

The Genesis of "Rat-Eating" Plants

Tom Hennigan

Keywords

biology, plants, botany, carnivorous, Mount Alexandria, Nepenthes attenboroughii, nitrogen, phosphorous, adenosine triphosphate, pitcher plants

A menu of rats may be expected with coyotes and owls—but plants? As improbable as it sounds, there are plants that can digest rats and other small vertebrates. Recently, news agencies and websites were deluged with headlines that a new species of "rat-eating" plant was discovered by a botanical team led by Stewart McPherson.¹ Apparently the researchers got wind of a story that took place in 2000.

As the tale goes, two Christian missionaries to the Philippines got lost in central Palawan while attempting to ascend Mount Alexandria.² They were rescued 13 days later and recounted seeing large carnivorous pitcher plants on the slope of the mountain. Their botanical descriptions were unique enough to cause McPherson and team to mount a two-month expedition to the area in 2007. Upon hiking through dense forests and climbing up Mount Alexandria, they spotted the first specimen at around 1,600 meters in elevation.

As they suspected, it was a species of pitcher plant unknown to the botanical community. They dubbed it *Nepenthes attenboroughii*, in honor of famed British natural history broadcaster Sir David Attenborough,³ and concluded that it is one of the largest pitcher plants in the world. Some measured 30cm (12 inches) in diameter and were able to hold animals the size of rats, though arthropods make up the majority of creatures digested. *Nepenthes deaniana*, another large pitcher plant unseen for 100 years, was also rediscovered during this expedition, and many had large arthropods trapped in them, including giant centipedes and 10cm (4 inch) spiders.

What are these plants? Why do they eat animals and how are we to understand them within a biblical model of creation?

Carnivorous Plant Classification

According to the Botanical Society of America (BSA), there are approximately 11 families and two subfamilies that encompass about 600 species of carnivorous plants worldwide.⁴ They tend to grow in low nutrient environments where nitrogen and phosphorous are limited. Nitrogen is a crucial element because, among other things, it provides the basis for protein and nucleic acid synthesis. Phosphorous is a key component of adenosine triphosphate (ATP) and other complex organic compounds critical to living creatures. In the absence of either element, life would cease.

Whereas most plants get these nutrients from the soil via roots, carnivorous plants may obtain their nitrogen and phosphorous from the soil through roots and/or the bodies of animals that fall in their traps.⁵ The traps are

modified leaves and come in six models: the *pitfall trap* (pitcher plants), *lobster-pot trap* (one species of pitcher plant), *eel trap* (corkscrew plant), *flypaper traps* (sundews and butterworts), *snap traps* (Venus flytraps and the waterwheel plant), and *suction traps* (bladderworts).

Pitcher plants are found in four major families, but most are in Nepenthaceae and Sarraceniaceae.⁶ Pitfall traps are similar in all pitcher plants; however, there are unique permutations in the trapping details depending on the species and habitat. For example, in the northern pitcher (fig. 1—*Sarracenia purpurea*) downward facing hairs make it difficult for insects to turn around and get back out, increasing the chances of falling in. The plant contributes little to its digestive chemistry, instead, the liquid pool contains symbiotic bacteria that produce the needed digestive enzymes. Also, as ants are caught and digested, they provide formic acid which further decreases the pH (sometimes as low as 2) and also enhances plant digestion and absorption.⁷ Conversely, pitfalls in *Nepenthes* often produce their own digestive chemistry from glands located in the trap.



Fig. 1. Northern Pitcher Plant.

For purposes of this paper, we will limit our discussion to family Nepenthaceae and genus *Nepenthes* because *Nepenthes attenboroughii* was classified in this genus. *Nepenthes* consist of the tropical monkey cups that number about 90 species. Some grow in tropical lowland areas, but most are found in the harsh mountainous zones of tropical Papua New Guinea, Australia, and South East Asia.⁸

The word *Nepenthes* comes from Greek mythology and literally means "without grief," referring to Homer's *Odyssey*, in which Helen was given the Nepenthe drug in order to make her sorrows go away. Linnaeus,⁹ who first classified them in 1737, explains:

If this is not Helen's Nepenthes, it certainly will be for all botanists. What botanist would not be filled with admiration if, after a long journey, he should find this wonderful plant. In his astonishment past ills would be forgotten when beholding this admirable work of the Creator.¹⁰

The Monkey Cups: Family Nepenthaceae

Monkey cups are so named because monkeys have been observed drinking rain water from the pitchers. Most plants of this genus produce two types of pitcher leaves (pitfall traps). This is known as leaf dimorphism. As *Nepenthes* tend to grow as hanging plants, many pitchers are suspended in midair and attached to narrow stems that proceed from the end of typical looking leaves. Many hanging pitchers produce tendrils that anchor them to nearby supports.

