Supporting Information

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SI Methods

Site Descriptions. Sites for the present study were selected based on two main criteria: (*i*) similar biotic and abiotic factors; and (*ii*) the presence of both focal *Piper* species.

Mexico, Veracruz, Los Tuxtlas. Los Tuxtlas is a tropical rainforest in the southeastern part of Veracruz, Mexico. This site is considered to be the "northern limit" of the lowland tropical rainforest ecosystem of the Neotropics (1, 2). We carried out the present study within the Los Tuxtlas Biological Research Station (Universidad Nacional Autónoma de México; 95 W; 18 N) and the surrounding area. The reserve has 650 ha of forest with an average temperature of 26 °C, ranging from 20° to 28 °C, and a mean annual rainfall of 4,500 mm (1). All sampling at this site was performed between 100 and 600 m above sea level (Fig. S5).

Costa Rica, Heredia, La Tirimbina. La Tirimbina Biological Reserve is located in the Atlantic lowlands of Heredia, Costa Rica (3). The reserve includes 350 ha of lowland tropical rainforest but forms part of a network of private and national reserves that include the La Selva Biological Station (Organization of Tropical Studies) and Braulio Carrillo National Park. The reserve has a mean annual temperature of 25.3 °C (ranging from 20.2 °C to 30.0 °C) and 3,800 mm of annual precipitation (10°82 N; 84°87 W). All sampling at this site was performed between 150 and 300 m above sea level (Fig. S5).

Ecuador, Napo, Jatun Sacha. Jatun Sacha Biological Station and Reserve are located in eastern Ecuador where the upper Amazon Basin meets the base of the eastern Andes. The reserve includes 1,700 ha of tropical lowland rainforest (00°59 S; 77°36 W) with a mean annual temperature or 25.0 °C and 3,700 mm of annual precipitation. All sampling at this site were performed between 400 and 500 m above sea level (4) (Fig. S5).

Yanamono, Loreto, Peru. The Yanamono region is located 80 km northeast of Iquitos. It includes a 200 ha island in the Amazon River and riverside reserve of more than 1,600 ha of lowland tropical rainforest that is owned by the local community (03°25 S; 72°45 W). It has an annual precipitation of 3,600 mm and a mean temperature of 26 °C, ranging from 20.8 °C to 31.7 °C (5). All sampling at this site was performed between 100 and 150 m above sea level (Fig. S5).

Chalalan, Madidi, La Paz, Bolivia. The Chalalan Natural Reserve is located within the Madidi National Park, in the department of La Paz, Bolivia (14°25 S; 67°55 W). The park includes 12,700 km^2 of tropical lowland rainforest with a mean annual temperature or 26.0 °C (ranging between 18 °C to 32 °C) and 3,200 mm of annual precipitation (6, 7). All sampling at this site was performed between 400 and 500 m above sea level (Fig. S5).

Plant Host Species Details. Piper aduncum *L.* *Piper aduncum* L. (Species Plantarum. Editio sexta 1: 29. 1753.) is one of the most widely known species of *Piper* in the Neotropics. It is a very common pioneer and secondary forest small tree species that can grow up to 12 m in height. It is commonly found in medium to full sunlight, forest edges, clearings, river shores, and urban and agricultural settings (8). It has been extensively studied for its complex secondary chemistry (9–11). However, more recently, this species has gained more attention because of its invasive status in the Pacific islands of Southeast Asia (8, 12). In its native range, the species is more common at low elevations (0–1,000 m above sea level) and normally grows in multi-*Piper* species patches. Leaves are relatively tough and coarse, covered by small stiff trichomes.

Piper aequale *Vahl.* *Piper aequale* Vahl. (Eclogae Americanae 1: 4, t. 3. 1797.) is a relatively unknown, exclusively Neotropical species. This small shrub is a "primary forest" species that can grow up to 3 m in height. It is commonly found in the forest understory under closed canopy (13). Like *P. aduncum*, this species has been studied for its secondary chemistry, although not in much detail (10, 14). In its range, the species is found mainly at low elevations (0–1,300 m above sea level) and normally grows in small multi-*Piper* species patches. Leaves are relatively soft, smooth, and glabrous.

Herbivore Diet Breadth Assessment. After the identification of the caterpillars, databases were used to compile a list of plants that have been reported as hosts for the each particular caterpillar. In a very few cases where (*i*) caterpillars of a particular species were not abundant enough to complete feeding trials in the field and (*ii*) the particular species was not found in any of the databases or bibliographical sources consulted, we extrapolated their diet breadth from the predominant diet breadth of close relatives (species from the same genus present at the same locality).

