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Sphingidae (Lepidoptera) in the collections of the Manchester Museum

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ABSTRACT

There are over 2,400 Sphingidae (hawkmoths) held in the Manchester Museum's Lepidoptera collections, distributed among separate British and worldwide sections. This summary provides a full species list and brings information about the collections and collectors together in one place to encourage the use of the collections for academic or personal research, or for creative inspiration.

Keywords: Hawkmoths, C.H. Schill, P.H. Schill, J. Sidebotham, Manchester Entomological Society

INTRODUCTION

The collections of arthropods in the Manchester Museum, one of the UK's largest university museums, hold more than three million specimens. About two and a half million of these are insects, making the entomological collection probably the third largest in the UK (Logunov & Merriman 2012; Logunov 2012). Of these insects, more than 150,000 are butterflies and moths, arranged into separate British and foreign sections.

Published descriptions of the Lepidoptera collections at the Manchester Museum cover the general collection of British Lepidoptera (Logunov 2012), Joseph Sidebotham's Lepidoptera (Cook & Logunov 2016), David Longsdon's collection of swallowtail butterflies (Dockery & Logunov 2015), the small Sphingidae collection of Michael J. Adams and George I. Bernard (Miles 2018), and a description of the unusual Lepidoptera collection of William Raymond Wooff by Michael Dockery and Dmitri Logunov (2018).

The data provided below are based on taxonomy following Kitching (2018). Accession numbers for collections are provided in brackets *e.g.* (MANCH.Fxxxx), and the following abbreviations are used: MMEA – the Manchester Museum's Entomological Archive, M.E.S. – Manchester Entomological Society.

SPHINGIDAE AT THE MANCHESTER MUSEUM

The Sphingidae at the Manchester Museum are contained in five Lepidoptera collections, those of C.H. Schill (worldwide), P. Schill (Palaearctic), J. Sidebotham (probably mostly British), R. Wooff (Afrotropical, New World and European), and the general British Lepidoptera collection. In total, there are 2,220 pin-mounted adult specimens, 59 larvae and 38 pupae, also pin-mounted, eight eggs, and 104 papered specimens. These represent 288 worldwide Sphingidae species and subspecies in 96 genera, out of a current world Sphingidae fauna of 1,602 species in

205 genera (Kitching *et al*. 2018), i.e. approximately 18% of the world fauna. A complete list of species is given in Appendix 1. Table 1 summarises the taxonomic scope of the collections and Table 2 shows the distribution of the specimens between the various Lepidoptera collections.

BRITISH SPHINGIDAE

The British Sphingidae are held in the general British Lepidoptera collection, the J. Sidebotham collection, and the W.R. Wooff collection. In total these contain 842 Sphingidae specimens representing 17 species. Table 3 summarises the British species and numbers of specimens in each collection.

A. The British Lepidoptera Collection

The general British Lepidoptera collection contains over 50,000 Lepidoptera specimens although this is an underestimate as to date not all have been counted and recorded in the museum database. There are 1,653 species represented, around 61% of British species (Logunov 2012). The collection is based on Hugh Nicholas Michaelis' collection of Macrolepidoptera acquired in 1959 (MANCH.F2414) (Report 1958–59) and 1962–63 (MANCH.F2461, F2471). Michaelis (1904–95) was a Manchester bank manager and an expert lepidopterist and collector. He published 29 papers on Lepidoptera and was president of the M.E.S. 1938–39 and 1958–59 (Cook & Logunov 2017). Michaelis acquired the collection of W.P. Stocks in the 1940s and amalgamated it with his own. Stocks was a founder member of the M.E.S., described by Michaelis as his '*mentor and encourager*' in his early days of collecting (Letter to Colin Johnson, 15 Oct. 1990, MMEA, M.E.S. archive, Box 1, Item 28).

Around 840 species of Macrolepidoptera were collected by John Ray Hardy, mainly from Sherwood Forest between 1879 and 1900. These moths provided the reference material for Hardy's paper on that subject (Hardy 1901). Hardy (1844–1921) was the first Assistant Keeper of Entomology at the Manchester Museum, appointed in 1888, and another founder member of the M.E.S. During his time as Assistant Keeper, he was instrumental in acquiring many exotic specimens, including the C.H. Schill Lepidoptera collection (see below) (Johnson 1996; Logunov 2010).

Other more recent incorporations into the British Lepidoptera collection include Michaelis' collection of Microlepidoptera, donated in 1964 (Cook 2018), which includes much local material from Cheshire and Lancashire dating from 1910–1960 (Logunov 2010).

R.C.R. Crewdson's collection of Noctuidae, Geometridae and other families (MANCH.F2708) was donated in 1978, originally in three 20-drawer cabinets plus documentation. Crewdson (1902–1978) was an active member of the M.E.S. (President in 1957) and authored two papers on Microlepidoptera (Cook & Logunov 2017). A collection of 268 British moths and butterflies from the Trafford Museum was added when it closed in 1983, including nine sphingids (MMEA, M.E.S. archive, Box 1, Item 47).

Curatorial Assistant Philip Rispin recently completed the mammoth task of incorporating all the British Lepidoptera into a single collection arranged in taxonomic order, and all individual collections, with the exception of part of the

TABLE 1. TAXONOMIC SUMMARY OF MOUNTED SPHINGIDAE AT THE MANCHESTER MUSEUM

Subfamily	Tribe	Subtribe	Genera	Species + subspecies	Adults	Larvae	Pupae	Eggs
Langiinae			1	1	1			
Macroglossinae	Dilophonotini	Dilophonotina	13	34	172			
		Philampelina	7	22	115			
	Hemarini		2	11	156	1	1	
		Acosmerygina	2	5	18			
		Choerocampina	11	66	634	18	10	
		Clarinina	4	6	17			
		Macroglossina	10	39	199	4	1	
		‘Sphingonaepiopsis genus-group’	2	3	9			
		Unplaced Macroglossini	3	4	15	2		
Smerinthinae	‘Polyptychus genus-group’		1	1	4			
	Ambulycini		6	8	33			
	Leucophlebiini		2	2	2			
	Mimatini		2	2	88	2	2	
	Sataspedini		1	2	4			
	Sichiini		1	5	22	1		
	Smerinthini		4	15	257	12	7	8
	Unplaced Smerinthinae		4	5	19		1	
Sphinginae	Sphingini	Acherontiina	3	6	163	6	6	
		Cocytiina	3	6	21		1	
		Sphingina	10	35	233	6	8	
		‘Psilogramma genus-group’	1	4	15	5		
	Sphingulini		2	3	3			
	‘Australian Sphingulini’		1	1	1			
Undetermined					19	2	1	
TOTAL			**96**	**286**	**2220**	**59**	**38**	**8**

TABLE 2. SUMMARY OF COLLECTIONS CONTAINING MOUNTED SPHINGIDAE AT THE MANCHESTER MUSEUM

			No. of specimens*				
Collection	**Genera**	**Species and subspecies**	**Adults**	**Larvae**	**Pupae**	**Eggs**	**Total**
C.H. Schill Worldwide Lepidoptera	94	270	1059 (4)	13 (2)	5 (1)		1077
P. Schill Palaearctic Lepidoptera	17	35	374	24	8		406
British Lepidoptera	12	17	619	22	25	8	674
J. Sidebotham Lepidoptera	11	15	158 (1)				158
W.R. Wooff Lepidoptera	6	6	10				10
Total			**2220**	**59**	**38**	**8**	**2325**

*Numbers in brackets determined to genus only

J. Sidebotham collection (see below), have been rehoused and amalgamated in 405 new plastazote-lined, glass-topped drawers (Fig. 1) in pest-proof, stainless steel cabinets.

