SUPPLEMENTARY DATA

FIG. S1. Morphology of *Caularthron bilamellatum* pseudobulbs. All material was from plants naturally growing on *Annona glabra* (Annonaceae) in BCNM, Panama. (A) Cross-section of immature pseudobulb exhibiting a clear, gel-like parenchyma in the centre. During pseudobulb maturation this tissue desiccates forming a hollow chamber. (B) Cross-section of a pseudobulb having failed to form a basal opening. Very few pseudobulbs fail to form an opening after maturation. The centre desiccates as usual but the resulting cavity remains inaccessible to ants. Remaining parenchymatous tissue partially covers the cavity inside the pseudobulb whereas it is usually removed by colonizing ants. (C) Cross-section of the middle region of a mature pseudobulb inhabited by large numbers of *Azteca* ants and filled with ant-made carton. The genus *Azteca* is known to use carton to divide nesting space into different compartments.
(D) Longitudinal section of a mature pseudobulb weakly inhabited by ants. The surface is smooth in basal and middle regions (bottom) but becomes very rough towards the apex (top).

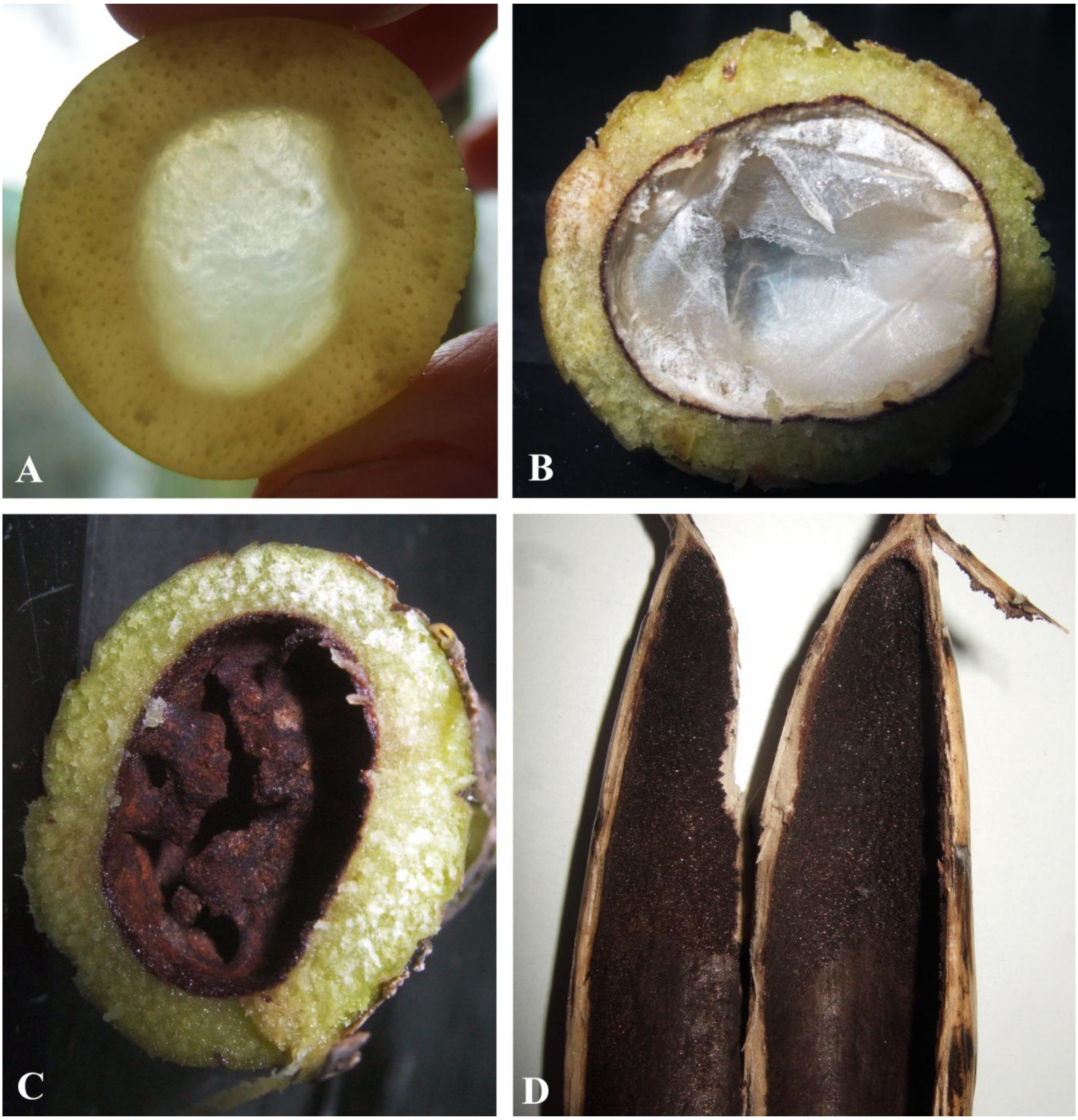

FIG. S2. Pseudobulb anatomy of *Caularthron bilamellatum*, collected in BCNM, Panama. (A) SEM image of a mature, uninhabited pseudobulb cavity. The surface is smooth and consists of shingle-like cells. (B) SEM image of mature, uninhabited pseudobulb cavity near the apex. The rough surface contains large dead and often torn cells. (C) LM image of a mature pseudobulb inhabited by a large number of ants (cross-section near the apex). The surface of the pseudobulb cavity (top) is covered with ant waste and fungal hyphae. A higher magnification of this image can be found in Fig. 2D in the main text. (D) SEM image of mature pseudobulb cavity near the apex inhabited by a large number of ants. The surface is completely covered with a layer of organic material intermingled with fungal hyphae. A lower-magnification version of this image can be found in Fig. 2B in the main text. Scale bars: (A) = 2mm; (B, C) = 100µm; (D) = 25µm.

