

SEQUOIA NATURE GUIDE SERVICE

A plant that devours insects in Sequoia National Park

THE SUNDEW

One of the strangest things in Nature is the group of carnivorous plants - those which capture insects, or even small mammals, and consume them as food to supply the plants with nitrates and salts. One of these plants is the Sundew (*Drosera rotundifolia*), which inhabits the Sierra Nevada Mountains at moderate elevations in marshy places from Tulare County to Siskiyou County. In this locality it is only found growing at Orville Lake and Huckleberry Meadow in Sequoia National Park; altitudes of 5,600 and 6,500 feet, respectively.

The Sundew is not a conspicuous plant in either size or color, seldom attaining a height of over eight inches when in full flower or fruit. The unbotanical person has no conception of the sudden death lurking in such a small innocent looking plant. But if one enjoys watching a floral cannibal at work during the warm summer days when tiny insects are in the air, then the Sundew will give plenty of amusement; for it is then that the plant is busily at work gathering in tiny gnats and mosquitoes, literally sucking the life fluid from the unfortunate insects. The leaves of the Sundew actually bloat during the banquet.

The Sundew has 8 to 14 round, pad-like leaves all in tuft at the base one-half inch or less across, and supported on small stems one inch or less in length that radiate out in all directions. They give to the plant the appearance of a small greenish-brown or red rosette made up of tiny palm leaf fans. The leaves are margined with numerous tentacles which stand out like hairs or pins from a cushion, one-half inch or less in length. On the ends of these tentacles are small glands which secrete a sticky fluid and glisten in such a way as to resemble dewdrops and attract insects; hence the common name of the genus. When an insect alights, however, it is stuck fast, and at the same time the tentacles close in upon the body and the more the insect struggles the worse entangled it becomes, until death ensues. The insect is digested by a secretion which the glands pour over it, and the nitrogenous compounds in the insect are absorbed in the leaf.

The Sundew is a perennial glandular herb that grows from a small seed about the size of a tobacco seed. Seed germination takes place in the spring of the year, soon after the snow melts from the ground, and the young plants spring up in late May or early June. In about three weeks from the time the plants come up, practically all leaves are formed on the more vigorous ones and carnivorous action starts in. If the plants are successful in their capture of a bounteous supply of insect life, and other conditions are favorable, they soon run up to the flowering stage and fruit; but if they fail to capture any insects, they remain in their leafy stage; or if but few insects are taken, both flower and seed are much dwarfed or absent. The flowers are white, 5 petaled, about $\frac{1}{4}$ in broad, 1 to 25 on a terminal naked stock one-sided raceme. The life of an individual flower ranges from 8 to 12 days, after which the petals fall and seed-pods start to form. Seeds are borne in one-celled capsules about the size of a small grain of wheat, and come to maturity in about 20 days. There are many seeds in a fully developed capsule. The capsules crack open late in the autumn, thus distributing their seed for the following year.

The Sundew is only partially insectivorous, as it relies on the soil to germinate the seed and grow the plants until they reach their leafy stage; the insect traps complete the growth by supplying nitrogenous material taken from insect life.

The Sundew appears to have definite laws to govern it in the capture of insects. For instance, if a very small insect alights on a leaf, just a few of the tentacles close over it to handle the captive. But if a fairly large insect alights, all of the tentacles quickly close over it as if realizing that a powerful struggle was at hand. Of course, in this each leaf has its special work to perform and works independently from the others. After the digestive substance has been extracted from an insect, the tentacles again rise to their former upright position preparatory to the next victim; and in so doing they raise the undigested particles of their last capture with them, usually to be carried away by the wind.

Digestion is rapid in the Sundew, and it seems to have a voracious appetite for insects of many kinds. It starts operations with its little baited trap-lines by the time the leaves and their tentacles are two-thirds grown, and continues the summer through until the plant is fully matured. Hundreds of insects may fall the prey of one given plant during a season. A fully ripened specimen now under glass in the Giant Forest Museum, that was taken July 27, 1926, still had a grip on 12 insects when taken.