The Sphingidae occupy 14 of these drawers. There are 17 species in 12 genera, that is all the nine hawkmoth species native to Britain and the eight regular immigrants (see Table 3). In total, there are 619 adult specimens, 22 larvae, and 25 pupae, all pin-mounted, and eight eggs glued to pin-mounted card. Of those hawkmoths with locality data (about 65% of specimens), 87% are from England, and more than half of those are from Lancashire, Greater Manchester and Cheshire, as might be expected given the donors' connections to the area, and their association with the M.E.S. Of the rest, eight are from Scotland, 11 from Wales, and 35 are from other parts of the world.

The collectors named on the specimen labels reflect the strong association between the M.E.S and the Manchester Museum. The M.E.S. operated from 1902 to 1991, and the first President, William Evans Hoyle (1855–1926) was also the first Keeper of the Manchester Museum, where the Society's meetings were held jointly with the Lancashire and Cheshire Entomological Society (Cook & Logunov 2017). W.P. Stocks contributed 53 of the hawkmoths in the collection, with dates 1903–1930, the majority of these with localities in North West England. At least 32 were reared from larvae or ova. R.C.R. Crewdson contributed 43 hawkmoths, mostly from the North West, between 1927 and 1958. Other collectors include M.E.S. members H.N. Michaelis, J.R. Hardy, B.H. Crabtree (1862–1950, also a member of the Manchester Museum Committee for 20 years), L. Nathan, R. Tait (1869–1939, founder member of M.E.S. and President 1907–08), A.E. Tonge (one-time President of M.E.S) (Cook & Logunov 2017) and Alan Brindle (1915–2001), Keeper of Entomology at the Manchester Museum 1961–1982.

Further hawkmoth contributions were provided by R. Goff (26 from Norfolk and Lincolnshire 2001–2008, ten captive bred); Roy Leverton (16); Philip Rispin, current Curatorial Assistant at the Manchester Museum (15 from Stretford); Colin Johnson, former Keeper of Entomology at the Manchester Museum (seven from Cornwall and Manchester); Horace Rupert Last (1908–1995) (three, of which two were bred and one ex-ova from London Zoo); H.G. Allcard (moths from Switzerland!); R.N. Baxter (three pupae from ova, 1980–81), and Leonard Woods Newman (1873–1949), who supplied entomologists with stock from his butterfly

Photo: © Manchester Museum

Fig. 1. — Bee and Hummingbird Hawkmoths, *Hemaris* and *Macroglossum* species in the recurated British Lepidoptera Collection.

Photo: © Manchester Museum

Fig. 2. — The oldest dated Sphingidae specimen in the British Lepidoptera collection, a Narrow-bordered Bee Hawkmoth, *Hemaris tityus* (Linnaeus, 1758), MANCH. F3262.285. Scale bar: 0.5cm.

TABLE 3. BRITISH SPHINGIDAE IN THE COLLECTIONS AT THE MANCHESTER MUSEUM

				British Lepidoptera collection				Sidebotham collection	Wooff collection	
Subfamily	**Tribe**	**Subtribe**	**Species**	**Adults**	**Larvae**	**Pupae**	**Eggs**	**Adults**	**Adults**	**Total specimens**
Macroglossinae	Hemarini		*Hemaris fuciformis* (Linnaeus, 1758)	37	1			16		54
			Hemaris tityus (Linnaeus, 1758)	26				16		42
	Macroglossini	Choerocampina	*Deilephila elpenor* (Linnaeus, 1758)	52	3	5		13	2	75
			Deilephila porcellus (Linnaeus, 1758)	64	2			16		82
			Hippotion celerio (Linnaeus, 1758)	8				5		13
			Hyles euphorbiae (Linnaeus, 1758)	18	1	1		1		21
			Hyles gallii (von Rottemburg, 1775)	16		1		11		28
			Hyles livornica (Esper, 1780)	17				5		22
		Macroglossina	*Daphnis nerii* (Linnaeus, 1758)	5						5
			Macroglossum stellatarum (Linnaeus, 1758)	40	1			13	1	55
Smerinthinae	Mimatini		*Mimas tiliae* (Linnaeus, 1758)	50				14		64
	Smerinthini		*Laothoe populi* (Linnaeus, 1758)	98	7	5	8	12	3	133
			Smerinthus ocellata (Linnaeus, 1758)	62	2	1		7	2	74
Sphinginae	Sphingini	Acherontiina	*Acherontia atropos* (Linnaeus, 1758)	29	1	3		7		40
			Agrius convolvuli (Linnaeus, 1758)	26		2		7	1	36
		Sphingina	*Sphinx ligustri* Linnaeus, 1758	54	2	6		9	1	72
			Sphinx pinastri Linnaeus, 1758	17	2	1				20
			Hybrid *Smerinthus ocellata* x *Laothoe populi*					5		5
			Undetermined*					1		1
Total				**619**	**22**	**25**	**8**	**158**	**10**	**842**

*An extremely faded specimen, possibly a hybrid.

Photo: © Manchester Museum

Fig. 3. — Larvae of the Poplar Hawkmoth, *Laothoe populi* (Linnaeus, 1758), MANCH. F3262.525-526 – examples of the work of H.E. Hammond, Oxford, 1958, in the British Lepidoptera Collection. Scale bar: 1cm.

Photo: © Manchester Museum

Fig. 4. — Parasitoid wasps with the pupae of the Death's-Head Hawkmoth, *Acherontia atropos* (Linnaeus, 1758), from which they emerged, in the British Lepidoptera Collection. MANCH. F3262.206–207, R. Standen, 1868, Goosnargh, Preston, Lancashire and F3262.205, J.R. Hardy, 1902, Sale, Cheshire. Scale bar: 1cm.

farm at Bexley (four including two pupae, 1907–1934) (Salmon, Marren & Harley 2000).

