Journal of Natural Science Collections

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Source: Miles, C. (2018). Taking Wing: Curating a collection of Venezuelan hawkmoths at the Manchester Museum. *Journal of Natural Science Collections*, *Volume 5*, 41 - 49.

URL: http://www.natsca.org/article/2445

Taking Wing: Curating a collection of Venezuelan hawkmoths at the Manchester Museum

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Received: 28/07/2017

Accepted: 21/09/2017

Citation: Miles, C., 2018. Taking wing: Curating a collection of Venezuelan hawkmoths at the Manchester Museum. *Journal of Natural Science Collections,* 5, pp.41-49.

Abstract

This paper reports on a project to re-curate and catalogue the Adams and Bernard collection of 174 Venezuelan hawkmoths (Lepidoptera: Sphingidae) at the Manchester Museum. The project was made possible by a grant awarded by the Natural Science Collections Association (NatSCA). The moths were set, photographed, accessioned, identified, and recorded in the museum database. The collection was found to represent 43 species in 16 genera.

Keywords: Curation, Venezuela, neotropical Sphingidae, museum collections, research, access, Heterocera, digitisation

Introduction

Manchester Museum's arthropod collections contain around 2.5 million insects, and date back to the founding of the museum in 1821 by the Manchester Society for the Promotion of Natural History (Logunov and Merriman, 2012). Logunov (2010) provides a comprehensive list of the entomology collections, but particular strengths include the worldwide collections of Coleoptera, Dermaptera, and Lepidoptera. The major collections of Lepidoptera include:

- Over 50,000 British specimens (an underestimate as not all have been counted and recorded in the museum database). The basis of the British collection is the H.N. Michaelis and R.C.R. Crewdson collections of Lepidoptera, acquired in 1959, 1962–63, and 1978 (Logunov, 2012).
- C. H. Schill's worldwide collection of 40,000 specimens, representing over 8,000 species in all families of butterflies, larger moths, and micro-Lepidoptera, donated to Manchester Museum in 1900 by the collector Charles Henry Schill (1863-). This collection also now incorporates the collections of C.O. Trechmann and A.L. Darrah (Logunov, 2010).
- The David Longsdon Papilionidae collection of 9,300 apollos, swallowtails, and birdwings, containing 87% of all described Papilionidae species. This collection was acquired by bequest of the London-based artist David Longsdon (1864–1937) in 1938 (Dockery and Logunov, 2015).
- The Paul H. Schill Palaearctic Lepidoptera collection of butterflies, larger moths, Pyralidae, Micropterigidae, Sessidae, and Psychidae, in 150 drawers (three large double cabinets and one small cabinet), acquired 1901 (University of Manchester, 1901). This collection now incorporates the L. Krah collection of European Bombycidae, Sphingidae, and Noctuidae (48 drawers), and specimens from H.G. Allcard and Joseph Sidebottom.

Figure 1. A drawer of neotropical hawkmoths (Sphinginae: Cocytiina) in the C. H. Schill collection (MANCH F4197) at Manchester Museum. Image: C. Miles.

Within the Lepidoptera collections, there are 2,010 adult hawkmoth specimens determined to species: 871 in the C. H. Schill Worldwide Lepidoptera collection (Figure 1), 768 in the British collection, and 371 in the P. Schill Palaearctic Lepidoptera collection. In total, they represent about 270 species, 19% of the world Sphingidae fauna (cf. van Nieukerken et al., 2011). In addition, there is an unquantified amount of papered material awaiting determination, from regions which include Kenya, South Africa, India, and the USA. The Adams and Bernard collection of Venezuelan Sphingidae was among this material.

The hawkmoths are a family present on every continent except Antarctica (Kitching, 2017). They have a strong forward flight, with a fast wing beat, and commonly hover like hummingbirds to feed at flowers with their long proboscis (Willmer, 2011). The hawkmoths are pollinators as adults, and some can move pollen far greater distances than, for example, bees (Willmer, 2011), having a flight capacity of over 15km (Amorim et al., 2014). Most are nocturnal, but a few are day-flying. They can be agricultural pests as leaf-feeding larvae, for example the tobacco hornworm, *Manduca sexta* (Linnaeus, 1763), the tomato hornworm, *M. quinquemaculatus* (Haworth, 1803), and the sweet potato hornworm, *Agrius cingulata* (Fabricius, 1775) (Figure 2) (Hill, 1987). Their relatively well-understood taxonomy and fast response to environmental changes makes them useful environmental indicators (de Camargo et al., 2016).