When the overall length of a plant finally results in pitchers touching the ground, the ground-level pitchers take on a somewhat different morphology from their hanging counterparts. Elevated pitchers tend to be smaller and vary in color. Differing morphologies are thought to attract different prey species—while their development is nothing short of miraculous. Pitchers on the ground may produce an elongated midrib, or central vein, that extends away from the main body producing a coiled tendril.¹¹ The midrib seems to act as a pathway to lure and guide crawling prey up the body of the pitcher to the nectar covered rim. In the largest, *Nepenthes rajah*, once the tendril touches the ground it inflates into a pitcher plant capable of holding 3.5 liters of liquid.¹² Consequently, the operculum (lid), thought to prevent rainwater from diluting the digestive chemicals, opens and signals trap readiness. Odors and colors are thought to attract the animals.

It has been assumed that the key to pitfall success in *Nepenthes* was due to the design of the inner surface of the pitcher. The surface is slippery on the inside because it is made of waxy flakes that easily fall away on contact.¹³ Compounding matters the chemistry of the peristome (lip) is such that with a little humidity or watery secretion, friction is further decreased, making it nearly impossible for the hungry visitor to get a grip and resulting in a free fall into the vat of digestive chemicals.¹⁴

However, not all *Nepenthes* species have the above traits, and there is evidence that the pitfall trapping success is more complicated than first thought. The chemical make-up of the liquid pool is composed of highly viscous and elastic fluid (viscoelastic) properties that keep the organism from escaping.¹⁵ This property may be more important than the morphology of the inner pitcher itself in the trapping success of plants.

The more the animal resists, the greater amount of digestive acids are secreted and the faster digestion takes place. These acids are so strong that small insects like flies and midges can disappear in hours as their nutrients are absorbed into glands located in the lower part of the trap.¹⁶

Larger animals like mice,¹⁷ lizards, and frogs have been found in large pitchers like *Nepenthes rajah*, but verification of these data has been both difficult and rare. I'm aware of only three confirmed accounts of rats being found dead inside *Nepenthes rajah* plants,^{18, 19} making reports about "rat-eating" pitchers exaggerated. Though *Nepenthes attenboroughii* rivals the biggest of pitchers and is capable of digesting rats, confirmed reports are lacking. By far, the majority of creatures digested by carnivorous pitchers are arthropods that include insects and spiders.

The Genesis of Carnivorous Plants

Fossil data for carnivorous plants are sparse. Nevertheless, evolutionists believe that the carnivory habit evolved independently from noncarnivorous species on several different occasions. In the case of pitfall traps, it is believed that they have experienced convergent evolution—or the development of the carnivorous trait independent of lineage—four different times in four different families.²⁰ However, neo-Darwinian explanations for plant origins, let alone plant carnivory without a Creator, are fraught with problems and overwhelming inconsistencies.²¹

These adaptations are highly complex and intricate biochemical systems working in sync from an embedded genetic code still not understood. The result is the production of unique traits that allow these plants to grow in extremely harsh, low nutrient environments that include sand and gravel substrates. Natural selection and random genetic mutations cannot account for the vast diversity of life, including the origin of carnivorous

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plants.²² These facts are, however, consistent with the biblical account of Christ, the Creator, as the superior Engineer behind these currently incomprehensible systems.²³

On the other hand, the Bible teaches that plants were created on Day 3, and though considered biologically alive according to man's definition of life, they are not considered biblically alive according to God's definition ("life," Hebrew *hyh*, npš).²⁴ As every green plant was made to be food for living creatures such as insects and rodents, creationists believe that general carnivory between animals is a product of post-Fall adaptations. In the case of plant carnivory, it is not clear whether it is an original design or a consequence of the post-Fall curse and is an area holding great promise for future creation research.²⁵

Baraminology of Nepenthes

Baraminology is a uniquely creationist classification method for determining the "created kind" (Heb. $b\bar{a}r\bar{a}$ [create], $m\hat{n}$ [kind]). Turner emphasizes that though the study of the created kinds is helpful, creationists should be careful because the word is tough to define and seemingly imprecise.²⁶ To demand a precise definition is not possible and should be used tentatively when trying to determine the "created kinds." He concludes that the focus of such research should be to let the biblical text speak for itself and to realize that what creation research identifies as a baramin, may not be equal to the biblical definition of same.

With this in mind, we can extropolate from the data that because 79 of the approximate 90 species of *Nepenthes* (227 records) can hybridize with one another, they are the same "kind" or monobaramin.²⁷ Baraminologists define monobaramin as the members within a group having significant holistic biological similarity without comparing them to other taxa.²⁸ These researchers also point out that in order for hybridization to occur, holistic



Fig. 2. Nepenthes hamata. (Photograph: Ron Dudek).

biological similarity is demonstrated by the fact that chromosomal, cellular, developmental, and anatomical levels of organization would otherwise not be revealed without detailed biological research. They have diversified since their creation and may provide many research avenues for creationists to explore the genetic and environmental design mechanisms that drive these changes. Furthermore, Sanders and Wood note that, though there is no evidence for intergeneric hybrids, if carnivory arose from noncarnivorous ancestors, we might see variations in this habit in Nepenthaceae and Sarraceniaceae, but we do not because all species are carnivorous.²⁹