The oldest dated Sphingidae specimen in this collection is a Narrow-bordered Bee Hawkmoth, *Hemaris tityus* (Linnaeus, 1758), from the collection of Joseph Sidebotham, and labelled 'H-Schaffer, 1858' (Fig. 2). 'H-Schaffer' is likely to be Gottlieb August Wilhelm Herrich-Schäffer (1799–1874), the German entomologist and physicist whose work 'Systematische Bearbeitung der Schmetterlinge von Europa' in six volumes written 1843–1856, was one of the most influential works on the higher classification of Lepidoptera of the 19th century (Anon 1874). The most recent Sphingidae acquisitions are both from Manchester in 2010 – a Death's Head Hawkmoth, *Acherontia atropos* (Linnaeus, 1758), collected by A. Appleby in Heaton Park, and the pupa of an Elephant Hawkmoth, *Deilephila elpenor* (Linnaeus, 1758), collected by P. Rispin, in Stretford.

Seven of the larval specimens, dated between 1960 and 1962, were mounted by Harold Edward Hammond (1902–63) (Fig. 3). Hammond was a keen lepidopterist and entomologist, known for encouraging young enthusiasts, whose expertise in preserving and mounting butterfly and moth larvae was much sought after. In exchange for his services he asked only for duplicate larvae to add to those he collected himself, or raised in his own garden, where he carefully built micro-habitats for various foodplants (Smith 1964). When preparing collections for individuals and institutions such as museums, he worked only on a non-profit-making basis. He first described his methods in a paper, 'Preserving Caterpillars. How to 'blow' and 'pickle' larvae successfully' (Hammond, 1948), and continued to develop his techniques throughout his life, his final paper on 'The preservation of Lepidopterous larvae using the inflation and heat-drying technique' being published in 1960. The collection also contains a number of parasitoid wasps, together with the pupae from which they emerged (Fig. 4).

B. The Joseph Sidebotham Collection

Joseph Sidebotham's Lepidoptera collection (MANCH.F3259) was acquired by the Manchester Museum in 1919 as a gift from his son, presented in a 40- and a 32-drawer cabinet. It contained 1809 species (22,890 specimens), with over half of these being Microlepidoptera. All specimens are in perfect condition, beautifully mounted, and reliably identified (Logunov 2010; 2012; Cook 2015; 2018). The Microlepidoptera and some Macrolepidoptera have been incorporated into the general British Lepidoptera collection but the remaining Macrolepidoptera have been retained as an example of a typical Victorian cabinet, although the taxonomy has been recently updated by Laurence Cook, Hon. Research Associate at the museum (Fig. 5).

Joseph Sidebotham (1824–1885) was a coalmine owner, a court magistrate and a Manchester businessman in the cotton printing industry, who became partner at the Strines Printing Company in the Goyt Valley (Cook 2015; Cook & Logunov 2017). Substantial bequests enabled him to retire early and pursue his many interests, which included botany, entomology, astronomy and photography, and the collection of diatoms. He was one of the founders of the Manchester Field Naturalists' Society (Logunov 2012) and the Manchester Photographical and Microscopical Societies, as well as Fellow of the Royal Astronomical Society, the Society of Antiquaries of London, the Linnean Society and the Entomological Society of London, and a member of the Manchester Literary and Philosophical Society (Cook 2015).

Photo: © Manchester Museum

Fig. 5. — A drawer of Sphingidae in the Joseph Sidebotham collection – *Sphinx ligustri* Linnaeus, 1758, *Acherontia atropos* (Linnaeus, 1758), *Hyles gallii* (von Rottemburg, 1775), *H. euphorbiae* (Linnaeus, 1758), *H. livornica* (Esper, 1780), and *Hippotion celerio* (Linnaeus, 1758).

Photo: © Manchester Museum

Fig. 6. — The earliest dated hawkmoth in the Manchester Museum collections, a Striped Hawkmoth, *Hyles livornica* (Esper, 1780), MANCH.F3259.7965, from the Joseph Sidebotham collection, 'taken on Ashton Moss, near Town of Ashton, 1837.' Scale bar: 1cm.

Sidebotham's collection was created at that time when the increased interest in enquiry into natural sciences led to the burgeoning of entomological societies, and the number of accepted British Lepidoptera species was increasing rapidly. He investigated the effect of environment on coloration and started to use his illustrative skills, working with the microscopist H. Watson, to create an (uncompleted) series of drawings of wing scales to aid identification. He was interested in the distinction between species as compared to variation within species and his investigations required access to longer series of species, which he bred, or acquired through purchase or exchange (Cook & Logunov 2016).

His collection contains 158 Sphingidae specimens of 15 species (see Table 3), which occupy four drawers in the collection. Locality data from the labels is also transcribed onto a set of index cards, although it is not known whose work this was. Dates of specimens, where given, range from 1837 to 1878. The earliest dated specimen, and the earliest dated of all the Sphingidae in the combined collections, is a Striped Hawkmoth, *Hyles livornica* (Esper, 1780) (identified at the time as *H. lineata*) taken in 1837 near Ashton, Greater Manchester (Fig. 6).

Unfortunately, only 22 Sphingidae specimens have any locality data. As Cook (2015) pointed out, although it is assumed that the collection is mostly British, the absence of locality data and prevalence of some of the rarer species does raise some questions. The only two hawkmoths that bear Sidebotham's name on the label are specimens of the Death's-head Hawkmoth, *Acherontia atropos*, which he bred. It was known that some dealers passed off continental specimens as British and this may be why, where labels are present, the names of witnesses to the collection are often given.

Some labels have an acerbic tone, one example being: '*This specimen of celerio was taken in a house in Rusholme 17 Sept 1852 and then taken to John Fletcher Moor St who gave it to D. Sykes unset and he stupidly broke off the legs by putting it into his hand and then passed it to me last 1/9/52 RSE*' (Fig. 7). 'RSE' was Robert Smith Edleston (1819–1872), an insect-collecting associate of Sidebotham's, also in the calico printing industry (Cook & Logunov 2016).

Eight moths are labelled as bred – specimens of *Acherontia atropos*, *Hyles gallii* (von Rottemburg, 1775), *Hyles livornica* and a hybrid *Smerinthus ocellata* × *Laothoe populi*. Specimens of *Macroglossum stellatarum* (Linnaeus, 1758), *Hemaris tityus* and *H. fuciformis* (Linnaeus, 1758) in the collection were collected by H.H. Doubleday (1808–1875) who is notable for introducing, in 1842, the technique of sugaring trees to collect moths, as well as for creating the first checklist of British Lepidoptera, and for his work to unify the continental and British name systems (Anon 1875).