A strange thing about the Sundew is its inability to throw off that which is harmful to the digestion, or that difficult of digestion when taken. When a capture is made, the plants hang onto it for dear life, trying to make the best of it, as the following will show:

On June 29, 1908, while camped at Huckleberry Meadow, I decided to conduct experiments covering a period of 30 days, by feeding certain plants on various sorts of food different from their regular diet. For the experiment 6 plants that stood close together in the patch were selected. They were all vigorous plants, of about the same size, in heavy leafy stage, containing 10 leaves each, and no leaves bore evidence of having yet captured insects. All plants were given their first feed during the noon hour, and every leaf was given as large a morsel of food as it was capable of handling. So there were 60 little traps all set for action, and which closed upon the food as fast as it was given. All plants were given special kinds of food thereafter as fast as they could digest it. The following foods were given, and results obtained:

Plant No. 1. Fed fat salt bacon: was dead by morning of July 3. One feed given

Plant No. 2. Fed on California cheese: was dead by the evening of July 9. One feed given.

Plant No. 3. Fed on ordinary house-flies: lived the period throughout, ran up flowering stock 7 inches high, containing 8 flowers; also fertile seed. Four feeds given.

Plant No. 4. Fed on wood ants: lived the period throughout; ran up flowering stock 2½ inches high, which was dead by the 23rd of July without flowering. Two feeds given.

Plant No. 5. Fed on mountain lady-bug beetles: lived the period throughout but never went beyond the leafy stage, and looked quite puny at the close of the test. One feed given, upon which the plant worked all the while excret-

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ing digestive juices in an effort to decompose what nitrogenous material the beetles contained, rendering it available for the nourishment of the plant, without apparent result. All beetles were practically whole at the close of the test, and tentacles were clasped tightly over them.

Plant No. 6. Fed on fresh beef's liver: lived the period throughout, ran up a flowering stock 14 inches high, containing 29 flowers; also contained good, fertile seed. Both flowers and seed pods, as well as the leaves, were unusually large. Five feeds were given.

All insects were killed by method of pin puncture prior to their being fed to the plants; as this was necessary for the reason that traps were not strong enough to hold them when given alive. Only one insect at a time was given to each leaf.

One day a hungry yellowjacket lit on a plant leaf and attempted to steal one of the liver baits; but one bite was sufficient to satisfy his taste, for he left without taking it and had some difficulty in extricating two of his feet from the trap.

Whether or not the Sundew will continue to survive in these parts is somewhat doubtful, for there have been two seasons within the last 23 years that the species at both places heretofore referred to were brought nigh to extermination. The first was in 1906, when the snowfall of the previous winter was unusually heavy and remained on the ground until late in July, only to be followed by frosts and freezing weather early in September. By reason of the short growing season all plants were killed prior to their fruiting. Out of a stand of some 300 plants at Huckleberry Meadow, only 2 could be found in 1907, while the stand at Oriole Lake of some 200 plants was reduced to 5 for the following year. The next season was that of 1924, which was the driest season of which we have record. Because of the drought the marshes dried up early in the season, thus causing the plants to perish prior to fruiting; so the stand at Huckleberry Meadow was reduced from a stand of 96 plants to 4 for the following year, and as late as 1929, the species had recovered to only 19 individual plants. The stand at Oriole Lake also sustained heavy damage and few plants now remain.

How the Sundew obtained its first start in its present home, to me, is a mystery; and as to how the species has been able to survive down through the ages to this time, with its many handicaps, is still a greater mystery. For hundreds, yes, perhaps thousands of years these little plants have struggled and fought their many battles, only winning out at times by a mere hair's breadth. But the plants are still with us in all their hungry beauty, and let us hope that they will remain to grace our mountain meadows for many years to come, for they are among the most interesting of our California flora, whether it be to the botanist, scientist, or casual observer.

In the tropics there are carnivorous plants, such as the pitcher plant, which capture not only insects but lizards, mice, rats and other mammals; and stories from Madagascar tell of one capable of capturing monkeys.

There are several different kinds of carnivorous plants found growing within the United States and elsewhere, but to me the Sundew is the most interesting and fascinating of any I have seen.