Figure 2. Agrius cingulata (Fabricius, 1775), pink-spotted hawkmoth (MANCH F2653.263) in the Adams/Bernard collection. Its larva is the sweet potato hornworm. Image: C. Miles.

The Adams and Bernard Sphingidae collection

The hawkmoths in the Adams and Bernard collection (MANCH F2653) were collected in Venezuela in May 1975. This was the third expedition to Colombia and Venezuela completed by Michael J. Adams (Figure 3), a teacher from Dorset, UK, and his friend, colleague, and fellow lepidopterist, George I. Bernard (Figure 4) (Adams, 1984; 1987). They were investigating the biogeography of the pronophiline butterflies (Nymphalidae: Satyrinae: Pronophilina) in the northern Andes, on which they published a number of papers. Altogether, Adams completed eight trips to the region between 1971 and 1986, and Bernard accompanied him on five of them (Johnson and Adams, 1993).

The information provided with the collection states that the moths were collected using the 'Mercury Vapour Lamp and White Sheet method', in which a light source with a high emittance in the ultraviolet part of the spectrum is suspended near a white surface, often a sheet hung vertically and/or placed

Figure 3. Michael Adams 'having caught a spectacular roidinid [sic]'. July 1977, Arcabuco Canyon, c.2,600m., Boyacá Department, Colombia. Riodinids are commonly known as metalmark butterflies. Image: M.J. Adams and G.I. Bernard.

Figure 4. George Bernard, March 1975, east of San Pedro de la Sierra, c.1,500m., Sierra Nevada de Santa Marta, Magdalena Department, Colombia. Image: M.J. Adams and G.I. Bernard.

flat on the ground. UV radiation attracts more moth species and higher numbers of moths than longer wavelengths, and there is some evidence these smaller wavelengths attract relatively larger moth species and a higher abundance of these species (van Langevelde et al., 2011).

The collections were made in three localities. These are, with additional detail provided more recently by Adams and Bernard (2017):

1. Rancho Grande, Henri Pittier National Park, Aragua State, at altitude 1090m (120 specimens)
2. 24 km north of Altagracia de Orituco, Guatopo National Park, Miranda State, at altitude 700m (46 specimens)
3. El Guapo Dam, Miranda State, at altitude 100m (8 specimens).

Adams' and Bernard's stay in the University facility of Rancho Grande (now Estación Biológica Rancho Grande, a high-altitude field station) and their excursion to Guatopo National Park to collect butterflies were organised by their host, Prof. Francisco Fernández Yépez, founder and curator of the Museo del Instituto de Zoología Agrícola Francisco Fernández Yépez (MIZA), Universidad Central de Venezuela, Maracay (Adams and Bernard, 2017). MIZA is dedicated to the study of tropical biodiversity and houses a nationally important hawkmoth collection (MIZA, n.d).

The hawkmoths were purchased from Adams and Bernard by Manchester Museum in April 1976 (Accession number F2653) as part of a consignment of 300 Venezuelan Heterocera (moths). The specimens were received undetermined, and have been stored in the Entomology Department in cardboard boxes, enclosed in triangular, glassine-type paper packets (Figure 5).

Figure 5. The moths as stored in glassine packets. Image: C. Miles.

