

SUPPLEMENTARY MATERIAL

Diversity of moths and butterflies of the southwestern region of Costa Rica

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Supplementary Table 1

List of taxonomists that contributed to the identifications of species in each family in which at least some species were identified to the species level or categorized as a morpho species within a particular genus. The affiliation of each taxonomist is also included.

Family	Taxonomist	Affiliation
Aididae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Don Davis	Smithsonian Institution Washington
	Daniel H. Janzen	University of Pennsylvania
Apatelodidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History
	Rodolphe Rougerie	Muséum national d'Histoire naturelle, Sorbonne Université
Arrhenophanidae	Daniel H. Janzen	University of Pennsylvania
Blastobasidae	David Adamski	Smithsonian Institution Washington
	Daniel H. Janzen	University of Pennsylvania
Bombycidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History
	Rodolphe Rougerie	Muséum national d'Histoire naturelle, Sorbonne Université
Castniidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	Jacqueline Miller	University of Florida, Gainesville, Florida
Choreutidae	Daniel H. Janzen	University of Pennsylvania
Crambidae	Daniel H. Janzen	University of Pennsylvania
	Eugene G. Munroe	Entomology Division in Ottawa, Ontario, Canada
	Alma Solis	Smithsonian Institution Washington

Dalceridae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Don Davis	Smithsonian Institution Washington
	Daniel H. Janzen	University of Pennsylvania
	Scott Miller	Smithsonian Institution Washington
Elachistidae	Daniel H. Janzen	University of Pennsylvania
Erebidae	Victor O. Becker	Reserva Serra Bonita, Brazil
	Bernardo Espinoza Sanabria	INBio
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Paul Goldstein	U.S. Department of Agriculture
	Daniel H. Janzen	University of Pennsylvania
	Suzanne Rab-Green	American Museum of Natural History, New York
Euteliidae	John E. Rawlins	Carnegie Museum of Natural History
	Paul Goldstein	U.S. Department of Agriculture
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History
Geometridae	Gunnar Brehm	Institut für Spezielle Zoologie und Evolutionsbiologie Museum, Germany
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	Tanner Matson	Smithsonian Institution Washington
	Roy Mora	INBio
	Linda M. Pitkin	Natural History Museum, London
	John E. Rawlins	Carnegie Museum of Natural History
	J. Bolling Sullivan	North Carolina Biodiversity Project
Hedylidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	Malcolm J. Scoble	Natural History Museum, London
Hesperiidae	George T. Austin	Butterflies of America
	Andrew Brower	American Museum of Natural History, New York
	John Burns	Smithsonian Institution Washington
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	Nick V. Grishin	Butterflies of America
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Olaf Hermann Hendrik Mielke	Universidade Federal do Paraná, Brazil
	Paul A. Opler	Smithsonian Institution, Washington
	Gordon B. Small	Smithsonian Institution Washington
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Dick Vane-Wright	Natural History Museum, London

	Andrew D. Warren	University of Florida, Gainesville, Florida
Lasiocampidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	José Montero Ramírez	INBio
Limaecodidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Jorge Corrales Mayorga	INBio
	Don Davis	Smithsonian Institution Washington
	Mark Epstein	California Department of Food and Agriculture
	Daniel H. Janzen	University of Pennsylvania
Lycaenidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Phil De Vries	University of New Orleans
	Andrew Brower	American Museum of Natural History, New York
	Daniel H. Janzen	University of Pennsylvania
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Paul A. Opler	Smithsonian Institution, Washington
	Robert Robbins	Smithsonian Institution Washington
	Gordon B. Small	Smithsonian Institution Washington
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Dick Vane-Wright	Natural History Museum, London
Megalopygidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Don Davis	Smithsonian Institution Washington
	Mark Epstein	California Department of Food and Agriculture
	Daniel H. Janzen	University of Pennsylvania
Mimallonidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
Noctuidae	Victor O. Becker	Reserva Serra Bonita, Brazil
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	John G. Franclemont	Cornell University
	Paul Goldstein	U.S. Department of Agriculture
	Daniel H. Janzen	University of Pennsylvania
	J. Donal Lafontaine	Canadian National Collection of Insects and Arachnids
	Robert W. Poole	Smithsonian Institution Washington
	John E. Rawlins	Carnegie Museum of Natural History
Nolidae	Paul Goldstein	U.S. Department of Agriculture
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History

Notodontidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Paul Goldstein	U.S. Department of Agriculture
	Daniel H. Janzen	University of Pennsylvania
	James S. Miller	American Museum of Natural History, New York
	Mike Pogue	Smithsonian Institution Washington
	John E. Rawlins	Carnegie Museum of Natural History
	Alexander Schintlmeister	Museum Witt Munich & Nature Research Center Vilnius
	Ryan St Laurent	University of Colorado Boulder
Nymphalidae	Paul Thiaucourt	Muséum national d'Histoire naturelle
	Annette Aiello	Smithsonian Tropical Research Institute
	Patrick Blandin	Muséum National d'Histoire Naturelle
	Andrew Brower	American Museum of Natural History, New York
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Phil De Vries	University of New Orleans
	Daniel H. Janzen	University of Pennsylvania
	Mirna Martins Casagrande	Universidade Federal do Paraná
	André Victor Lucci Freitas	Universidade Estadual de Campinas, Brazil
	Jason P. W. Hall	Smithsonian Institution Washington
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Roberto Gonzalo de la Maza	Sociedad Mexicana de Lepidopterología
	Javier de la Maza Elvira	Sociedad Mexicana de Lepidopterología
	Lee D. Miller	Allyn Museum of Entomology, Sarasota Florida
	Paul A. Opler	Smithsonian Institution, Washington
	Gordon B. Small	Smithsonian Institution Washington
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Dick Vane-Wright	Natural History Museum, London
Oecophoridae	Keith Willmott	Florida Museum of Natural History
	Ronald W. Hodges	U.S. Department of Agriculture
Papilionidae	Daniel H. Janzen	University of Pennsylvania
	Andrew Brower	American Museum of Natural History, New York
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Phil De Vries	University of New Orleans
	Daniel H. Janzen	University of Pennsylvania
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Roberto Gonzalo de la Maza	Sociedad Mexicana de Lepidopterología
	Javier de la Maza Elvira	Mexico
	Paul A. Opler	Smithsonian Institution, Washington

	Gordon B. Small	Smithsonian Institution Washington
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Dick Vane-Wright	Natural History Museum, London
	Keith Willmott	Florida Museum of Natural History
Phiditiidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History
	Rodolphe Rougerie	Muséum national d'Histoire naturelle, Sorbonne Université
Pieridae	Andrew Brower	American Museum of Natural History, New York
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Phil De Vries	University of New Orleans
	Daniel H. Janzen	University of Pennsylvania
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Roberto Gonzalo de la Maza	Sociedad Mexicana de Lepidopterología
	Javier de la Maza Elvira	Mexico
	Paul A. Opler	Smithsonian Institution, Washington
	Gordon B. Small	Smithsonian Institution Washington
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Dick Vane-Wright	Natural History Museum, London
	Keith Willmott	Florida Museum of Natural History
Pyralidae	Daniel H. Janzen	University of Pennsylvania
	Eugene G. Munroe	Entomology Division in Ottawa, Ontario, Canada
	Michael Schaffer	Entomological Society of Scandanavia
	Alma Solis	Smithsonian Institution Washington
Riodinidae	George T. Austin	Butterflies of America
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Andrew Brower	American Museum of Natural History, New York
	Phil De Vries	University of New Orleans
	Don Harvey	Smithsonian Institution Washington
	Daniel H. Janzen	University of Pennsylvania
	Gerardo Lamas	Universidad Nacional Mayor de San Marcos, Lima, Perú
	Andrei Sourakov	Museum of Natural History, Gainesville, Florida
	Paul A. Opler	Smithsonian Institution, Washington
	Gordon B. Small	Smithsonian Institution Washington
	Dick Vane-Wright	Natural History Museum, London
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica

Saturniidae	Daniel H. Janzen	University of Pennsylvania
	Claude Lemaire	Muséum national d'Histoire naturelle
	Rodolphe Rougerie	Muséum national d'Histoire naturelle, Sorbonne Université
Sematuridae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	John E. Rawlins	Carnegie Museum of Natural History
Sphingidae	Jean Marie Cadiou	Muséum national d'Histoire naturelle
	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	Daniel H. Janzen	University of Pennsylvania
	Ian Kitching	Natural History Museum, London
	Rodolphe Rougerie	Muséum national d'Histoire naturelle
Thyrididae	Daniel H. Janzen	University of Pennsylvania
Tortricidae	John W. Brown	Smithsonian Institution Washington
	Daniel H. Janzen	University of Pennsylvania
	Eugenie Phillips Rodríguez	INBio
	Jerry A. Powell	University of California, Berkeley
	Józef Razowski	Polish Academy of Sciences
Uraniidae	Isidro Chacón	BioAlfa, Santo Domingo de Heredia, Costa Rica
	John E. Rawlins	Carnegie Museum of Natural History
Yponomeutidae	Daniel H. Janzen	University of Pennsylvania

Supplementary Table 2

Number specimens identified exclusively to each taxonomic category, and the percentage of specimens identified in each category. Data correspond to the 78747 specimens of moths and butterflies included in this study.

Category	No. specimens	Percentage
Order	2097	2.7
Family	13638	17.3
Genus	5211	6.6
Species/morphospecies	57801	73.4

Supplementary Table 3

Number species (or morphospecies) and the number of specimens identified for each of the 37 families of moths and butterflies, collected in the southwestern region of Costa Rica. Families for which specimens were not identified to species or morphospecies are not included.

Family	No. species	No. specimens
Aididae	1	81

Apatelodidae	17	823
Arrhenophanidae	1	3
Blastobasidae	9	13
Bombycidae	12	966
Castniidae	3	22
Choreutidae	28	247
Crambidae	287	6709
Dalceridae	8	121
Elachistidae	29	373
Erebidae	842	14913
Euteliidae	10	166
Geometridae	306	7633
Hedylidae	13	588
Hesperiidae	76	290
Lasiocampidae	42	1182
Limacodidae	60	2058
Lycaenidae	34	105
Megalopygidae	24	965
Mimallonidae	31	412
Noctuidae	313	3109
Nolidae	39	689
Notodontidae	261	6877
Nymphalidae	177	2037
Oecophoridae	5	5
Papilionidae	14	115
Phiditiidae	2	19
Pieridae	21	114
Pyalidae	96	1648
Riodinidae	57	158
Saturniidae	61	2246
Sematuridae	1	1
Sphingidae	96	1461
Thyrididae	31	165
Tortricidae	20	252
Uraniidae	2	33
Yponomeutidae	1	3
TOTAL	3030	56602

Supplementary Table 4

Pairwise comparisons of dissimilarity between families on Sorensen index values calculated for each family among localities. Estimate refers to the difference of Sorensen mean values between the corresponding pair of families. Values in bold indicate significant differences.

Contrast	Estimate	SE	df	t.ratio	p.value
Apatelodidae – Bombycidae	0.060	0.047	168	1.26	0.311

