

Close-up of the large *P.* from Ayautla, Oaxaca

stick is on the whole plant and not only on the upper sides as in other examples of this genus.

It is to be assumed that the species grows on the south side of the steep walls from Rio Uruapan and its source until above Ayautla where the walls peter out. The plant can easily be propagated by leaf cuttings and seed It is robust and withstands the hardest rains since it is well attached to the walls.

sia streptophylla. Some of the best climbers of our boys reached the plants where photos were made which turned out to be spectacular. What was unexpected: The leaves catch insects on the upper and lower sides, which means that the substance to which the insect



Insect trapped on the **underside** of the leaf.

The Possible Functions of the Thorns of *Nepenthes bicalcarata* (Hook. f .) Pitchers

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The tropical pitcher plant, *Nepenthes bicalcarata* Hook. f., is a common plant in the great peatswamp forests on the northwest coast of Borneo. It is readily distinguished from all other *Nepenthes* by the two large thorns (or "fangs") which protrude downwards from the base of the pitcher lid (Figure 1). These thorns may attain lengths of three centimetres on large specimens, and some of the largest pitchers may have a capacity of more than half a litre. Both the lower and upper pitchers possess the thorns. In terms of the plant (rather than the pitchers), *N. bicalcarata*



Figure 1. (right) An upper pitcher of *Nepenthes bicalcarata* Note the two thorns below the lid. This pitcher is about 12 cm in height.

is physically the largest *Nepenthes* species, with leaves up to one metre long and stems which may reach 20 metres in length, and four centimetres in diameter.

Various functions have been suggested for the thorns, the best known theory having been put forward by Burbidge (see Slack 1979), who suggested that the thorns protect the contents of the pitchers from arboreal mammals (such as tarsiers, lorises and monkeys), which reach into other *Nepenthes* pitchers and feed on the contents. The thorns would certainly prevent a mammal such as a tarsier from doing this to *N. bicalcarata* pitchers. Dodd (1982) discussed possible roles for the thorns of *N. bicalcarata*, and although he did not come to any conclusions as to their function (if any), he did not think that they played any role in catching of prey by the pitchers.

In 1989 and 1990, I had the chance to perform field research on a number of lowland *Nepenthes* species in Brunei Darussalaam, a small country on the west coast of Borneo. One of these species was *N. bicalcarata* . After observing the plants for several months, I came to the conclusion that the thorns have no role in protecting the pitchers' "catch", because monkeys and tarsiers which feed from pitchers do so by ripping the pitchers apart (at the sides), rather than by reaching in through the mouth. Pitchers of *N. bicalcarata* were not spared from this fate, though the frequency with which they were damaged was considerably less than for other species, such as *N. rafflesiana* Jack.

I also noticed that many insects (crawling and flying) visit the pitchers and crawl onto the thorns to feed on nectar which accumulates at their tips. These insects, particularly larger ones such as cockroaches, often experience difficulty in maintaining a foothold whilst on the thorns. It is also noteworthy that the tips of the thorns are nearly always positioned over the centre of the pitcher mouth. Insects which lose their foothold while crawling over the thorns fall straight into the pitcher fluid,without touching the sides of the pitcher.

I was unable to perform any experiments to determine whether or not the principle role of the thorns is to assist in the catching of prey, but my observations suggest that it may be. It is certainly not true that the thorns of *N. bicalcarata* serve to protect the pitchers' prey from marauding mammals. Having eliminated one hypothesis, I am afraid that I cannot provide anything more than circumstantial support for another! It would be most interesting to perform field-based experiments to find out the exact function of these thorns, if indeed there is one.

Literature Cited

Dodd, C. 1982. The most dangerous (looking) *Nepenthes*. *Carnivorous Plant Newsletter*. 11(3):64-65.

Slack, A. 1979. Carnivorous Plants. p. 82. A.H. and A.W. Reed, N.S.W., Australia.

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