

The Silent Predators

By Kerry Wixted

Carnivorous plants have captivated the masses for a number of years. Folklore is filled with tales of man-eating plants in the wild jungles of Madagascar and Borneo. Hollywood has spun these stories into talking plants requesting to be fed and genetically engineered plants enslaving humans. Despite these tales, no plants are known to be able to capture and consume (or enslave!) people. In fact, the largest "carnivorous" plant in the world, *Nepenthes rajah*, has been found to feast on Tree shrew poop.

Over 670 species of carnivorous plants are known to exist worldwide. North Carolina's savannas and wetlands contain over 30 flesh-eating plant species in addition to a number of pseudo-carnivores. A true carnivorous plant is one that has the ability to capture, digest and absorb prey. Carnivorous plant traps can be separated in to two main categories: those which are passive or active at catching prey. Passive traps include "pitchers and papers". These species include plants with pitcher-like traps and those with sticky, fly paper-like traps. In contrast, species such as the iconic Venus flytrap use active traps in which sensitive trigger hairs cause the traps to close on its unfortunate prey.

Carnivory may seem like a brutal lifestyle for a plant, but it is one which has evolved out of necessity over time. In many instances, these carnivorous plants live in harsh environments- acidic bogs with little nutrients available or jungles brimming with oodles of species competing for limited nutrients. Whatever the case, the main reason for carnivory in the plant kingdom is to supplement nitrogen in the plant's diet. Nitrogen is essential for many of the plant's basic functions and also is a necessary component to complete photosynthesis.

Carnivorous plants in North Carolina fall within five genres: butterworts (*Pinguicula*), sundews (*Drosera*), pitcher plants (*Sarracenia*), bladderworts (*Utricularia*) and Venus flytraps (*Dioanea*).

Butterworts and sundews are both passive trappers which use brightly colored leaves to attract unsuspecting prey. Butterworts have thick, waxy leaves that contain two specialized glands on the surface. These glands produce a mucilaginous sap that makes the plant look shiny to its prey. Once prey land on the leaves, they get stuck in the sap and as they struggle, the glands secrete extra sap to glue its prey to the leaf. Within minutes of capture, the plant will begin to release digestive enzymes to break down its meal. Three species of butterworts can be found within North Carolina. Yellow butterwort (*Pinguicula lutea*) is considered Imperiled in North Carolina and is found within savannas of Bladen, Brunswick, Columbus, New Hanover and

Pender counties. This diminutive plant produces a rosette of oval-shaped leaves that get up to two and a half inches in length in addition to a bright yellow flower from February-May.

In contrast to butterworts, sundews typically have spoon shaped leaves or tentacles with bright red stalks that secrete mucilaginous sap. Insects that land on the leaves become stuck in mucilage and are gradually digested by a suite of enzymes and acids. Some species even bend their "tentacles" slowly around their meal. As the sundew's meal digests, glands on the leaves slowly absorb nutrients. On average, one sundew traps and consumes about five insects per month. Most sundews in North Carolina can be found within bogs. The Thread-leaved sundew (*Drosera filiformis*) has long, thread-like leaves and is considered to be Imperiled in the state. It can be found within Bladen, Brunswick, Columbus, Duplin, Robeson and Sampson counties.

Pitcher plants are also passive about trapping their prey. However, pitcher plants use a different approach than butterworts and sundews. As their name suggests, pitcher plants have vase-like leaves that fill with water and enzymes. Many of these hungry critters land on the pitcher, follow the colorful veins on the leaf and fall in with the aid of downward pointing hairs and slippery cells. Interestingly enough, the non-biting Pitcher plant mosquito (*Wyeomyia smithii*) has evolved with pitcher plants; its larvae live within the pitcher. The Pitcher plant mosquito acts as the top level predator in the pitcher and feeds on parts of animals that the plant cannot digest as well as microscopic organisms such as rotifers. Over 30 species of New World pitcher plants (those in the family Sarraceniaceae) are known to exist worldwide. At least six species and five hybrid pitcher plant species live within wetlands of North Carolina. Only one site in Clay County contains the Globally Rare Green pitcher plant (*Sarracenia oreophila*). Aside from this site, the rest of its worldwide distribution exists within Georgia and Alabama.

Bladderworts are, by far, the most sophisticated carnivorous plants. These carnivores are active trappers which are typically aquatic. Their unpleasant name stems from the air-filled sacs or bladders used to entice and actively capture unsuspecting prey. Much of the plant exists as a fine network of bladders and filament-like leaves submerged under the water or a wet substrate like gravel. Because they spend much of their time below a surface, bladderworts are often overlooked until they produce showy flowers that stick out above the water or substrate surface.

Bladderwort bladders are considered one of the most complex structures in the plant world. When water fleas or midges float past and tap specialized trigger hairs on the bladders, a flap on the bladder opens. The plant then uses a vacuum-like force to

suck in prey. Once the bladder fills with water, the flap closes and a sugary substance is released to seal both the door and the fate of its prey. This process occurs in one five-hundredth of a second! Over 200 bladderworts can be found worldwide, fifteen of which have been found within North Carolina. One common bladderwort in North Carolina is the Swollen bladderwort (*Utricularia inflata*). This species resembles a floating wheel in the water when it produces its bright yellow flowers.

Venus flytraps (*Dionaea muscipula*) are perhaps the most iconic carnivorous plants in the world, and surprisingly, they have a very limited distribution worldwide. This distribution is within a 100-mile radius of Wilmington, North Carolina. The largest extant population, possibly 50% of the remaining wild population, is located on Holly Shelter Game Reserve near Wilmington. Like bladderworts, Venus flytraps also use trigger hairs. The bright red coloring inside the leaves attracts insects which tap the trigger hairs. Two trigger hairs have to be tapped within 20 seconds for the trap to close; this helps the plant distinguish between living and non-living stimuli like rain drops. Once the signal has been detected, the trap will close in less than a second. The plant will then release digestive juices and slowly absorb its meal. Digestion takes anywhere from two to five days, and leftover insect parts will blow or wash away.

Throughout the world and in North Carolina, many carnivorous plants are rare, threatened or endangered. Carnivorous plants in North Carolina face multiple threats. First and foremost, habitat alteration and destruction accounts for the greatest loss of carnivorous plants. The International Carnivorous Plant Society estimates that as much as 95% of carnivorous plant habitat in the United States has been lost. Carnivorous plants are also threatened by amateur collectors who poach vulnerable populations. This is especially problematic for Venus flytraps which are frequently poached. Current research also suggests that carnivorous plants are further threatened by poisonous prey contaminated by heavy metals and insecticides.

Carnivorous plants are yet another fascinating example of the rich diversity of life found in North Carolina. These plants have evolved over thousands of years to endure and thrive in harsh, unsympathetic environments. Yet, we risk losing them if we fail to recognize their intrinsic value. As research continues, scientists are beginning to redefine the concept of plant carnivory. Did you know that those colorful Petunias on your porch and in your garden have specialized hairs to trap prey? Or that bromeliad in your living room has been found to attract and trap insects in water pockets between the leaves? As we learn more about the hidden complexity of plants, we need to ask ourselves, "Is it safe to turn my back on my plants?"