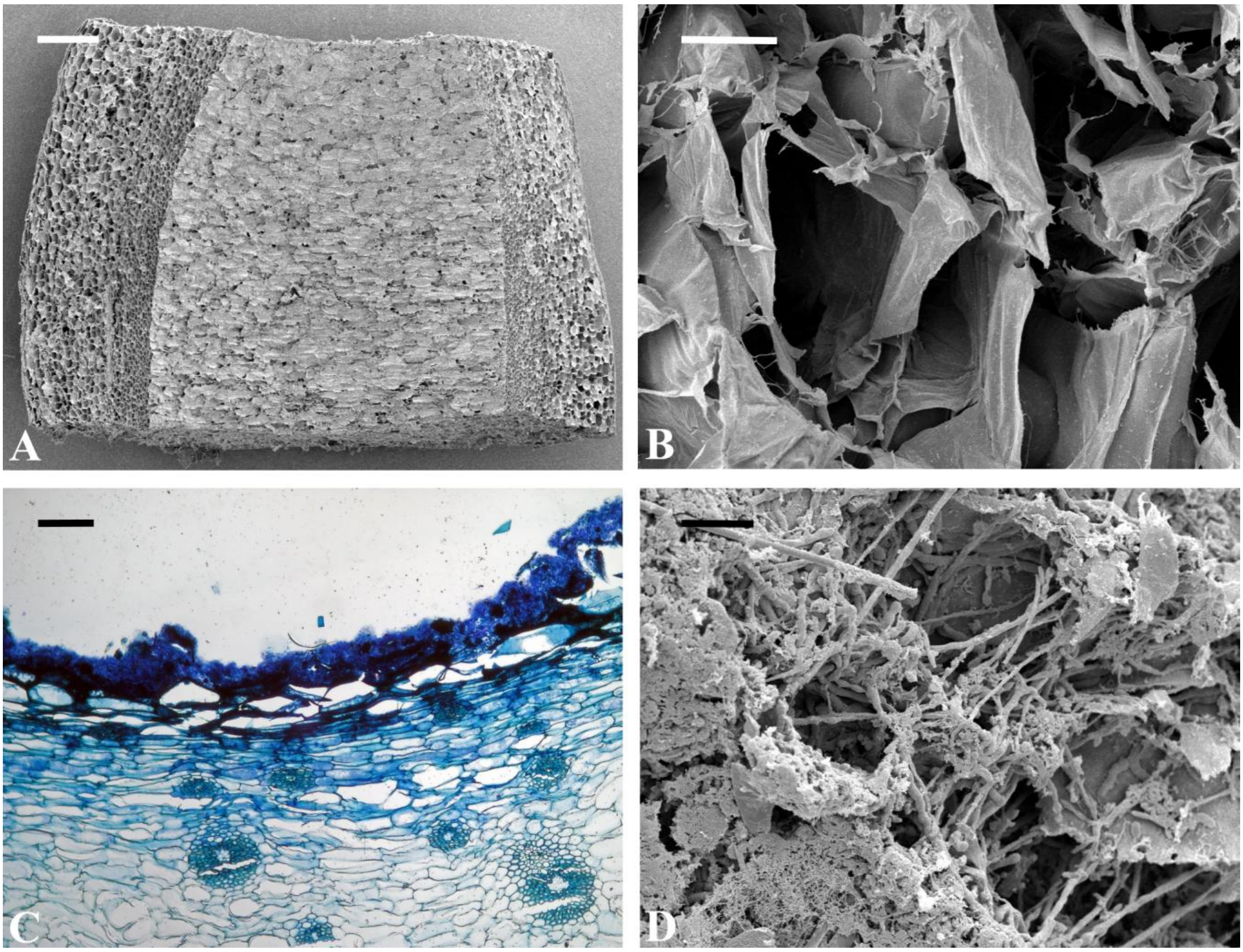

FIG. S3. ^{15}N uptake kinetics of *Caularthron bilamellatum* pseudobulb inner surface. Shown are uptake rates within the domatia of a neotropical myrmecophytic orchid collected at a tropical moist forest, BCI, Panama. Data are given for NH_4^+ (A), glutamine (B), and urea (C). Nitrogen concentrations of the labelling compound in µM are given as on the *x*-axes, uptake rates in µmol ^{15}N g^{-1} DM h^{-1} on the *y*-axes. Note the different scales. Regression lines represent the fitting of the Michaelis–Menten equation to data by hyperbolic regression for (A) and (C), and by linear regression for (B).