Pitchers and their Symbiotic Relations

The Trinitarian character of Yahweh is relational, which means love and relationships have always existed. Therefore, it is no surprise that fascinating and complex relationships are ubiquitous in creation, and pitcher plants are no exception.³⁰

In ecology, long-term relations involving two or more organisms are called symbiotic associations. They can be harmful, neutral, and/or mutually beneficial. In recent years, as biblically based researchers study the relational character of God, they are beginning to see the fruitful potential for building ecological models based on symbioses.³¹ There are numerous fascinating examples that continue to be unveiled in carnivorous plants. Sanders and Wood document intricate mutual and commensal associations in both Nepenthaceae and Sarraceniaceae.³²

As symbiotic associations are universal, it is no surprise to find unique relationships within *Nepenthes*, as the following two examples illustrate:

• *N. bicalcarata* has spaces in its elevated pitchers for carpenter ants (*Camponotus schmitzi*) to build nests.³³ These take advantage of the pitchers' ability to attract other arthropods, and when they arrive, the ants prey on them. The ant is benefited by the plants ability to attract prey. Conversely, it is hypothesized that the pitcher is benefited because the ants reduce the amount of accumulated bodies which would otherwise putrefy in the trap through decomposition. If there are too many organisms decomposing in the pitfall, it may deleteriously harm the infauna living in the pitcher, which in turn affects their symbiotic ability to aid in the plant's digestion.

• *N. lowii* is a montane species found in Borneo that produces a leaf dimorphism such that two very different types of pitchers develop. The immature plants produce the classic pitcher designed to digest arthropods. However, as the plant matures it produces a pitcher that lacks the carnivorous traits and instead is visited by tree shrews that ingest exudates produced by the pitcher. They then proceed to defecate into the cup.³⁴ The symbiosis seems to be mutual in that the tree shrews gain nutrition from *N. lowii*, and in return the pitcher obtains between 57 and 100% of the needed nitrogen from tree shrew feces.

Conclusion

Carnivorous plants are amazingly intricate systems, and we know that their genesis began in the mind of Christ Jesus. Are they rat eaters? Rarely. Did they originate by random mutation and natural selection? Not hardly. Do they continue to be botanical enigmas in terms of their ecology, symbiotic relations, and rapid diversification since the Flood? Most definitely. Are they evidence for a Creator that loves us so much that He died so that we might live? The Apostle Paul answers this way:

For by him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things were created by him and for him. He is before all things, and in him all things hold together For God was pleased to have all his fullness dwell in him, and through him to reconcile to himself all things, whether things on earth or things in heaven, by making peace through his blood, shed on the cross. Once you were alienated from God and were enemies in your minds because of your evil behavior But now he has reconciled you by Christ's physical body through death to present you holy in his sight, without blemish and free from accusation—if you continue in your faith, established and firm, not moved from the hope held out in the gospel.³⁵

Footnotes

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- 3. For further insight into Sir David Attenborough views on Christianity and Creation, see Taylor, P., 2009. Famous evolution is told to "burn in hell". Retrieved from, http://www.answersingenesis.org/articles/2009/01/30/ evolution is t-told-burn-in-hell
- 4. Botanical Society of America. Carnivorous plants/Insectivorous plants. Retrieved on 26 August 2009 from, http://www.botany.org/carnivorous_plants/
- 5. Schulze, W., E. D. Schulze, J. S. Pate, and A. N. Gillison, 1997. The nitrogen supply from soils and insects during growth of the pitcher plants *Nepenthes mirabilis*, *Cephalotus follicularis*, and *Darlingtonia californica*. *Oecologia* **112**:464–471. One thing to keep in mind is that there is a dispute among carnivorous plant aficionados as to which plants should or should not be classified as carnivorous. Hence, the number of species can vary from expert to expert. A prime example is *Darlingtonia californica*, aka "cobra lily." It is a monotypic taxon in the Sarraceniacea family. This plant, though menacing in appearance, does not produce digestive enzymes. It depends on symbiotic relationships with bacteria and mosquitoe larvae to break down the tissues of captured prey. Ergo, there are some carnivorous plant purists who claim, on the basis that this plant cannot "digest" its own food, that it should not be classified as a true plant carnivore. The majority would claim it is though.
- 6. The other families are Cephalotaceae and Bromeliaceae. Family Sarraceniaceae includes the pitcher plants found in eastern North America (genus *Sarrecenia*), the "cobra lilies" of the USA's Pacific Northwest (genus *Darlingtonia*), and the sun pitchers from the mountains of South America (genus *Heliamphora*). Family Cephalotaceae contains one genus and a single species of pitcher plant called the Albany pitcher found in peat bogs of southwest Australia. Family Bromeliaceae, of which the pineapple is a member, contains two subfamilies with carnivorous pitchers. Subfamily Pitcairnioidea (genus *Brocchinia*) has at least two species that live in South American mountain and savanna environments. Subfamily Tillandsioideae (genus *Catopsis*) contains one species of carnivorous pitcher and can be found in humid habitats of South and Central America, Florida, and the West Indies.
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