Apatelodidae – Crambidae	-0.129	0.047	168	-2.72	0.020
Apatelodidae – Erebidae	-0.221	0.047	168	-4.68	<0.001
Apatelodidae – Geometridae	-0.110	0.047	168	-2.33	0.049
Apatelodidae – Lasiocampidae	-0.212	0.047	168	-4.49	<0.001
Apatelodidae – Megalopygidae	-0.162	0.047	168	-3.42	0.003
Apatelodidae – Noctuidae	-0.257	0.047	168	-5.43	<0.001
Apatelodidae – Notodontidae	-0.144	0.047	168	-3.06	0.010
Apatelodidae – Nymphalidae	-0.211	0.047	168	-4.46	<0.001
Apatelodidae – Saturniidae	-0.082	0.047	168	-1.73	0.147
Apatelodidae – Sphingidae	-0.128	0.047	168	-2.70	0.020
Bombycidae – Crambidae	-0.188	0.047	168	-3.99	0.001
Bombycidae – Erebidae	-0.281	0.047	168	-5.94	<0.001
Bombycidae – Geometridae	-0.170	0.047	168	-3.60	0.002
Bombycidae – Lasiocampidae	-0.272	0.047	168	-5.76	<0.001
Bombycidae – Megalopygidae	-0.221	0.047	168	-4.69	<0.001
Bombycidae – Noctuidae	-0.316	0.047	168	-6.69	<0.001
Bombycidae – Notodontidae	-0.204	0.047	168	-4.32	<0.001
Bombycidae – Nymphalidae	-0.270	0.047	168	-5.72	<0.001
Bombycidae – Saturniidae	-0.142	0.047	168	-3.00	0.011
Bombycidae – Sphingidae	-0.187	0.047	168	-3.96	0.001
Crambidae – Erebidae	-0.092	0.047	168	-1.95	0.105
Crambidae – Geometridae	0.018	0.047	168	0.39	0.780
Crambidae – Lasiocampidae	-0.084	0.047	168	-1.77	0.147
Crambidae – Megalopygidae	-0.033	0.047	168	-0.70	0.571
Crambidae – Noctuidae	-0.128	0.047	168	-2.71	0.020
Crambidae – Notodontidae	-0.016	0.047	168	-0.33	0.786
Crambidae – Nymphalidae	-0.082	0.047	168	-1.73	0.147
Crambidae – Saturniidae	0.047	0.047	168	0.99	0.434
Crambidae – Sphingidae	0.001	0.047	168	0.02	0.982
Erebidae – Geometridae	0.111	0.047	168	2.34	0.049
Erebidae – Lasiocampidae	0.009	0.047	168	0.18	0.883
Erebidae – Megalopygidae	0.059	0.047	168	1.25	0.311
Erebidae – Noctuidae	-0.036	0.047	168	-0.75	0.562
Erebidae – Notodontidae	0.076	0.047	168	1.62	0.177
Erebidae – Nymphalidae	0.010	0.047	168	0.22	0.867
Erebidae – Saturniidae	0.139	0.047	168	2.94	0.013
Erebidae – Sphingidae	0.093	0.047	168	1.98	0.103
Geometridae – Lasiocampidae	-0.102	0.047	168	-2.16	0.073
Geometridae – Megalopygidae	-0.052	0.047	168	-1.09	0.398
Geometridae – Noctuidae	-0.146	0.047	168	-3.10	0.009
Geometridae – Notodontidae	-0.034	0.047	168	-0.72	0.565
Geometridae – Nymphalidae	-0.100	0.047	168	-2.12	0.077
Geometridae – Saturniidae	0.028	0.047	168	0.60	0.638
Geometridae – Sphingidae	-0.017	0.047	168	-0.37	0.780
Lasiocampidae – Megalopygidae	0.051	0.047	168	1.07	0.401
Lasiocampidae – Noctuidae	-0.044	0.047	168	-0.94	0.445

Lasiocampidae – Notodontidae	0.068	0.047	168	1.44	0.246
Lasiocampidae – Nymphalidae	0.002	0.047	168	0.04	0.982
Lasiocampidae – Saturniidae	0.130	0.047	168	2.76	0.020
Lasiocampidae – Sphingidae	0.085	0.047	168	1.79	0.145
Megalopygidae – Noctuidae	-0.095	0.047	168	-2.01	0.099
Megalopygidae – Notodontidae	0.017	0.047	168	0.37	0.780
Megalopygidae – Nymphalidae	-0.049	0.047	168	-1.03	0.416
Megalopygidae – Saturniidae	0.080	0.047	168	1.69	0.158
Megalopygidae – Sphingidae	0.034	0.047	168	0.72	0.565
Noctuidae – Notodontidae	0.112	0.047	168	2.37	0.048
Noctuidae – Nymphalidae	0.046	0.047	168	0.97	0.434
Noctuidae – Saturniidae	0.175	0.047	168	3.70	0.002
Noctuidae – Sphingidae	0.129	0.047	168	2.73	0.020
Notodontidae – Nymphalidae	-0.066	0.047	168	-1.40	0.257
Notodontidae – Saturniidae	0.063	0.047	168	1.32	0.288
Notodontidae – Sphingidae	0.017	0.047	168	0.36	0.780
Nymphalidae – Saturniidae	0.129	0.047	168	2.72	0.020
Nymphalidae – Sphingidae	0.083	0.047	168	1.76	0.147
Saturniidae – Sphingidae	-0.046	0.047	168	-0.97	0.434