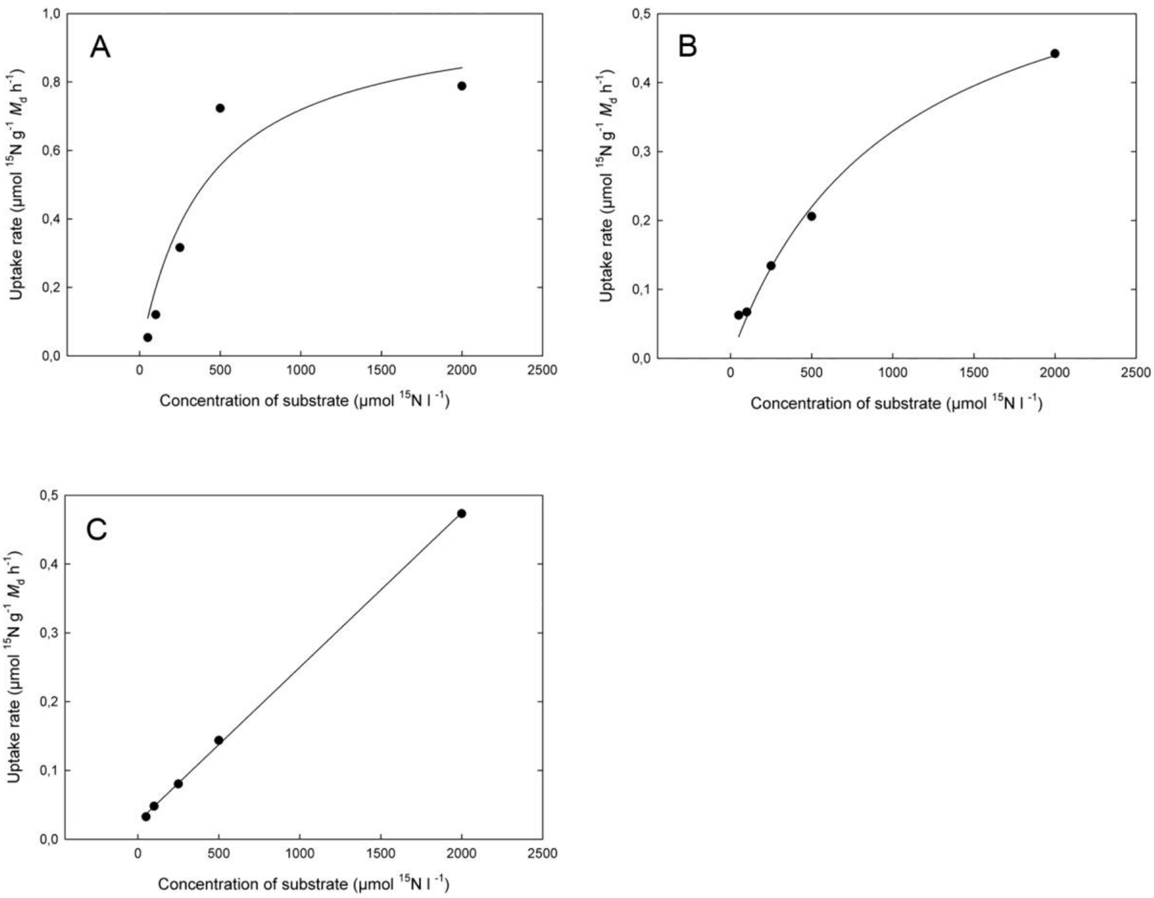

FIG. S4. Spatial variations of ^{15}N uptake between basal and middle regions of immature pseudobulbs, partially filled with parenchymatous tissue. Ants inhabiting specimens of the myrmecophytic orchid *Caularthron bilamellatum* growing on *Annona glabra* along the shoreline of BCNM, Panama, were labelled by feeding them a solution of honey containing $^{15}NH_4Cl$. Ants transported the label into the plants hollow pseudobulbs used as nesting space. Pseudobulbs were harvested after 2 weeks. Spatial distribution of label within immature pseudobulbs was significantly different between basal regions accessible to ants and the inaccessible middle regions still filled with parenchymatous tissue slowly desiccating towards the apex (t-test: $t = -16.251$, $P < 0.001$, $n_{base} = 3$, $n_{middle} = 3$). $\delta^{15}N$ values in middle regions were again significantly different compared with the unlabelled control group (t-test: $t = -16.251$, $P < 0.001$, $n_{control} = 8$, $n_{labelled} = 3$) indicating distribution of label within the plant. Error bars represent the standard error.

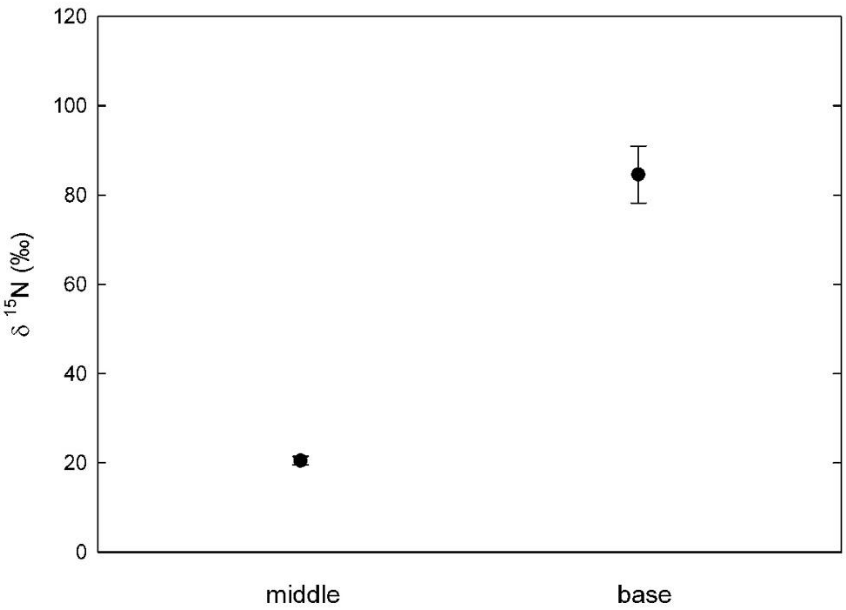

