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0 | Ellison and Gotelli

Positions of carnivorous plant families in the current overall angiosperm phylogeny (Stevens, 2007; relationships within the Lamiales from Müller et al., 2006). Families that are exclusively carnivorous are set in bold and highlighted in green; families with only one (Dioncophyllaceae) or two (Bromeliaceae) carnivorous genera are set in italic and highlighted in yellow; and the family (Martyniaceae) with the possibly carnivorous Ibicella lutea v.Eselt. is set in italic and highlighted in blue. Representative traps of each genus are illustrated (drawings by Elizabeth Farnsworth), and the number of species in each genus is given in parentheses. The phylogenetic tree was drawn using the MrEnt software package (Zuccon and Zuccon, 2006); branch lengths are drawn only to emphasize the location of carnivorous families and otherwise are not meaningful (i.e., do not signify time since divergence or any other metric of relatedness).

phylogenetic history of the angiosperms (Stevens) and \mathbf{S}

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Rates of genetic change and new hypotheses arising from carnivorous plant genomics

 \mathbf{A} , \mathbf{A} and as more stabilized and as more stabil generate data have accrued for carnivorous plants of carnivorous plants \mathbf{v} \overline{z} species of the analyses of the \overline{x} different taxable possible. In the possible $\mathbf{X} = \mathbf{X} \mathbf{X} + \mathbf{X} \mathbf{X} +$ $\begin{array}{ccc} \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{array}$ \mathcal{L} specialization in the derived generalization in the derived generalization in the derived generalization of \mathcal{L} U_1 c^a and Ge^a , $ea \rceil$ (1002) for $\lceil a \rceil$ $\mathbf{r} = \mathbf{r} - \mathbf{r}$ relative rates of nucleotide substitutions (based on $\mathbf{r} = \mathbf{r} - \mathbf{r}$ RRTree computations: Robinson-Rachavi and Huchon, $2\sqrt{2}$ u (tri d 7 tri L trn transmitted spacer, respectively. The \mathbf{r}_1 space \mathbf{r}_2 and \mathbf{r}_3 respectively. \bullet \bullet 7 times factor in Pinguicularia than in Pinguicularia tha \mathcal{A} and \mathcal{A} . (2004) reported that Ge^{\bullet} , ean Utricularian have relative rates of nucleotide substitutions (relative to an $A b e^{\theta} a$ in the set of θ $\sum P \cdot g \cdot c^a a$, d.d. (2004) **found that substitution rates of General Utricularism** Ge^{\bullet} , ean Utricularian were higher than those of 292 other angiosperm taxa, and that \mathbf{v} other carnivors plant \mathbf{v} D_rea Neelhe, Saacenia **rates** \mathbf{r} $\mathbf{$ Two hypotheses have been suggested to account for the \mathcal{R} rates worked in \mathcal{R} rates \mathcal{R} and \mathcal{R} rates \mathcal{R} by \mathcal{R} Ge^4 , ea $\overline{7}$ $\overline{1}$ $\overline{1}$ $\overline{2}$ $\overline{2}$ \mathbf{r}_1 single or small number of changes in \mathbf{r}_1 regulatory genes in regulatory genes in regulatory genes in \mathbf{r}_2 could a rapid morphology in \mathbf{z} and \mathbf{z} in \mathbf{z} in Utri $c^{\bullet}a\ a;$ In particularia. In the set al. (2004) focus et al. (2004) \bullet $c\neq$ 71 subunit of $c\neq$. They showed that $c\neq$ \mathbf{r} virus continuous continuo has been subject to structure subject to structure selection, and the structure structure structure structure \mathbf{a} in \mathbf{c} in \mathbf{c} and \mathbf{a} in \mathbf{a} in \mathbf{b} in \mathbf{c} in \mathbf \mathbf{r} required to \mathbf{r} required to \mathbf{r} and \mathbf{r} \mathbf{r} and \mathbf{r} and \mathbf{r} both \mathbf{r} and \mathbf{r} little differentiation between stems, \mathbf{r} r elaxed in aquatic and r is often observed in a r epiphytic habitats, where neutral buoyancy (in the water) or other supporting structures (for $\mathbf{y} = \mathbf{y}$ equations) obviously for $\mathbf{y} = \mathbf{y}$ need for structural tissues (such as large stems or wood). T nde combination of a unique molecular mutation in T

Relative rates of gene substitution in carnivorous plant genera relative to the basal angiosperm (Amborella+Nymphaeales). Angiosperm taxa are arrayed on the x-axis from smallest to largest rates of matK substitution rates. The relative substitution rate on the y-axis is calculated as the difference between K(Genlisea, outgroup)-K(other taxon, outgroup), where K (taxon, outgroup)=the maximum likelihood estimate of substitutions per site between the taxon and the outgroup (Müller, 2005). A rough estimate of the percentage difference in substitution rates between two carnivorous plant taxa can be found as 100

carnivorous plants and N it and a feithbe a great diadvantage in the $a \rightarrow a$ muscipular muscipular muscipular muscipular eta g c^{la}, ede a he ed, and een additional daging ee_k after ad, ece g , e, $b^* \mathcal{V}$; a, cha, a ie ed daffdbiⁿine iei. It de fabetter for the $a \uparrow \uparrow$ and f and e $\uparrow a$ dedex 'age ed acaled, adl d'allemente el e, cape; and this advantage is secured by the slowly intercrossg ag d , μ , h ch ad μ lhe age e, he, f a h g-d, d^* glhe, d^* ad ℓ^e , f is ecae.

