Propagating this plant has proven to be fairly easy and can be done using several methods. Seed, when available, germinates readily although growth is somewhat slow.

Mature plants will often produce plantlets from the side of the crown. When this occurs, these plantlets can be removed and potted up. In addition, the entire crown may divide down the middle producing two mature plants.

However the easiest-yes,there is an easy way to propagate this plant is by leaf cuttings. So far, in my experience, this species has not exhibited the same reluctance to strike from leaf cuttings that other *D. petiolaris* forms show.

When I first received the plants, I automatically took cuttings as a precaution against the loss of the plant. These leaves were buried about half way in long fiber sphagnum moss. Being familiar with the strike problems of other members of this group, I was quite amazed to see plantlets poking through the moss in three weeks. Overall I had about an 80% success rate.

After examining failed leaves from this and other attempts, I have determined that when taking cuttings it is vital to "cut" the petiole as close to the plant as possible. Leaves that are cut off too far above the leaf stem junction invariably fail. The best way I have found to take the cuttings is to grasp the leaf as close to the plant as possible and pull gently downward until the leaf comes free.

In subsequent cutting attempts I have found that unless the leaf is obviously dying, age has little effect on success. In addition, temperature seems to play only a small role as well. I have had pots of cuttings strike with equal success indoors under lights and outside subjected to variable day-night temperatures.

In anticipation of questions regarding the availability of this plant for trade, at the moment I have no spares available, although I anticipate having some soon so feel free to inquire. Although I have had great success with cuttings I have found that the resulting plantlets are often quite sensitive to disturbance and should be allowed to become well established before repotting.

Pinguicula villosa
The Northern Butterwort

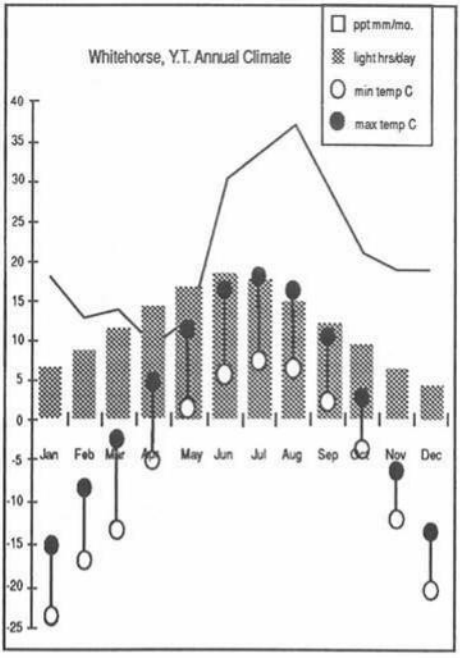
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Introduction

Pinguicula villosa, the minute butterwort of northern Canada and Alaska, has been commented on sparsely to date and studied by few. Rarely cultivated and even more difficult to obtain, this butterwort prefers to grow in the remote and often inaccessible north which helps contribute to its status as a "rare" plant. Despite being labelled as a very difficult plant to grow, if careful attention is given to the stringent culture requirements of *P. villosa* then successful and flowering colonies can be grown. Ranging from northern British Columbia [59 degrees latitude], to within 160 kilometers [100 miles] of the Arctic circle, 16 study sites were visited and observed over a four year period. The accompanying map shows the study areas which consisted mainly of Canada's Yukon Territory and included parts of northern British Columbia and eastern Alaska.



Alaska, BC, Yukon and study sites.



Yukon's annual climatic data.

Morphology and description

The basal rosettes of *P. villosa* resemble tiny gaping green mouths due to their highly inrolled leaf edges. The plants, each with two or three leaves which last the entire season, are found set into the tops or sides of Sphagnum hummocks.

The butterworts size and color varied with the amount of sunlight received during the season. Rosette diameters ranged from 1.0 centimeter in full sun to 2.5 cm in heavy shade. Leaf coloration ranged from a very light green in shaded sites, to becoming lightly suffused with copper color when found growing in full sun. (See photo on page 78 (top).

The flowers of *P. villosa* are a medium purple in color with a white rimmed yellow-orange palate that is striped with thin black lines. The flower stalks are unique as they are covered with fine hairs giving them a furry appearance. Flower and stalk size were also found to vary with light exposure. In full sun the flower stalks averaged 3 cm in height with tiny 0.5 cm flowers, while in heavy shade *P. villosa* grew flower stalks up to 6 cm tall with larger 1.0 cm long flowers.

Seed production in *P. villosa* was always minimal in the wild and appeared to be partially weather dependent. Unless optimal conditions occurred during the short growing season, only a fraction of the butterworts observed would produce flowers. Seed capsules were not always produced and frequently bare topped stalks were seen in the colonies studied. When seed capsules were produced, seed production was found to be sparse. In no instances were insect pollinators seen.

The seed capsules of *P. villosa* differ from the regular pointed-top tear-drop shape as seen with *P. vulgaris* and *P. macroceras*. In addition to the basic tear-drop shape there are two wings emerging, one on each half of the seedpod. The short wings project upward to meet and form a flat horizontal ridge at the seed capsule's top giving it a stubby upside down missile-like appearance.