TABLE S1. Comparison of nitrogen uptake in myrmecophytic *Caularthron bilamellatum* plants, colonized by ants and ant larvae, and with ant carton across five different sampling sites. The ants were labelled by feeding them a solution of honey containing $^{15}NH_4Cl$ and transported the label into the plants' hollow pseudobulbs used as nesting space. Pseudobulbs were harvested after 2 weeks. $\delta^{15}N$ values of pseudobulbs are given as means with standard error. Samples of ants, ant larvae and carton had to be pooled for every sampling site to obtain sufficient material for analysis, and represent single values. In some sampling sites ants and larvae could not be obtained in sufficient quantities for analysis.

Sampling site	Sample size (*n* pseudobulbs)	Pseudobulbs $\delta^{15}N$ (‰)	Ants $\delta^{15}N$ (‰)	Ant larvae $\delta^{15}N$ (‰)	Ant carton $\delta^{15}N$ (‰)
1	26	78.99 ± 9,38	–	12.41	33.86
2	14	163.35 ± 20,11	290.11	10.23	27.15
3	12	69.70 ± 16,71	1457.10	–	90.24
4	7	80.71 ± 17,50	471.96	–	214.99
5	9	49.41 ± 16,63	147.57	–	32.30

TABLE S2. One-way ANOVA and Holm–Sidak post-hoc test results for the distribution of ^{15}N label in basal, middle and apical regions of *Caularthron bilamellatum* pseudobulbs. For details see legend of Fig. 3 in the main text.

Effect	SS	d.f.	MS	*F*	*P*
Intercept	168472.9	1	168472.9	88.96891	<0.000001
Location	13976.4	2	6988.2	3.69041	0.040046
Error	45446.8	24	1893.6		

Location	*P*
apex vs. middle	0.403256
apex vs. base	0.031316
middle vs. base	0.354073