Pattern and process in prey capture by

 I , ed. I a , $1 \cdot 1$ \mathbf{v} available phylogenetic data suggests that in all \mathbf{v} carnivos lineages except perhaps the Sarraceniaceae (\overline{z} \mathcal{R} , complex traps (pitchers, etc.) complex traps (pitchers, \sqrt{a} are derived relative to striky-leaved, flypa-leaved, \sqrt{a} \mathbf{r} $\mathbf{$ $\frac{d}{d\theta}$ $\frac{d$ **g** Ge^a eand U _r e^a and v **m** τ and frequent captures of prey than do genera with more \mathbf{v} with \mathbf{v} , \mathbf{v} extension it could be \mathbf{v} . esi \overline{z} in general, in general, in general, \overline{z} with \overline{z} with \overline{z} with \overline{z} complex transferred have more predictable and frequently predicted and frequently predicted and frequently predicted and frequently problems of the state and frequently problems of the state and frequently problems of the captures of previous captures of previous captures of the simple simple transition of the simple transition of
The simple transition of the simple transition of the simple transition of the simple transition of the simple $\overline{1}$ in predictability and frequency of predictability and frequency of predictability $\overline{1}$ \hat{f}_eq could be achieved by evolving more elaborate more elaborate mechanisms of \overline{z} for attracting pressure pressure of \mathbf{r} and particular types of particular types of \mathbf{r} predicted, by specializing \mathcal{L} by specializing \mathcal{L} e.g., $\begin{matrix} 2 & 1 \end{matrix}$ and $\begin{matrix} 3 & 1 \end{matrix}$ becomes of prevention $\begin{matrix} 4 & 1 \end{matrix}$

prey actually captured would not be a random sample of \mathbf{v} , \mathbf{v} , when \mathbf{v} , $\mathbf{v$ \mathbf{v} \mathbf{r} , \mathbf{r} , \mathbf{r} ,

Do different carnivorous plant genera specialize on particular prey?

Are they really specialists? Comparisons of captured prey and available prey

Niche overlap among co-occurring carnivorous plants

The costs of carnivory

 \mathbf{r} $\mathbf{$ sequences recorded from Archaea, bacteria, or eukaryotes. This dicysteine motif causes a conformational change that at least partly decouples this protein's electron transport $f(x)$ is proton pumping function. Later $f(x)$ is pumping function. Later $f(x)$ $e^{i\theta}$. (2006) estimated that the third that the third that the third that the third that the this conformation θ optimizes power output when the bladder trap is reset. The bladder trap is reset to the bladder trap is reset. A_1 there is a associated respiratory cost to the set of this associate to the set of t

 $\begin{array}{ccccc} \mathbf{u} & \mathbf{f} & \mathbf{u} & \mathbf{u} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} \\ \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} \\ \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} & \mathbf{v} \end{array}$ and niche segregation may become more apparent if prey \mathbf{v} sorted to \mathbf{v} and \mathbf{v} in \mathbf{v} $\mathcal{L}_{\mathcal{T}}$ measures of specialization, niche overlap, capture rate, capture rate, capture rate, capture rate, capture rate, \mathcal{T} and capture efficiency are all potentially biased without parallel measurements of a \mathcal{L} and \mathcal{L} $V = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ capture by carnivorous plants should be carnivorous plants should be a should relative abundance of potential presentations of \mathcal{P} h
1 \mathcal{D} . The dichotomy between \mathcal{D} \mathbf{u} be rethought. Defining \mathbf{v} by the return by \mathbf{v} $\sum D$, e and $\sum T$ in $\sqrt{27}$ \overline{P} \overline{P} \overline{Q} $\overline{$ p and p friction p friction p frictionless period p frictionless period p frictionless period p $Sa \tace \t a$
1, \cdot d d , 1, 1 F_{eff} \mathbf{A} \mathbf{B} \mathbf{A} \mathbf{A} \overline{z} Neelhe, \overline{z} controlled by \mathbf{r} by \mathbf{r} and \mathbf{r} by \mathbf{r} and \mathbf{r} and \mathbf{r} \mathbf{r} or by the plant itself (nectar secretion). Itself (nectaristic secretion). $\begin{array}{ccc} \textbf{1} & \textbf{2} & \textbf{3} & \textbf{4} \end{array}$ $f: Y \to Y$ mechanisms and rates of prey capture, renewed attention \mathbf{v} is the activity of the activity of \mathbf{v} 7 Ge^{\blacksquare}, ea. $\mathcal{F} \subset \mathcal{F}$ in the relation in the relation in the relation in the relationship in the relations v_1 in the plant control by th \mathbf{r} abundance on Utricularia transmission abundance on Utricularia transmission and Utricularia transmission and U $\begin{array}{ccc} 2 & \mathbf{u} & \mathbf{v} \\ 2 & \mathbf{v} & \mathbf{v} \end{array}$ will have with \mathbf{v} $\frac{d\mathbf{r}}{dt}$ are $\frac{d\mathbf{r}}{dt}$ are (Let $\frac{d\mathbf{r}}{dt}$). Such that \overline{z} \overline{z} and \overline{z} \overline{z} \overline{z} $\sqrt{2}$ carnivorous plants beyond $\sqrt{2}$ simple predator plants between $\sqrt{2}$ simple predator– presented the \mathbf{v} models \mathbf{v} and \mathbf{v} defined et al. $1\ldots$

Carnivorous plant energetics

 3.7×10^{-4} Measurements of c_0

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 $\begin{matrix} -\mathsf{A} & 0 & -\mathsf{B} & \mathsf{A} & \mathsf{A} & \mathsf{A} \end{matrix}$ $\mathsf{A}, \mathsf{A}, \mathsf{A}$

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