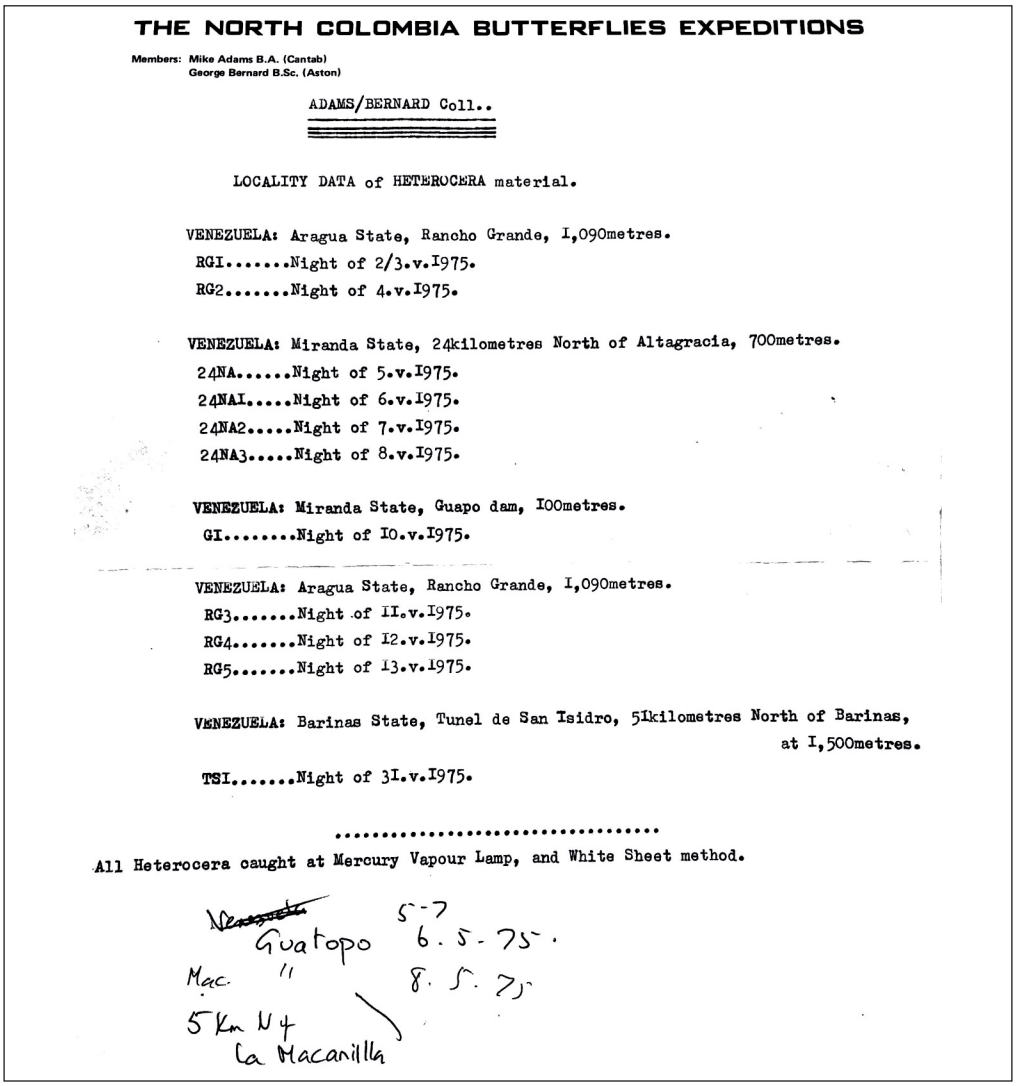
Recuration

This project was made possible thanks to a NatSCA Bill Pettitt Award grant awarded in 2016, which funded the purchase of ten glass-topped drawers with Plastazote inserts, and a reference (Kitching and Cadiou, 2000).

The aims of the project were to:

1. Improve the preservation and security of the Adams and Bernard Sphingidae collection
2. Make the collection available for study
3. Provide a resource for a range of teaching and engagement activities
4. Share and improve curatorial skills

The Adams and Bernard collection was considered suitable for this project because of its good quality associated data (Figure 6) and the generally good condition of the specimens. The moths were set (Figure 7), photographed with labels (Figure 8), individually accessioned and identified. The identification of the material was based on D'Abrera, 1986; Kitching and Cadiou, 2000; Martin, 2016; Kitching, 2017; Oehlke (n.d.), and Chacín et al. (n.d.), and the collections at Manchester Museum. Hawkmoth nomenclature and classification follows Kitching, 2017. All specimens have been recorded, with images, on the Manchester Museum's collections management database (KE EMu), making them immediately publicly accessible on the Museum's searchable external website (http://harbour.man.ac.uk/mmcustom/narratives/).