The short growing "window" for *P. villosa*, as shown on the graph of annual climatic conditions, results from the long harsh northern winters which leave approxi-



Basal rosettes in Sphagnum moss with *D. rotundifolia.*



Rosettes with penny for size comparison

mately only a four month growing season. In its natural habitat, *P. villosa* does not put up its few leaves until late May, followed by flowers in late June. Dormancy and the accompanying hibernaculum formation is achieved by early August. The reason for the early dormancy is that even in the southern Yukon, frost frequently appears by the middle of August.

Locating the plants

First encounters with this inconspicuous insect-eating plant often end up with many being trodden upon before the plants are spotted. Usually it is the showy yet equally small flower, not the basal rosette of leaves, that first catches the eye of the individual when out in the field. However, once the appearance of butterwort's habitat is recognized and its biology is understood, they can be located from a distance. By watching for the plants habitat instead of the plant itself, searches for *P. villosa* will have a higher degree of success.

In addition to the small compact species of Sphagnum moss that the butterworts grow in, other plant associates include *Picea mariana* (Black Spruce), *Vaccinium oxycoccus* (bog cranberry), *Rubus chamaemorus* (cloud berry), *Drosera anglica, D. rotundifolia*, as well as *Platanthera* and *Cypripedium* orchids.

Home cultivation

The only method for success when cultivating *P. villosa* is to mimic the natural conditions under which they naturally grow, in particular their substrate and growth/dormancy requirements. With proper cultivation technique the butterworts will produce higher numbers of flowers in culture than in the wild where they are often stressed.

Cultivation mediums best suited for *P. villosa* are the smaller and more slower growing forms of Sphagnum, which will not overgrow and smother the tiny butterworts. By using live Sphagnum moss, a continually moist and acidic environment is always ensured.

Dormancy requirements and seasonal cycles of plants from increasingly northern latitudes, such as for *P. villosa*, are difficult to alter. Strong responses to changes in photoperiod, light intensity and temperature automatically trigger the plant's biological clocks to begin dormancy processes and cease growth. Once dormant, the butterworts can be kept in the fridge until spring arrives to stimulate their natural winter conditions. Freezing of the plants is not required or even recommended as it may prove fatal to them. It is advisable to check the stored plants periodically to give them an air change and to check for fungus or mold attacks which may require treatment. As is indicated by the climate graph, the butterworts should be brought out of the fridge in early May to imitate their natural seasonal cycle and begin growth once again.

Water levels should always be at least 10 cm [4 inches] or more below the moss surface. In nature, the butterworts are usually located further up from the water table and rely on the Sphagnum's wicking effect to keep them moist on the hummocks sides and top. Watering from the bottom by the tray method is recommended.

Lighting requirements can range from partial shade to full sun. When *P. villosa* is cultivated at more southern latitudes, growth begins much sooner due to the earlier occurring spring conditions and increasing daylength. In southern British Columbia and northern Washington state, cultivated plants which were not stored in the fridge overwinter will usually be in full bloom by late April. These same plants will have reverted to dormancy however by the end of June due to their short growth season so it is best to keep them stored in the fridge, as stated previously, and start them later in the spring as they would have naturally. So far, plants in cultivation have shown no problems coping with the shorter daylength during the not-as-long summer days at lower latitudes.

Any attempts for off-season growing of *P. villosa* will require artificial growlights to break dormancy and to simulate their required natural photoperiods. Success may be achieved but it is important to remember that chances of plant loss are greatly increased with such attempts.

Temperature requirements of the butterworts are not stringent during the summer months, but avoid excessively high heat for prolonged periods. Once the plants have begun dormancy, they should be placed in a cooler, shaded area for a few weeks and then stored in the nonfreezing portion of the refrigerator until the following spring.

Feeding requirements are minimal with *P. villosa* and should only be done naturally by placing fruitflies or equally small insects on the leaves. Sometimes very small amounts of skim milk powder can also be used successfully as food.

As with most insect-eating plants the overall performance, seed and gemmae production will be enhanced by the season's end with such supplementary feeding. Each time the dormant plants are brought out of refrigeration for their next growing season, the gemmae should be separated and planted to help establish a larger colony of plants.

Summary

Surprisingly, *P. villosa* appears more frequently than expected in the boreal Black Spruce-Sphagnum habitat which predominates in much of northern North America. Although more tedious and time consuming to grow than your easier types of carnivorous plants, such as the Cape sundew, colonies of *P. villosa* will reward you with a mini landscape studded with many flowers in the spring. Pinguicula fanciers should find this tiny butterwort's contrast in size with their regular species intriguing. The size of *P. villosa* should also appeal to those who grow other miniature carnivorous plants such as the pygmy sundews. If you are fortunate enough to be able to locate a source to obtain these tiny butterworts from, you will find growing them challenging but well worth the trouble.



P. villosa at Angela Lake—close up of flowers.



Group of pings in bloom along open ground.