Refer to refs. 4 and 15–26 for the sources used to confirm and assess herbivore diet breadth.

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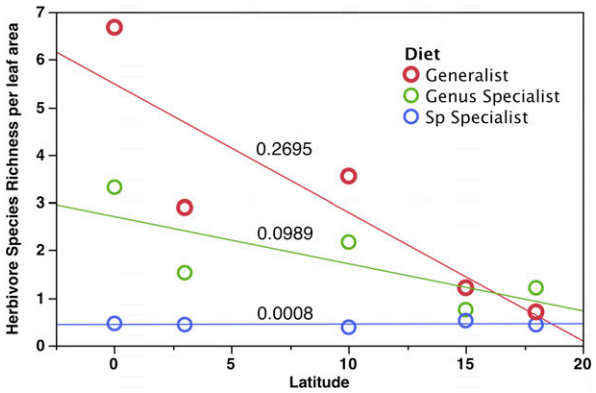

Fig. S1. Simple linear regressions for the diet breadth categories of herbivores across the latitudinal gradient. The numbers above the regression lines are the slopes for each regression. Generalists: $r^2 = 0.7653$, $F = 9.784$, $P = 0.0521$ (red); genus specialists: $r^2 = 0.5807$, $F = 4.154$, $P = 0.1343$ (green); specialists: $r^2 = 0.01662$, $F = 0.0507$, $P = 0.8363$ (blue).

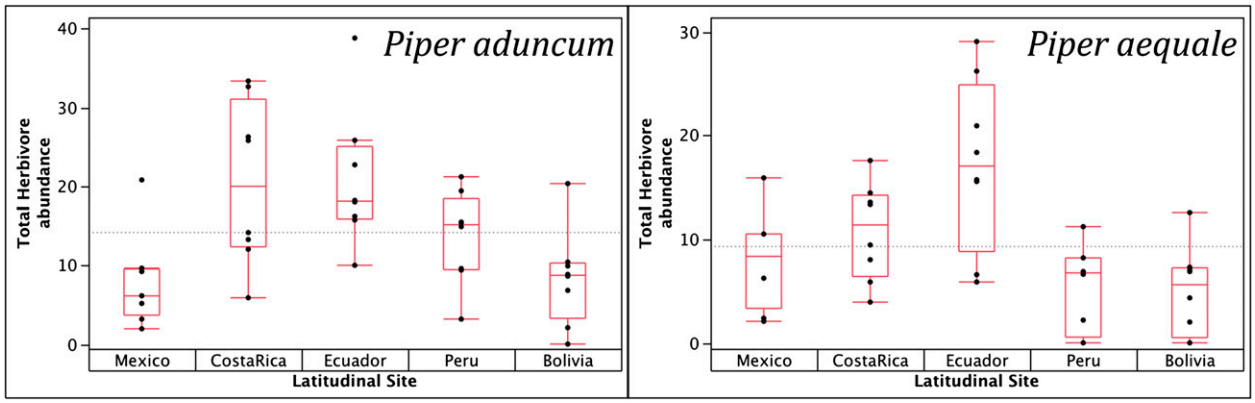

Fig. S2. Total abundance per latitudinal site of *Piper aduncum* and *P. aequale*. Herbivore abundance is measured as the number of lepidopteran larvae present per 100-m^2 leaf area. Points on the graph represent each of the eight sampled populations per latitudinal site. ANOVAs showed a significant greater herbivore abundance at lower latitudes (*P. aduncum*: $F = 4.76$, $df = 4$, $P = 0.0046$; *P. aequale*: $F = 9.17$, $df = 4$, $P < 0.0001$).

