Fortunately, I propagated two tiny plants from it before this happened and these are still small but are showing the same strange habit.

The remaining plant is "D. muscipula forma linearis." It also has the basic "erecta" habit and just how it differs, I cannot tell from my tiny plants. So far its petioles seem more linear and less tapered in shape and the teeth on the trap are shorter and finer; but as the plants are only small, these characteristics could disappear, so here it is clearly a case of wait and see.

## WHY A FLYTRAP IS NOT A BEAR TRAP

by Stephen E. Williams

The obvious similarity in form between the structure of a Venus' flytrap and a bear trap has on occasion led people to carry the analogy too far and draw a number of false conclusions about the mechanism of movement and insect capture in Dionaea. A review of this subject, which is apparently more confusing than first meets the eye, may help to avoid further false analogies.

A look at both a flytrap and a bear trap--of the type often depicted in cartoons--reveals that:

1. Both have two lobes which close together.
2. Both have teeth on the edges of the lobes.
3. Both have a trigger (or triggers) inside the lobes which spring them.
4. Both have bait* which attracts the victim to the trap.

These similarities easily lead to the formation of further, but false analogies between the bear trap and the flytrap. For instance it would be tempting to draw the analogy that the "teeth" or projections along the margin of the flytrap lobe might bite into the prey, or to conclude that the midrib of the flytrap acts as a hinge. Indeed the second of these analogies has been seriously made in various scientific papers. It does not require scientific training, however, to easily confirm the falsity of both of these analogies.

Observation of the flytrap reveals that it imprisons its prey between the lobes and that the cavity formed serves as a gut during the digestive stages. The teeth on the lobes serve to bar the escape of a sufficiently large insect and not to grasp it or stab it to death. By contrast the bear trap grasps its prey between its jaws and holds it until the trapper returns. In this case it is the trapper who provides the digestive apparatus. Charles Darwin placed a great deal of emphasis on the fact that the teeth on the lobes of the flytrap allowed the little ones to get away thus saving the leaf the energy consuming process of digesting an insect which would only yield a small return.

That the midrib of a flytrap is not a hinge is also easily observed. Most fully expanded leaves have lobes which have a concave outer surface. During closure it may be seen that the lobe reverses its form and its outer surface becomes convex. The majority of the movement occurs because the lobes mechanically flip inward. This mechanical flipping of the lobe amplifies a biological response in the lobe epidermis that is more sophisticated and is not well understood. The movement occurs in the lobes of the trap, not in the midrib and thus the midrib is not a hinge. On the other hand the bear trap consists of a spring loaded set of jaws connected by a hinge at each end and the closure of the rigid jaws consists of the rotation of the jaws on the axis of the hinges. There is no flipping (or flexing of the jaws) involved.

A consideration of the differences between flytraps and bear traps offers an explanation of why there are no reports of Venus' flytraps capturing North Carolina's bears but it does not really tell us how a Venus' flytrap closes. There are a number of experiments which have been performed which give us some indication of how this movement occurs. There is one hypothesis which I believe is the most plausible. Some of these experiments were done using Dionaea and others using Aldrovanda, which presumably has a very similar mechanism of movement.