There is a single specimen of the scarce immigrant Spurge Hawkmoth, *Hyles euphorbiae* (Linnaeus, 1758). According to the label, it was, '*…purchased out of Raddon's cabinet when sold in London 31st Sep* [*?*] *1848. £2. R.S. Edlestone*.' Two pounds was an immense sum at the time. William Raddon (1817–1862 fl.) was a London engraver and painter of portraits, scenes, animals and insects (Bury 2012), whose illustrations of '*Deilephila euphorbiae*' appear in the Entomological Magazine, 1834, along with a description of his discovery of larvae and adult Spurge Hawkmoths near Barnstaple in 1814 (Newman 1834–35; Raddon 1834–35).

There are five Silver-striped Hawkmoths, *Hippotion celerio* (Linnaeus, 1758), which were taken as adults around Greater Manchester, Wakefield and North Wales. This is a rare immigrant with fewer than ten reported in most years (Waring &

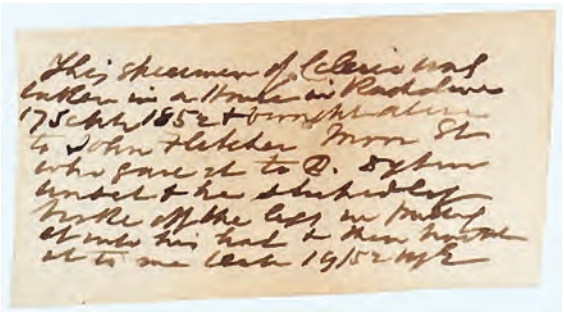

Photo: © Manchester Museum

Fig. 7. — One of Robert Smith Edleston's descriptive labels in the Joseph Sidebotham collection, from a specimen of *Hippotion celerio* (Linnaeus, 1758), MANCH.F3259.7959.

Townsend 2009). Edlestone (1846) describes two larvae being found in Newton Heath, Manchester in 1844 by a Mr Jamieson, their escape from captivity, and the subsequent capture of a fresh adult nearby in 1846 (now in the collection), spotted by Mrs Jamieson.

C. The W.R. Wooff Lepidoptera Collection

This unusual collection contains 2,459 butterflies and moths comprising Afrotropical butterflies (837 specimens of 128 species in 10 genera), New World butterflies (68 specimens of 26 species in 23 genera) and European butterflies and moths (1554 specimens of 332 species in 208 genera, 272 moth species and 60

Photo: © Manchester Museum

Fig. 8. — Index card for an Eyed Hawkmoth, *Smerinthus ocellata* (Linnaeus, 1758), MANCH.F3382.1953, in the Wooff collection.

butterfly species). Around 65% of the specimens were caught by Wooff himself with others probably being purchased, exchanged or gifted (Dockery & Logunov 2018). All ten of the Sphingidae specimens (MANCH.F3382.1950–1959) were collected in England, from Yorkshire and County Durham 1945–1955, from Cheshire in 1975, and one from Kent in 1946. The earliest were collected in Teesdale, when he must have been only 16–17 (See Table 3).

Wooff's specimens are prepared in a distinctive way, where the wings only are affixed to pre-printed index cards, which were completed with comprehensive data. The cards were then laminated (Fig. 8). This had several advantages, not least that it was relatively portable – the entire collection is housed in six index file drawers (Fig. 9)! This style of mounting does protect the specimens from pests and mechanical damage, but prevents examination of some features needed for identification, such as the genitalia.

William Raymond Wooff OBE (1929–2006) grew up in Barnard Castle, County Durham, UK. After national service in North Africa, Palestine and East Africa, he gained a Ph.D. in insect ecology, and in 1963 became Chief Tsetse Officer in the Ministry of Animal Industry, Game and Fisheries, Uganda. He returned to the UK in 1972 as Research Fellow and then Senior Lecturer in Biological Sciences at the University of Salford, moving to Somalia in 1987 to work again on the control of tsetse flies. He returned to live in Yorkshire in 1994. Dockery and Logunov (2018) provide a detailed biography and description of the collection, which was donated to the Manchester Museum in 2006 by his widow, Mrs Shirley M. Wooff.

THE C.H. SCHILL WORLD LEPIDOPTERA COLLECTION

Charles Henry Schill (1863–1935) and his brother Paul Herman Schill (1869–?) (see below) were the children of emigres from Baden-Wurttemberg in Germany. They went into business in Manchester as merchants in the South American trade and it is recorded that as a young man Charles undertook an expedition to the Amazon to collect butterflies and moths when he was out representing his firm in South America (Chorley 1950). He was an important member of the M.E.S. committee (Cook & Logunov 2017), and a member of the Manchester Museum's committee for many years. He donated his collection of butterflies to the museum in 1900 while still a member of the museum committee (Report 1899–90) after he decided to give up collecting Lepidoptera (Dockery & Logunov 2015). Correspondence and documents relating to the donation are held at the Manchester Museum in the archive of the M.E.S. (MMEA, M.E.S. archive, Box 1, Items 48–58).

The C.H. Schill worldwide Lepidoptera collection (MANCH.F1497) contains over 40,000 specimens of over 8,000 species, housed in 1,027 drawers and storeboxes. It includes all families of butterflies and larger moths, as well as 40 drawers of Pyralidae with other Microlepidoptera. At the time it was presented to the Museum it had '… *long been well known to specialists for its extent and the perfection of its specimens.*' (Report 1899–1900: 4).

The acquisition of Schill's collection '… *necessitated very considerable changes in the insect department ...The whole is now arranged in the cabinets in systematic order and a hand-list and index to the families and genera represented are in preparation*.' (Report 1899–1900: 7).

It included the butterfly collections of James Cosmo Melvill (1845–1929), which Schill acquired in 1893. Melvill turned his attention to entomology in his later years

Photo: © Manchester Museum

Fig. 9. — The compact Wooff collection – six drawers housing 2,459 specimens.

Photo: © Manchester Museum

Fig. 10. — The author near cabinets of the C.H. Schill world Lepidoptera collection (right) and the P.H. Schill Palaearctic Lepidoptera collection (left).

and built up his Lepidoptera collection after a career in his uncle's Manchester business (Riley 1930). His British butterflies and moths alone were contained in over 100 drawers and he also made '… *valuable collections of coleoptera*, *hymenoptera and other groups*.' (E.R.S. 1930: 59). However, he is better known as a botanist and conchologist. His worldwide plant collection now forms part of the backbone of the herbarium at the Manchester Museum, and he was acknowledged by an honorary Doctor of Science from the University of Manchester (E.R.S. 1930). His shell collection was said at one time to be the largest in the country, the types of which are now in the Natural History Museum, London and at the Manchester Museum, and he published extensively, describing almost 1,000 species.