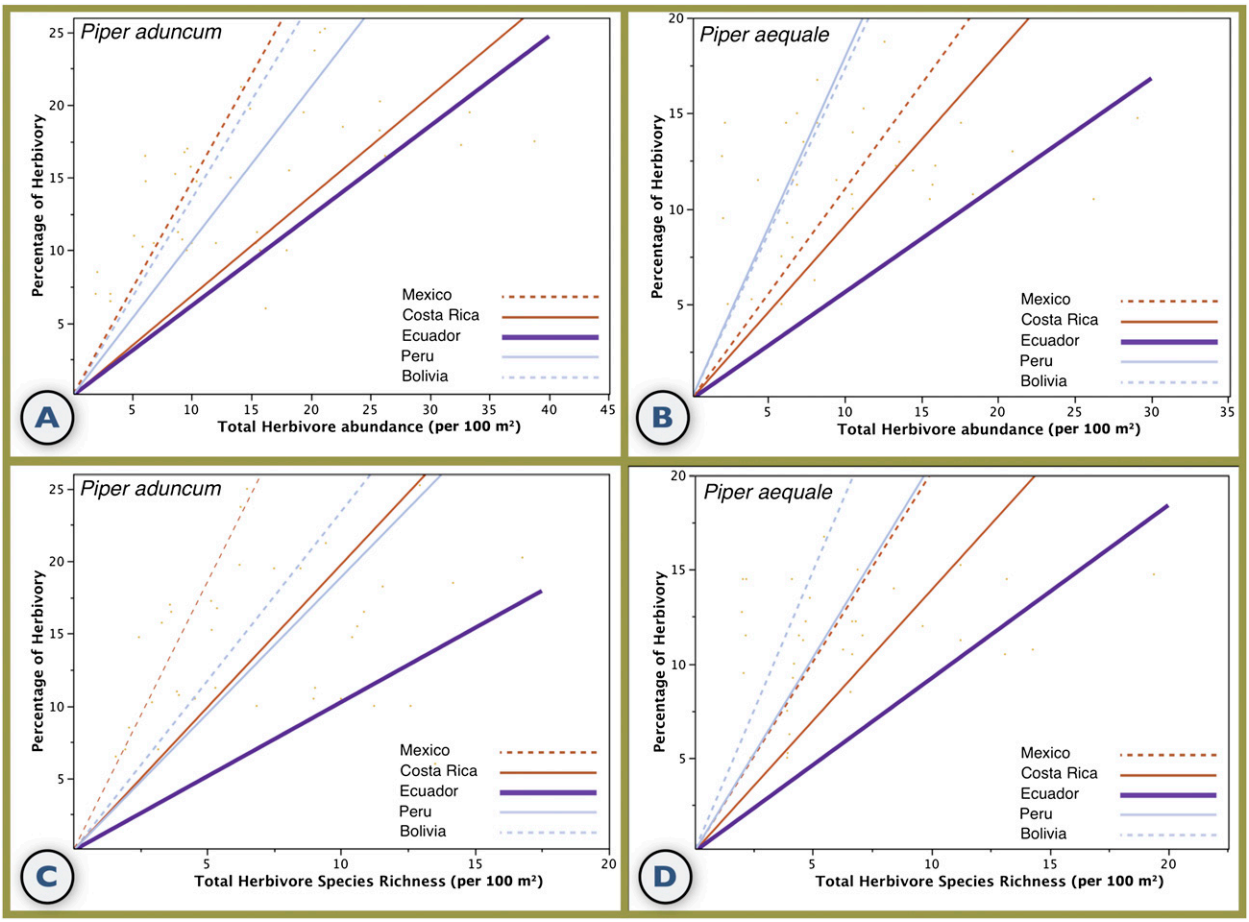

Fig. S3. Linear regression through the origin for percentage of herbivory vs. herbivore abundance (*A* and *B*) and total herbivore species-richness (*C* and *D*) latitudinal site of *Piper aduncum* and *P. aequale*. Dashed lines represent the study sites at higher latitudes (Bolivia and Mexico), thin solid lines represent the "medium" latitude sites (Costa Rica and Peru), and the thick solid line represents the latitude 0 site (Ecuador). Red lines are sites north of the equator, and blue lines are sites south from the equator. Specifics on the regression analysis are in Tables S2 and S3.

