CADDIS FLIES (TRICHOPTERA) AND PITCHER PLANTS

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Do caddis worms ever live in the leaf pitchers of pitcher plants? Is the microhabitat formed by the water in a pitcher plant leaf suitable for the larval stages of Trichoptera? This question is opened by the discovery of cases, adults and living eggs of Trichoptera in leaves of the pitcher plant, *Sarracenia purpurea*.

During casual inspection of pitcher plant leaf contents, larval cases obviously of trichopterous origin were discovered in late July at Robinson's Lake, near Irondale (Haliburton County), Ontario, Canada, by the writers. This is a hilltop lake, lying in a rocky depression, fed by rains and emptied by evaporation or by overflow if the level rises sufficiently to reach the low rim. The margins of the lake are largely boggy, where Sphagnum has built a floating web enmeshing waterlogged stumps, half rotted trunks and on which grows a dense mass of laurel and cranberry, with round-leaved sundew and pitcher plants in clumps at intervals. The water of the lake is very dark coffee colored, and the bottom is a tangle of waterlogged branches from trees.

The first cases discovered were in dead, closed pitchers at the base of plants at least eight inches above lake level. The cases were dry and empty. The writers immediately postulated that the caddis worms must have crawled into the pitchers at some time when the lake was, say, ten inches higher and the pitchers were flooded. At the time of observation, however, the lake was unusually high from recent, frequent and heavy rains. It was doubted by natives that the lake had been as high since the past spring, when the ice and snow broke up. Since the depth was greater than usual, the margin of the lake, where shallow enough for the bottom to be inspected through the dark colored water, was not the "normal" lake area, and the complete lack of visible life there (including caddis cases) was not

surprising. The tangle of branches on the bottom of deeper parts of the lake made dredging impossible.

On a return trip to the lake, almost every dead pitcher and every open living pitcher was inspected. Cases were found in dead pitchers two feet above the high lake level, and in living pitchers at all levels. None of the cases contained larvæ, a few retaining a small number of sclerites. In two dead leaves, one remote from the water, one close to it, sets of wings of *Ptilostomis* sp. (Phryganeidæ; probably *postica* Wlk.) were found. One green pitcher close to the water contained a partially digested caddis adult Limnephilidæ; (*Platycentropus indicans* (Wlk.) ♀), while another green pitcher remote from the water contained a freshly dead *Ptilostomis postica* (Wlk.). The latter pitcher, and several other green leaves devoid of caddis cases and adults, contained fresh masses of living, partially developed, caddis eggs. Judging from the size of the masses and their form, they were believed to be limnephilids.

The cases were small, and of two types, usually not more than two cases being found in any one pitcher. Often where two occurred, they were unlike in type. The cases were all constructed of laurel and cranberry leaf pieces, many of which fall into the water of the pitchers and remain there for a long while with little disintegration. The shorter type of case was cylindrical, as much as a centimeter long, and about the same in outside diameter. The leaves were arranged with one edge tangential to the central tube, the leaves or pieces being very numerous, cemented together by their flat surfaces. The outside of this type of case was quite rough due to the irregular shape, size and position of the leaves composing it. The longer type of case was roughly triangular in cross section, formed of fewer pieces of leaf, these with their flat surfaces tangential to the central tube. One or more larger pieces of leaf formed the base of the case, and to the edges of this base a low peaked roof was produced by two sheets of narrower, smaller leaf pieces cemented together along the three corners. These cases were as much as seventeen millimeters in length, eight wide, four high, and of rather flimsy construction. Both cases were thought to be limnephilid structures, but of species smaller than any found dead in the pitchers. The triangular case type might be leptocerid in origin. Several cases were closed at one end as is commonly done for pupation.

The scanty evidence given above is highly suggestive that some species of limnephilid caddis flies have the habit of laying eggs in July in water contained by leaves of *Sarracenia purpurea*, that the insects are able to escape from the pitchers, that the larvæ live in the pitcher water and pupate there. Since the water contains proteolytic digestive substances, such a caddis worm would require an impermeable integument such as found in the pitcher plant mosquito wriggler (*Wyeomyia smithii*) and the larvæ of the large fly, *Sarcophaga sarraceniæ*. It is interesting to note in this connection that large maggots of the latter insect continued to squirm with life for over two hours in seventy percent alcohol, and it was not determined whether they died from alcohol penetration or from suffocation, since the low surface tension of the alcohol did not permit them to use their hydrofuge hairs for surface respiration.

The writers were disappointed not to be able to obtain a definite answer on this matter, but the brevity of wartime vacations and the limitations in pitcher plant supply cut their investigations short. They hope that some readers of the present paper, having a nearby supply of *Sarracenia purpurea* (or other pitcher plant) will be able to get the answer to this interesting problem. They will be happy to assist anyone in the identification of larvæ, pupæ (preferably) or adults of Trichoptera found in pitcher plants.

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