Two smaller collections of foreign Lepidoptera by Charles Otto Trechmann (1851–1917) and Arthur Leicester Darrah (1878–1950) were incorporated in 1965–7 and 1962–3 respectively. The Trechmann collection of tropical Lepidoptera was received from Sunderland Museum in 1964 and contained 150 drawers in seven cabinets, with some boxes of papered specimens. Trechmann built up the collection in his later years when he took up entomology as a recreation. He is better known as the mineralogist and crystallographer who gave his name to the mineral *Trechmannite* in 1905 (Anon 1917). He bequeathed part of his extensive mineral collection to the then British Museum, now in the Natural History Museum, London, which lists 1,287 specimens donated by Trechmann (Natural History Museum, 2014). The Darrah collection, mainly of the larger and more spectacular foreign Lepidoptera, was received in 1952. According to his obituary in the Journal of Conchology, Darrah, of Marple, Cheshire, was the managing director of a Manchester plumbers' merchants, Baxendale and Co. Ltd who '*forgot the cares of big business as a collector of rare butterflies and sea shells from all over the world*' (Anon 1951: 163).

The larger moths in the C.H. Schill collection have been re-curated and re-housed in 39 Hill cabinets, where the Sphingidae occupy 39 drawers in 6 cabinets (Fig. 10). Most recently, 174 Venezuelan hawkmoths collected by Michael J. Adams and George I. Bernard in 1975 have been incorporated, which had previously been stored in the museum as papered specimens until they were set and identified in 2017 (Miles 2018) (Fig. 11).

The C.H. Schill collection contains 1,077 Sphingidae specimens representing 270 species in 94 genera (see Table 4). Around 75% of the specimens have locality data. Of those, about half (44%) are Neotropical, with the rest being mostly Afrotropical, Australasian and Indo-Malayan in equal parts, with just a few Palaearctic and Nearctic specimens.

Collectors include Albert Stewart Meek (1871–1943) who principally collected specimens for Walter Rothschild's Tring Museum. Several specimens are from his early days working on livestock stations in Queensland, and some are from his 1895 expedition to Kiriwina in the Trobriand Islands (Meek 1913) (Fig. 12). The American collector William Doherty (1857–1901) (Hartert 1901), who also collected for Rothschild, provided specimens dated 1889–1892 from India, Borneo and Indonesia. E. Harper provided 30 moths from Cape Colony in the late 1890s, and W. Harcourt Bath (1882–1932) specimens from Ceylon and India. Other collectors include Leon Humblot (1852–1914, Comoro Islands), G.F. Leigh (Durban), W.E. Pratt (Colombia), G.H. Burn (Natal, South Africa), H.G. Allcard (Morocco, 1960s), J.S. Dunkerley (Trinidad, 1926), and R.N. Baxter (Santa Catarina, Brazil, 1960–1975).

TABLE 4. SPHINGIDAE IN THE C.H. SCHILL WORLD LEPIDOPTERA COLLECTION AT THE MANCHESTER MUSEUM

Subfamily	Tribe	Subtribe	Genera	Species	Adults	Larvae	Pupae
Langiinae			1	1	1		
Macroglossinae	Dilophonotini	Dilophonotina	13	34	172		
		Philampelina	7	22	102		
	Hemarini		2	9	30		
	Macroglossini	'Sphingonaepiopsis genus-group'	2	2	8		
		Acosmerygina	2	5	18		
		Choerocampina	11	61	254	2	1
		Clarinina	3	5	15		
		Macroglossina	10	39	108		1
		Unplaced Macroglossini	3	4	15	2	
Smerinthinae	'Polyptychus genus-group'		1	1	4		
	Ambulycini		6	8	33		
	Leucophlebiini		2	2	2		
	Mimatini		1	1	3		
	Sataspedini		1	2	4		
	Sichiini		1	5	11		
	Smerinthini		4	10	24		
	Unplaced Smerinthinae		4	5	19		1
Sphinginae	Sphingini	'Psilogramma genus-group'	1	4	15	5	
		Acherontiina	3	6	63	2	
		Cocytiina	3	6	21		1
		Sphingina	10	34	120		
	Sphingulini		2	3	3		
	'Australian Sphingulini'		1	1	1		
Undetermined					13	2	1
Total			**94**	**270**	**1059**	**13**	**5**

Photo: © Manchester Museum

Fig. 11. — Sphingidae in the C.H. Schill collection – *Rhopalopsyche nycteris* (now *Macroglossum nycteris* Kollar, 1844), *Leucostrophus alterhirundo* d'Abrera, 1987, *Xylophanes pistacina* (Boisduval, [1875]) and Venezuelan specimens of *X. pluto* (Fabricius, 1777), *X. tyndarus* (Boisduval, [1875]) and *X. crotonis* (Walker, 1856) from the recently incorporated Adams and Bernard collection.

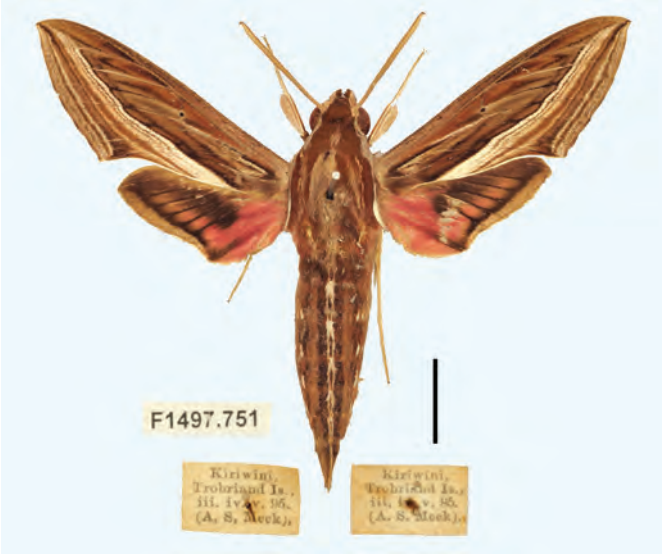

Photo: © Manchester Museum

Fig. 12. — A Silver-striped Hawkmoth, *Hippotion celerio* (Linnaeus, 1758), MANCH. F1497.751, collected by A.S. Meek, Kiriwina, Trobriand Islands, Papua New Guinea, 1895. Scale bar: 1cm.

Photo: © Manchester Museum

Fig. 13. — The oldest dated Sphingidae specimen in the C.H. Schill collection *Eumorpha achemon* (Drury, 1773), MANCH.F1497.468, collected by Miss Samuels, 1845, California. Scale bar: 1cm.