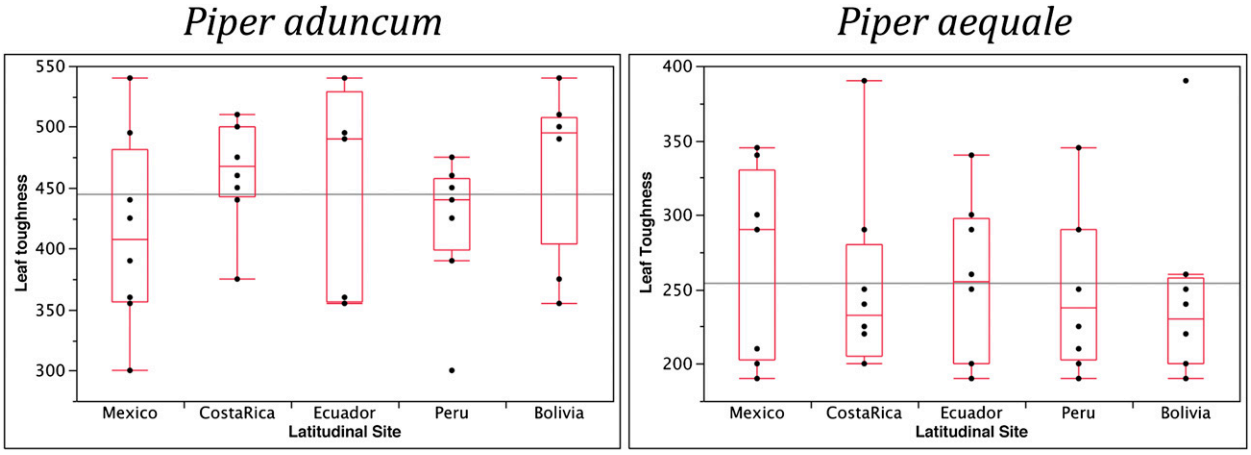

Fig. S4. Leaf toughness per latitudinal site of *Piper aduncum* and *P. aequale*. All leaves were collected from the tip of the branches. Toughness was measured as the amount of grams of force needed to pierce a 0.5-cm-diameter hole at the center of the leaf. Points in the graph represent the average toughness of 30 leaves from the 8 sampled populations per latitudinal site. ANOVAs showed no significant differences in leaf toughness across the five latitudinal sites (*P. aduncum*: $F = 1.1417$, $df = 4$, $P = 0.3531$; *P. aequale*: $F = 0.2247$, $df = 4$, $P = 0.92$).

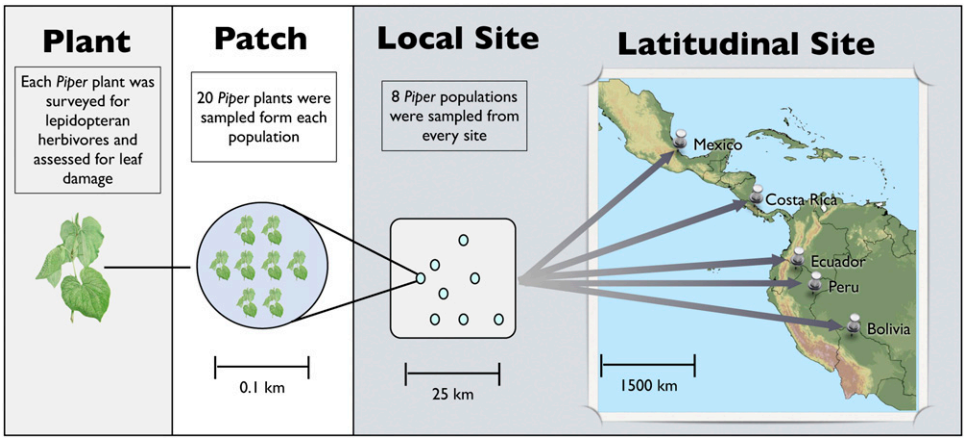

Fig. S5. Diagram of the herbivore and herbivore damage census sampling design.