THE NORTH COLOMBIA BUTTERFLIES EXPEDITIONS

Members: Mike Adams B.A. (Cantab)
George Bernard B.Sc. (Aston)

ADAMS/BERNARD Coll..

LOCALITY DATA of HETEROCERA material.

VENEZUELA: Aragua State, Rancho Grande, 1,090metres.
RG1.....Night of 2/3.v.1975.
RG2.....Night of 4.v.1975.

VENEZUELA: Miranda State, 24kilometres North of Altagracia, 700metres.
24NA.....Night of 5.v.1975.
24NA1.....Night of 6.v.1975.
24NA2.....Night of 7.v.1975.
24NA3.....Night of 8.v.1975.

VENEZUELA: Miranda State, Guapo dam, 100metres.
G1.....Night of 10.v.1975.

VENEZUELA: Aragua State, Rancho Grande, 1,090metres.
RG3.....Night of 11.v.1975.
RG4.....Night of 12.v.1975.
RG5.....Night of 13.v.1975.

VENEZUELA: Barinas State, Tunel de San Isidro, 51kilometres North of Barinas, at 1,500metres.

TS1.....Night of 31.v.1975.

.....

All Heterocera caught at Mercury Vapour Lamp, and White Sheet method.

~~Maracay~~ 5-7
Guatopo 6.5.75.
Mac. " 8.5.75.
5 Km N of
La Macanilla

Figure 6. Data provided with the collection. The handwriting is that of Manchester Museum's Keeper of Entomology at the time, Alan Brindle. Image: C. Miles.

Figure 7. Specimens spread and pinned in position with setting paper, after being relaxed in a damp atmosphere for several days. The largest moth here, Cocytius lucifer Rothschild & Jordan, 1903 (MANCH 2653.224) has a wingspan of 17 cm. Image: C. Miles.

Table 1. Sphingidae determined to species in the Adams/Bernard Collection.

Subfamily	Tribe	Subtribe	No. of genera	No. of species	No. of specimens
Macroglossinae	Dilophonotini	Dilophonotina	7	13	37
		Philampelina	2	6	18
	Macroglossini	Choerocampina	1	11	62
Smerinthinae	Ambulycini		2	3	10
Sphinginae	Sphingini	Acherontiina	1	1	2
		Cocytiina	2	3	5
		Sphingina	1	6	29
			16	**43**	**163**

Figure 8. Record shot of Hemeroplanes triptolemus (Cramer, 1779) MANCH F2653.287. Image: The Manchester Museum, The University of Manchester.

Figure 9. Species in the genus Erinnyis Hübner, [1819] from the Adams/Bernard collection in one of the new drawers. Image: C. Miles.

Results

The 174 specimens were found to represent 43 species in 16 genera, where 12 species (38 specimens) are new to the collection, an increase in Sphingidae species of 4%. In addition, for 24 of the 31 species that were not new to the collection, Venezuela extends the geographic range represented. Table 1 gives a summary of the collection. Species with their localities are listed in Appendix I.

At the time of writing, there are 11 specimens determined to genus only, pending access to comparative material: *Eumorpha* Hübner, 1807 (2 specimens), *Xylophanes* Hübner, [1819] (2 specimens), *Manduca* Hübner, 1807 (7 specimens).

Summary

With their improved physical storage (Figure 9) and security, the moths are now available for research and as a valuable resource for the museum's teaching, displays, public events and engagement activities. The hawkmoths are publicly accessible on the museum's searchable external website, and can easily be located with their associated documentation through the collections management database. The collection has already been used in research and engagement activities, which include filming of the curatorial process by students from the Granada

Centre for Visual Anthropology, and use with groups of students to illustrate the work of the museum and the use of the collections. A report describing the curatorial work in progress can be found on the Entomology Manchester blog (Miles, 2017).