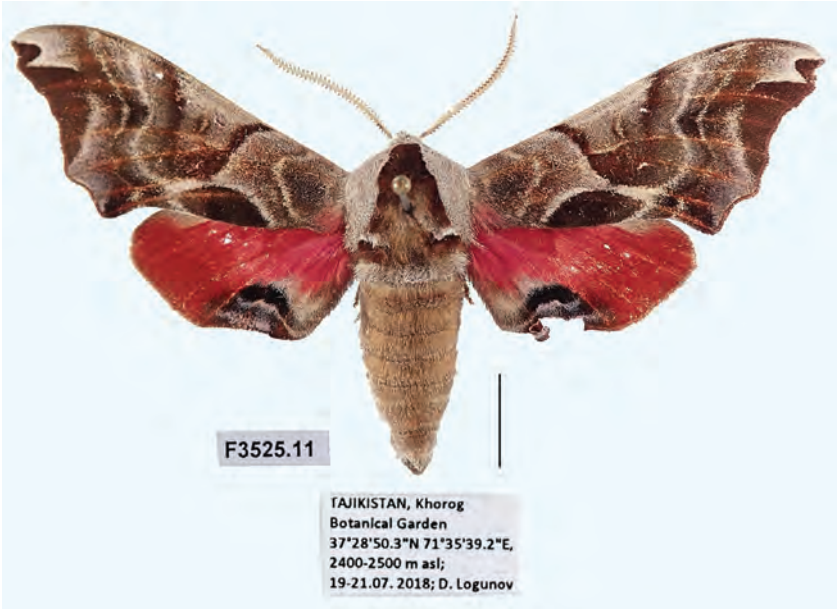

Fig. 14. — *Smerinthus kindermannii* Lederer, 1853, MANCH.F3525.11, collected by D.V. Logunov, Tajikistan, 2018, one of the latest additions to the C.H. Schill collection.

Six specimens are labelled ex-collection James John Joicey (1871–1932), who amassed an estimated 380,000 butterflies and moths from around the globe by buying collections and employing specialist field collectors. His collections were housed in the purpose-built Hill Museum, Witley, Surrey (Riley 1932).

The earliest dated hawkmoth specimen is an Achemon Sphinx, *Eumorpha achemon* (Drury, 1773), collected by a Miss Samuels in 1845 in California (Fig. 13), and the most recent additions are eight specimens collected by Dr. Dmitri Logunov, the museum's current Curator of Arthropods, on a 2018 field trip in Tajikistan (Fig. 14). Four species from this trip are new to the collection.

THE P.H. SCHILL PALAEARCTIC LEPIDOPTERA COLLECTION

The Paul Herman Schill collection (MANCH.F3261) comprises butterflies, larger moths, Pyralidae, Crambidae, Micropterigidae, Sesiidae, and Psychidae, in 150 drawers (three large double cabinets and one small cabinet (Fig. 10)), acquired 1901 (Report 1901). Except for the Sphingidae, the specimens in this collection have not yet been fully counted or documented on the museum database, which is a current work in progress. In a collection index created by Alan Brindle when he was Keeper of Entomology, he describes the collection as, '*Series generally small*, *labels small*, *black-edged*, *difficult to decipher*' (see Fig. 15) and he notes that the species are marked off in Staudinger and Rebel's (1901) Palaearctic List and arranged according to that list.

The collection contains 406 Sphingidae specimens, including 24 larvae and 8 pupae, in nine drawers. 35 species are represented in 17 genera (see Table 5). Unfortunately, 68% of specimens do not have decipherable locality data. Known localities are provided in Table 5 to give some indication of the geographic distribution.

According to the Annual Report of the Manchester Museum, 1900–1901, the collection included, '… *a large proportion of the material amassed by the distinguished traveller*, *H.T. Christoph. In conjunction with the large collection given last year by Mr. C.H. Schill*, *this donation places the Museum in the forefront of provincial institutions so far as Lepidoptera are concerned*.' (Report 1901: 3–4). Hugo Theodor Christoph (1831–1894) was born in Saxony and became a teacher, moving to Sarepta, Russia in 1858 at the age of 27. From 1870 he undertook entomological expeditions, '…*to various parts of the Russian Empire and adjoining countries*, *including*, *amongst others*, *Transcaspia* [the region east of the Caspian Sea], *Transcaucasia* [includes Georgia, Armenia and Azerbaijan], *Amurland*, *and North Persia* [Iran] ...' with the result that '… *few collections of Palaearctic insects of any note ... do not contain some of his materials*.' (Anon 1895: 30). In 1880 he became curator of the entomological collections of the Grand Duke Nikolai Michailovitch of Russia, living in St. Petersburg. He described many species of Lepidoptera and published papers on the results of his expeditions such that at the time of his death there was '… *probably no-one better acquainted with the Lepidoptera of the Russian Empire*.' (Elwes 1894: 1ii). Many of the specimens in the P.H. Schill collection that do have localities bear the tiny, black-edged locality labels that appear to be typical of Christoph specimens. Seven hawkmoths collected 1840–1858, including the earliest dated in the P.H. Schill collection, have a locality of Herrnhut, Saxony, which was Christoph's birthplace, and 17 come from Sarepta,

Photo: © Manchester Museum

Fig. 15. — *Pterogon gorgoniades* (now *Sphingonaepiopsis gorgoniades* (Hübner, [1819]), MANCH.F.3261.343, 1870, Sarepta, Russia, in the P.H. Schill collection, with the typical small, black-edged label of the H.T. Christoph specimens. Scale bar: 0.5cm.

dated 1859–1870, with others from the Ukraine, Siberia, Iran, Armenia, Azerbaijan, Georgia and other areas he visited.

148 hawkmoth specimens (over a quarter of the total) are from the L. Krah collection, which was incorporated after its acquisition in 1931–32. Krah was a member of the M.E.S. and at the time of his death in 1909 was noted as '*a most successful collector and breeder of European moths*, *especially Noctuae*' (Boyd 1909:76). His collection of European Bombycidae, Sphingidae, and Noctuidae, originally contained in 48 drawers in two cabinets, was presented by Philip Ziegler to Harry Britten, who subsequently donated it to the museum. Britten (1870–1954), '*the greatest British entomologist since the days of Curtis and Stephens*' (Hincks 1954: 225), was Assistant Keeper of Entomology at the Manchester Museum 1919–1937. Brindle's index card describes Krah's specimens as '… *in excellent condition*, *probably mainly reared*, *set high on continental pins*, *but rarely with locality labels*'. They can easily be picked out in the drawers as they do indeed sit high above the others (Fig. 16). Sadly, only 12 have any data. These include a *Hyles nicaea castissima* (Austaut, 1883) from Mauretania, 1904; *Hyles euphorbiae* and *Theretra alecto* (Linnaeus, 1758) from Portugal, and a *Hyles dahlii* (Geyer, 1828) collected in 1907, but no locality. Five specimens came to Krah via Franz Dannehl (1870–1947), a German entomologist and insect dealer specialising in Lepidoptera, who collected mostly in the German Tyrol.