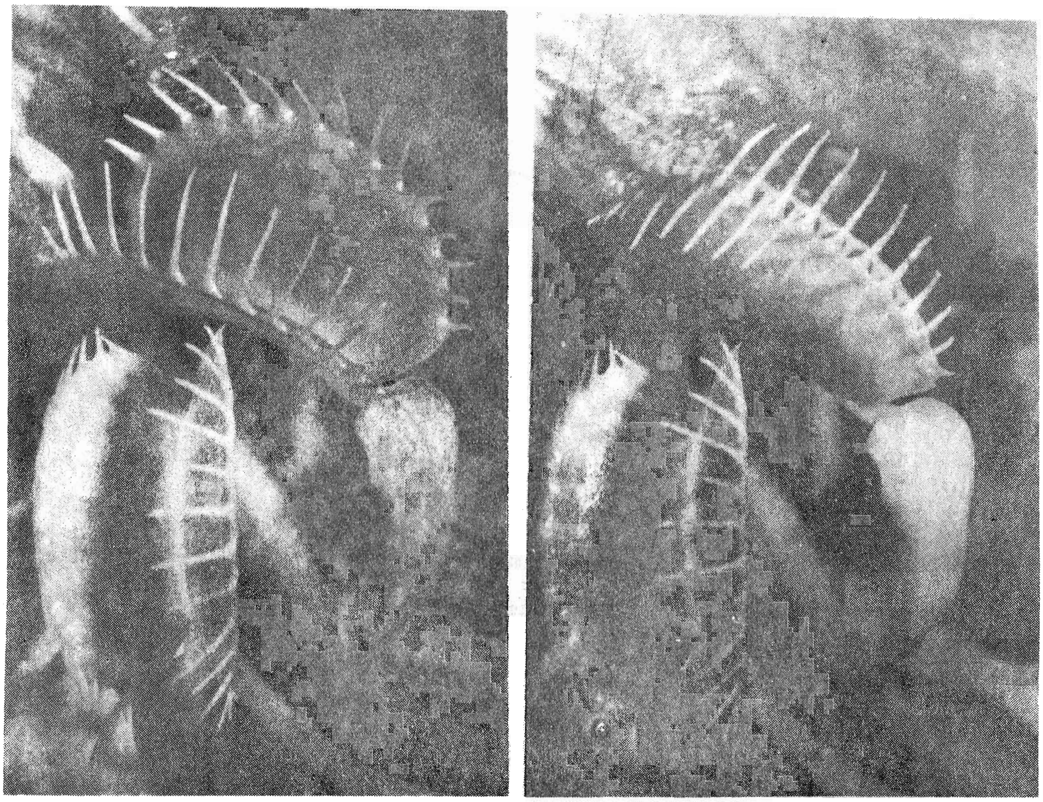
*The outermost sessile glands of the Dionaea leaf have been called alluring glands. Firm evidence that they do attract insects has yet to be established but it does not seem unlikely that there is some sort of attracting agent.

Work with Aldrovanda done by Joji Asheda in 1934* indicates that all ofthe movement in the leaves of that plant occurs in a "motile zone" about one-third of the way up the lobe and that the outer epidermis is under stress when the trap is fully open. After the movement the outer epidermis does not appear to be under stress. Asheda stated the very attractive hypothesis that the cells of the inner epidermis and the outer epidermis are both turgid when the trap is in the open position and that triggering the trap causes the cells of the inner epidermis to loose water and become more flaccid (as the plant does when it wilts). Asheda believed that the outer epidermis would then expand since it was no longer pushing against the inner epidermis. This would cause the slight increase in length of the outer surface of the lobe needed to flip it inward. Data gathered earlier by William Brown in 1916** indicates that the inner surface of Dionaea does not shrink significantly during the closure but that parts of the outer surface of the lobe expand as much as 8% in length. Although Brown interpreted his data in another way it is consistent with Asheda's ideas about how the trap moves. Although Asheda's papers are well reviewed in Lloyd's monograph, they are in English and it is worth taking the time to read the original work.

It would appear that the flytrap closes by a loss of water from cells on its inner surface which allows the cells on its outer surface to expand to their full size resulting in a slight curvature of the lobe which is able to flip it from its outward curving position to an inward curving position. The result of this movement is the creation of a prison with a barred opening that prevents the escape of the creature ensnared within. This trapping mechanism bears little resemblance to a bear trap if all the particulars are considered.

* J. Asheda: Mem. Coll. Sci., Kyoto Imp. Univ., Ser. B. 9, 141-244 (1934)

** W. Brown: Amer. J. Bot. 3 68-90 (1916)



Leaves of Dionaea x 4. When the trap is open the outer surface of its lobes are concave. When the trap closes the outer surface of its lobes are convex. The movement occurs in the lobes not in the midrib. Photographs were taken with equipment which was kindly provided by Dr. Natalie W. Uhl of the L. H. Baily Hortorium, Cornell University.

## THE DISTRIBUTION OF DARLINGTONIA CALIFORNICA

by Larry DeBuhr

Mr. Ziemer in Volume II, No. 2 of CPN wrote a very interesting note and discussed the local ecological conditions at several Darlingtonia bogs in Del Norte Co., California. I would like, as a follow-up to Mr. Ziemer's note, to discuss the total distribution of Darlingtonia. As background information for a study of various aspects of the biology of Darlingtonia, I felt it was important to familiarize myself with the total distribution of the species. I did this by studying labels on specimens of Darlingtonia that have been deposited in various herbaria, particularly those in California and Oregon. Some of the older collections lacked detailed information, and the exact location was not indicated.