infected with crane-fly eggs, as the larvae had eaten away the rootsystem. Because it is actually too warm in the greenhouse, the two plants that survived are placed back outside in the shade tunnel and have resettled themselves since then.... I will come back to this with new information hopefully in the next issue.

Hans Luhrs



Rosette of *Pinguicula antarctica* cultivated by Oliver Gluch.