55 specimens are ex-collection Joseph Sidebotham, with no other information than that four (one each of *Sphinx pinastri* Linnaeus, 1758, *Hyles dahlii*, *Hemaris fuciformis* and *Acherontia atropos*) were collected by Herrich-Schäffer in 1858.

TABLE 5. SPHINGIDAE SPECIES IN THE P.H. SCHILL PALAEARCTIC LEPIDOPTERA COLLECTION.

Subfamily	Tribe	Subtribe	Taxon	Adults	Larvae	Pupae	Known localities (no. of specimens)
Macroglossinae	Dilophonotini	Philampelina	*Proserpinus proserpina* (Pallas, 1772)	13			Austria (1), Germany (1), Poland (1)
	Hemarini		*Hemaris affinis* (Bremer, 1861)	1			
			Hemaris croatica (Esper, 1800)	9			Croatia (2), Russia (2)
			Hemaris fuciformis (Linnaeus, 1758)	11			Poland (1), Russia (1), Switzerland (7)
			Hemaris tityus (Linnaeus, 1758)	10		1	Georgia (1), Poland (2), Switzerland (3)
	Macroglossini	Choerocampina	*Deilephila elpenor* (Linnaeus, 1758)	17	1		Germany (1), Poland (1)
			Deilephila porcellus (Linnaeus, 1758)	15	1	1	Azerbaijan (1), Germany (2), Russia (1), Switzerland (1), UK (1)
			Hippotion celerio (Linnaeus, 1758)	13			Portugal (4)
			Hyles dahlii (Geyer, 1828)	9			Sardinia (2)
			Hyles euphorbiae (Linnaeus, 1758)	32	2		Portugal (2), Russia (2), Turkey (1)
			Hyles gallii (von Rottemburg, 1775)	17	2	1	Russia (Siberia) (3), Switzerland (5)
			Hyles hippophaes (Esper, 1789)	10			Switzerland (1)
			Hyles lineata (Fabricius, 1775)	15	2		Portugal (2), Russia (2), Spain (1), UK (2)
			Hyles nicaea (von Prunner, 1798)	3	1		
			Hyles nicaea subsp. *castissima* (Austaut, 1883)	1			Mauritania (1)
			Hyles vespertilio (Esper, 1780)	8			
			Hyles zygophylli (Ochsenheimer, 1808)	2			Caucasus (1)
			Theretra alecto (Linnaeus, 1758)	8	1		Iran (3), Portugal (1)
			Theretra oldenlandiae (Fabricius, 1775)	2			
		Clarinina	*Clarina syriaca* (Lederer, 1855)	2			Lebanon (2)
		Macroglossina	*Daphnis nerii* (Linnaeus, 1758)	12	1		UK (1), Germany (1), Russia (2)
			Macroglossum stellatarum (Linnaeus, 1758)	20	2		Croatia (1), Germany (1), Russia (2)
		'Sphingonaepiopsis genus-group'	*Sphingonaepiopsis gorgoniades* (Hübner, [1819])	1			Russia (1)

TABLE 5. SPHINGIDAE SPECIES IN THE P.H. SCHILL PALAEARCTIC LEPIDOPTERA COLLECTION –*cont.*

Subfamily	Tribe	Subtribe	Taxon	Adults	Larvae	Pupae	Known localities (no. of specimens)
Smerinthinae	Mimatini		*Mimas tiliae* (Linnaeus, 1758)	21	2	2	Germany (2), Russia, (2)
	Sichiini		*Marumba quercus* ([Denis & Schiffermüller], 1775)	11	1		Russia (2)
	Smerinthini		*Laothoe austauti* (Staudinger, 1877)	1			Algeria (1)
			Laothoe populeti (Bienert, [1870])	2			Russia (1)
			Laothoe populi (Linnaeus, 1758)	24	3		Azerbaijan (4), UK (3)
			Laothoe populi subsp. *populetorum* (Staudinger, 1887)	2			Tajikistan (2)
			Smerinthus ocellata (Linnaeus, 1758)	19	1		Azerbaijan (2), UK (10)
			Smerinthus ocellata subsp. *atlanticus* Austaut, 1890	1			Algeria (1)
Sphinginae	Sphingini	Acherontiina	*Acherontia atropos* (Linnaeus, 1758)	12	1	1	Cyprus (1)
			Agrius convolvuli (Linnaeus, 1758)	18	2		England (2), Germany (1), Switzerland (3)
		Sphingina	*Sphinx ligustri* Linnaeus, 1758	14	1	1	UK (1), Switzerland (1)
			Sphinx pinastri Linnaeus, 1758	18	1		Switzerland (3)
TOTAL				**374**	**24**	**8**	

PAPERED SPECIMENS

The papered Lepidoptera collections contain 104 sphingids

- W. Feathers collection (MANCH.F3252). 337 African Lepidoptera. 21 Sphingidae specimens, mostly undetermined, but include *Agrius convolvuli* (Linnaeus, 1758) and *Lophostethus morettoi* Eitschberger & Ströhle, 2011, from Kibwezi and Makindu, Kenya, dates range from 1928–1932.
- H. Stevens collection (MANCH.F2505). More than 200 Lepidoptera in three boxes, one box labelled 'Upper Congo'. Donated by will of H. Stevens of Tring, Hertfordshire, UK. 64 Nearctic/Neotropical Sphingidae specimens including *Callionima* sp., *C. duponchel* (Poey, 1832), *Enyo* sp., *Erinnyis alope* (Drury, 1773), *Manduca* sp., *Protambulyx strigilis* (Linnaeus, 1771), *Xylophanes* spp. including *X. pluto* (Fabricius, 1777), *X. tersa* (Linnaeus, 1771), *Pseudosphinx tetrio* (Linnaeus, 1771), *Isognathus swainsonii* Felder, C. & Felder, R., 1862, and undetermined specimens.
- Alan Brindle collection. 198 Indian and African Lepidoptera including two Indian and nine African Sphingidae. Brindle was Keeper of Entomology at the Manchester Museum 1961–1982. At least one moth from Bengal was collected by Brindle himself in 1943, probably while he was undertaking intelligence work there during the WWII. Localities include Silchar, Assam; Kurseong, Darjeeling, and the Andaman Islands. However, he also purchased many Indian insects of most orders from the collector P.S. Nathan, and after he retired, from Nathan's daughter-in-law, T.R.S. Nathan, at least until 1972 (MMEA, Brindle archive, items 215–234).
- Russell-Hyde collection (MANCH.F2051). One sphingid specimen among 208 Heterocera and 15 mixed invertebrates from Johannesburg, South Africa dated 1905–1907.
- Bernard Benesh collection, (MANCH.F2062). A specimen of *Manduca sexta* (Linnaeus, 1763) among 40 Lepidoptera from Burrville, Tennessee, USA, 1950–1951, where Benesh (1891–1964) lived in his later years.
- Michael Vincent Hounsome collection (MANCH.F3082). 36 Lepidoptera including one undetermined sphingid in poor condition, from Gabon, dated 1995 and which originated from a field trip Dr Hounsome (1943–2017) undertook when he was Keeper of Zoology at the Manchester Museum.
- A box of Lepidoptera labelled 'Possibly ex Coll. Schill'. 166 Lepidoptera, mainly noctuids and geometrids, with little data, but includes some Indian P.S. Nathan specimens from 1957–1958 (so probably *not* ex Coll. Schill) and five undetermined sphingids.
- K. Hunt collection (MANCH.F2674). two undetermined sphingids from Wulguru, Queensland, Australia.