Acknowledgements

With grateful thanks to NatSCA for funding the purchase of drawers and taxonomic reference; to Phil Rispin of the Manchester Museum for sharing his expertise; to Dimitri Logunov of the Manchester Museum for his support; and to the two anonymous reviewers for their helpful comments. Special thanks are due to George Bernard and Michael Adams for the information they provided and the use of their photographs.

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Appendix I

Table 2. Species represented in the Adams/Bernard Collection. Locality abbreviations: RG: Rancho Grande, Henri Pittier National Park, Aragua State, at altitude 1090m; NA: 24 km north of Altagracia de Orituco, Guatopo National Park, Miranda State, at altitude 700m; GD: [El] Guapo Dam, Miranda State, at altitude 100m.Taxonomy follows Kitching, 2017.

					No. of specimens			
					Locality			
Subfamily	**Tribe**	**Subtribe**	**Genus**	**Species**	**RG**	**NA**	**GD**	**Total**
Macroglossinae	Dilophonotini	Dilophonotina	*Callionima*	*falcifera* (Gehlen, 1943)	1	1		2
				parce (Fabricius, 1775)	4	1		5
			Erinnyis	*alope alope* (Drury, 1773)	8	1		9
				crameri (Schaus, 1898)	2			2
				ello ello (Linnaeus, 1758)	8		1	9
				lassauxii (Boisduval, 1859)	1			1
				oenotrus (Cramer, 1780)	1	2		3
			Hemeroplanes	*triptolemus* (Cramer, 1779)		1		1
			Madoryx	*bubastus* (Cramer, 1777)			1	1
			Pachylia	*ficus* (Linnaeus, 1758)			1	1
			Perigonia	*ilus* Boisduval, 1870	1			1
				lusca (Fabricius, 1777)	1			1
			Pseudosphinx	*tetrio* (Linnaeus, 1771)	1			1
		Philampelina	*Enyo*	*lugubris lugubris* (Linnaeus, 1771)		1		1
				ocypete (Linnaeus, 1758)			1	1
			Eumorpha	*anchemolus* (Cramer, 1779)		1		1
				satellitia licaon (Cramer, 1775)	5	5		10
				triangulum (Rothschild & Jordan, 1903)	1	1		2
				vitis vitis (Linnaeus, 1758)		2	1	3
	Macroglossini	Choerocampina	*Xylophanes*	*anubus* (Cramer, 1777)			1	1
				ceratomioides (Grote & Robinson, 1866)	9	1		10
				chiron nechus (Cramer, 1777)	3			3
				crotonis (Walker, 1856)	3			3
				germen yurakano Lichy, 1945	5			5
				neoptolemus (Cramer, 1780)	1	4		5
				pluto (Fabricius, 1777)	8	2		10
				porcus (Hübner, 1823)		1	1	2

					Number of specimens			
					Locality*			Total
Subfamily	**Tribe**	**Subtribe**	**Genus**	**Species**	**RG**	**NA**	**GD**	
Macroglossinae	Macroglossini	Choerocampina	*Xylophanes*	*pyrrhus* Rothschild & Jordan, 1906	5			5
				titana (Druce, 1878)	10	2		12
				tyndarus (Boisduval, [1875])	6			6
Smerinthinae	Ambulycini		*Adhemarius*	*gannascus* (Stoll, 1790)	8			8
				tigrina tigrina (Felder, C. & Felder, R., 1874)	1			1
			Protambulyx	*strigilis* (Linnaeus, 1771)		1		1
Sphinginae	Sphingini	Acherontiina	*Agrius*	*cingulata* (Fabricius, 1775)		2		2
		Cocytiina	*Cocytius*	*lucifer* Rothschild & Jordan, 1903	1	1		2
				antaeus (Drury, 1773)	1			1
			Neococytius	*cluentius* (Cramer, 1775)		2		2
		Sphingina	*Manduca*	*albiplaga* (Walker, 1856)	5			5
				diffissa tropicalis (Rothschild & Jordan, 1903)	4	1		5
				florestan (Stoll, 1782)	6	2		8
				lefeburii lefeburii (Guérin-Méneville, 1844)		3	1	4
				ochus (Klug, 1836)		1		1
				rustica rustica (Fabricius, 1775)	2	4		6
			Total		**112**	**43**	**8**	**163**