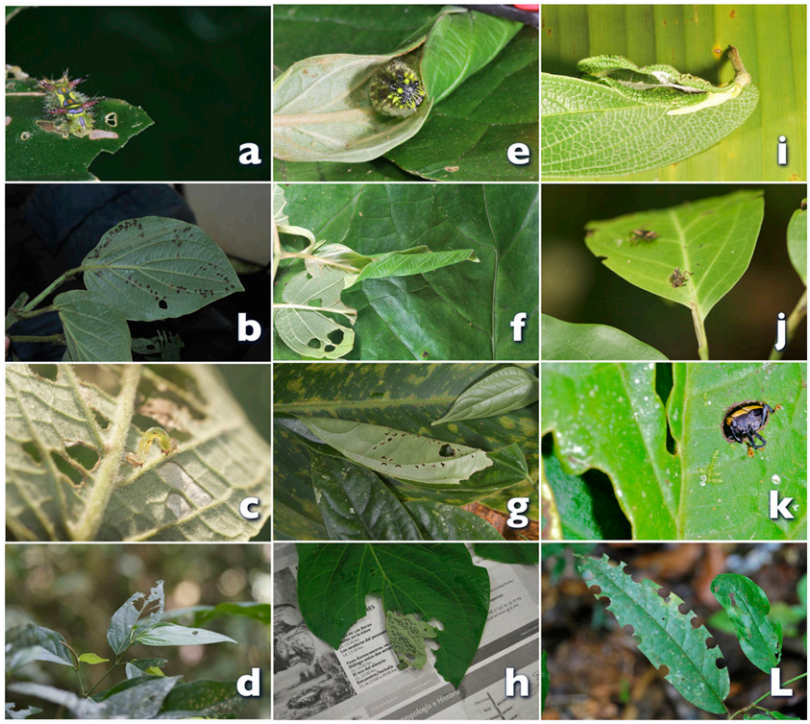

Fig. S6. Examples of types of herbivore damage common in Neotropical *Piper* species. (*A*) Generalist lepidopteran larva (Limacodidae). (*B* and *C*) Specialist geometrids (*Eois* spp.; Geometridae). (*D*) Specialist *Eois* spp. on *P. aequale*. (*E* and *F*) Genus specialist leaf roller (*Consul fabius*; Nymphalidae). (*G* and *H*) Genus specialist leaf folder (*Quadrus cerialis*; Hesperiidae). (*I*) Generalist leaf roller. (*J* and *K*) Weevil damage (Curculionidae). (*L*) Leafcutter bee damage (Megachilidae).

Table S1. Results for the ANOVAs test for the effect of latitudinal site and population on herbivore density, species richness, and plant damage

Species	Response variables	Sig.	Source	*df*	*F*	*P*
P. aduncum	Total herbivore species richness	*	Latitudinal site	4	12.81	<0.0001
		~	Population	7	0.37	0.9079
P. aequale		*	Latitudinal site	4	8.35	0.0001
		*	Population	7	4.45	0.002
P. aduncum	Specialist herbivore species richness	~	Latitudinal site	4	1.25	0.3118
		~	Population	7	2.00	0.0909
P. aequale		~	Latitudinal site	4	1.48	0.2334
		~	Population	7	1.07	0.4045
P. aduncum	Genus herbivore species richness	*	Latitudinal site	4	5.35	0.0025
		~	Population	7	0.50	0.8257
P. aequale		~	Latitudinal site	4	2.29	0.0840
		~	Population	7	2.24	0.0604
P. aduncum	Generalist herbivore species richness	*	Latitudinal site	4	6.40	0.0009
		~	Population	7	0.21	0.9783
P. aequale		*	Latitudinal site	4	4.64	0.0053
		~	Population	7	1.92	0.1026
P. aduncum	Total herbivore density	*	Latitudinal site	4	4.76	0.0046
		~	Population	7	0.4146	0.8850
P. aequale		*	Latitudinal site	4	9.17	<0.0001
		*	Population	7	2.77	0.0252
P. aduncum	Specialist herbivore density	~	Latitudinal site	4	1.22	0.3240
		~	Population	7	1.40	0.2441
P. aequale		~	Latitudinal site	4	1.13	0.3584
		~	Population	7	0.98	0.4605
P. aduncum	Genus herbivore density	*	Latitudinal site	4	5.10	0.0032
		~	Population	7	0.24	0.9691
P. aequale		*	Latitudinal site	4	4.16	0.009
		~	Population	7	1.86	0.1137
P. aduncum	Generalist herbivore density	*	Latitudinal site	4	9.33	<0.0001
		~	Population	7	0.26	0.9635
P. aequale		*	Latitudinal site	4	5.31	0.0026
		~	Population	7	1.81	0.1229
P. aduncum	Herbivory percentage	~	Latitudinal site	4	0.33	0.8553
P. aequale		~	Latitudinal site	4	1.48	0.2335

All values were normalized by total leaf area. Variables with asterisks indicate a significant difference (Sig.) among sites or populations. ~, no significant difference.

Table S2. Regression through the origin of percentage of herbivory with total herbivore abundance and herbivore species richness for *P. aduncum* and *P. aequale*

Latitudinal site	R^2*	Adjusted R^2	SE†	*df*	*F*	*P*
P. aduncum (% of herbivory vs. total herbivore abundance)						
Mexico	0.902	0.888	4.93499	8	64.379	0.0001
Costa Rica	0.884	0.868	5.99812	8	53.454	0.0001
Ecuador	0.918	0.906	4.38692	8	78.48	0.0001
Peru	0.932	0.922	4.48672	8	95.704	0.0001
Bolivia	0.936	0.927	3.83755	8	102.142	0.0001
P. aequale (% of herbivory vs. total herbivore abundance)						
Mexico	0.837	0.813	4.766	8	35.822	0.001
Costa Rica	0.981	0.978	1.57183	8	361.5	0.0001
Ecuador	0.927	0.916	3.20069	8	88.436	0.0001
Peru	0.774	0.742	6.90461	8	24.001	0.002
Bolivia	0.808	0.78	5.81336	8	29.383	0.001
P. aduncum (% of herbivory vs. herbivore species richness)						
Mexico	0.94	0.932	3.84506	8	110.581	0.0001
Costa Rica	0.934	0.924	4.53973	8	98.536	0.0001
Ecuador	0.928	0.917	4.12246	8	89.799	0.0001
Peru	0.895	0.88	5.56708	8	59.71	0.0001
Bolivia	0.813	0.786	6.55284	8	30.432	0.001
P. aequale (% of herbivory vs. herbivore species richness)						
Mexico	0.913	0.901	3.4678	8	73.884	0.0001
Costa Rica	0.911	0.898	3.40091	8	71.715	0.0001
Ecuador	0.887	0.87	3.97923	8	54.745	0.0001
Peru	0.668	0.621	8.37194	8	14.086	0.007
Bolivia	0.833	0.809	5.41765	8	34.892	0.001

Herbivore abundance is measured as the number of lepidopteran larvae present per 100 m^2 of leaf area. Species richness is calculated as the number of species of lepidopteran larvae present per 100 m^2 of leaf area.

*For regression through the origin (no-intercept model), R^2 measures the proportion of the variability in the dependent variable about the origin explained by regression. Importantly, this cannot be compared with R^2 for models that include an intercept.

†Of the estimate.

Table S3. Number of species and individuals of lepidopteran larvae by family collected at the five latitudinal sites

P. aduncum			*P. aequale*		
Family	Number of Species	Number of individuals	Family	Number of Species	Number of individuals
Mexico, Veracruz, Los Tuxtlas Biological Station					
Geometridae	1	17	Limacodidae	1	9
Hesperiidae	2	15	Geometridae	1	9
Limacodidae	1	3	Hesperiidae	2	12
Noctuidae	1	5			
Nymphalidae	1	8			
Costa Rica, Heredia, Tirimbina Biological Station					
Arctiidae	1	1	Megalopygidae	1	2
Bombycidae	1	7	Tortricidae	1	3
Crambidae	3	10	Limacodidae	2	8
Geometridae	3	9	Geometridae	3	12
Hesperiidae	5	45	Hesperiidae	3	14
Lasiocampidae	2	2			
Limacodidae	3	6			
Noctuidae	5	49			
Nymphalidae	2	33			
Papilionidae	1	14			
Sphingidae	1	3			
Tortricidae	3	5			
Ecuador, Napo, Jatun Sacha Biological Station					
Arctiidae	2	3	Geometridae	2	18
Bombycidae	2	2	Hesperiidae	3	27
Crambidae	2	3	Limacodidae	3	12
Geometridae	4	9	Tortricidae	1	3
Hesperiidae	5	20	Saturniidae	1	1
Lasiocampidae	2	4	Bombycidae	1	2
Limacodidae	3	3	Pyralidae	2	2
Noctuidae	5	21			
Nymphalidae	3	29			
Papilionidae	1	9			
Sphingidae	1	3			
Tortricidae	3	3			
Pyralidae	3	5			
Peru, Iquitos, Yanamono Island					
Arctiidae	2	2	Limacodidae	1	2
Bombycidae	1	2	Geometridae	2	7
Geometridae	2	12	Saturniidae	1	1
Hesperiidae	2	28	Pyralidae	1	1
Limacodidae	1	2	Hesperiidae	2	8
Noctuidae	2	10			
Riodinidae	2	3			
Nymphalidae	2	6			
Papilionidae	1	18			
Tortricidae	3	3			
Bolivia, La Paz, Chalalan Ecological Reserve					
Geometridae	1	18	Limacodidae	1	3
Hesperiidae	1	8	Geometridae	1	5
Crambidae	1	2	Hesperiidae	1	8
Noctuidae	1	5			
Riodinidae	1	2			
Papilionidae	1	2			
Arctiidae	1	1			