SUMMARY

The 2,200 specimens in the Sphingidae collections in the Manchester Museum provide an important resource that is used for research, teaching and public outreach events, both inside and outside the museum. Of necessity, the number of hawkmoths on display in the public galleries at any time is a tiny proportion (currently less than 1%) of the Sphingidae collection. These are typically used to illustrate various

Photo: © Manchester Museum

Fig. 16. — Drawer of Sphingidae in the P.H. Schill collection. *Protoparce convolvuli* (now *Agrius convolvuli* (Linnaeus, 1758)), *Hyloicus pinastri* (now *Sphinx pinastri* Linnaeus, 1758), *Deilephila vespertilio* (now *Hyles vespertilio* (Esper, 1780)) *and D. hippophaes* (now *Hyles hippophaes* (Esper, 1789)). The L. Krah specimens in columns 1, 3 and 5 typically set high on continental pins.

Photo: © Manchester Museum

Fig. 17. — Hawkmoths in a display of Lepidoptera in the Nature's Library gallery at the Manchester Museum. (The moth labelled *Cocytius antaeus* is actually *C. duponchel* (Poey, 1832).)

themes – at present 18 hawkmoths are displayed in three cases in the Nature's Library gallery as examples of 'Insects and spiders', 'Individual Passions' (representing Beauty), and the 'Culture of collecting' (Fig. 17).

The collection is an active repository and continues to grow through donations of research collections and specimens from scientific field trips and recording. In the course of this review, all the mounted hawkmoths have been given individual accession numbers and are now recorded on the museum database and on the museum's searchable website at http://harbour.man.ac.uk/mmcustom/narratives/. The collection is fully accessible and access requests can be made to Dr Dmitri Logunov, Curator of Arthropods.

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APPENDIX 1

SPHINGIDAE SPECIES AT THE MANCHESTER MUSEUM

Taxonomy follows Kitching, 2018.

Subfamily: LANGIINAE

Langia zenzeroides zenzeroides Moore, 1872

Subfamily: MACROGLOSSINAE

Tribe: Dilophonotini

Subtribe: Dilophonotina

Aellopos ceculus (Cramer, 1777)
Aellopos tantalus (Linnaeus, 1758)
Aellopos titan (Cramer, 1777)
Callionima falcifera (Gehlen, 1943)
Callionima inuus Rothschild & Jordan, 1903
Callionima nomius (Walker, 1856)
Callionima parce (Fabricius, 1775)
Erinnyis alope alope (Drury, 1773)
Erinnyis crameri (Schaus, 1898)
Erinnyis ello ello (Linnaeus, 1758)
Erinnyis lassauxii (Boisduval, 1859)
Erinnyis obscura (Fabricius, 1775)
Erinnyis oenotrus (Cramer, 1780)
Erinnyis yucatana (Druce, 1888)
Eupyrrhoglossum sagra (Poey, 1832)
Eupyrrhoglossum venustum Rothschild & Jordan, 1910
Hemeroplanes triptolemus (Cramer, 1779)
Isognathus rimosa (Grote, 1865)
Isognathus swainsonii Felder, C. & Felder, R., 1862
Madoryx bubastus (Cramer, 1777)
Madoryx plutonius (Hübner, [1819])
Nyceryx coffeae (Walker, 1856)
Nyceryx continua continua (Walker, 1856)
Nyceryx hyposticta (Felder C. & Felder, R., 1874)
Nyceryx riscus (Schaus, 1890)
Pachylia darceta Druce, 1881
Pachylia ficus (Linnaeus, 1758)
Pachylia syces syces (Hübner, [1819])
Pachylioides resumens (Walker, 1856)
Perigonia grisea Rothschild & Jordan, 1903
Perigonia ilus Boisduval, 1870
Perigonia lusca (Fabricius, 1777)
Perigonia stulta Herrich-Schaffer, [1854]
Phryxus caicus (Cramer, 1777)
Pseudosphinx tetrio (Linnaeus, 1771)

Subtribe: Philampelina

Aleuron carinata (Walker, 1856)
Aleuron chloroptera (Perty, 1833)
Aleuron iphis (Walker, 1856)
Amphion floridensis Clark, 1920
Enyo gorgon (Cramer, 1777)
Enyo lugubris lugubris (Linnaeus, 1771)
Enyo ocypete (Linnaeus, 1758)
Eumorpha achemon (Drury, 1773)
Eumorpha analis (Rothschild & Jordan, 1903)
Eumorpha anchemolus (Cramer, 1779)
Eumorpha fasciatus (Sulzer, 1776)
Eumorpha labruscae (Linnaeus, 1758)
Eumorpha obliquus (Rothschild & Jordan, 1903)
Eumorpha phorbas (Cramer, 1775)
Eumorpha satellitia licaon (Cramer, 1775)
Eumorpha triangulum (Rothschild & Jordan, 1903)
Eumorpha vitis (Linnaeus, 1758)
Pachygonidia hopfferi (Staudinger, 1876)
Pachygonidia subhamata (Walker, 1856)
Proserpinus proserpina (Pallas, 1772)
Unzela japix japix (Cramer, 1776)
Unzela pronoe pronoe Druce, 1894

Tribe: Hemarini

Cephonodes hylas australis Kitching & Cadiou, 2000
Cephonodes hylas hylas (Linnaeus, 1771)
Cephonodes hylas virescens (Wallengren, 1858)
Cephonodes janus Miskin, 1891
Cephonodes kingii (Macleay, W.S., 1826)
Hemaris affinis (Bremer, 1861)
Hemaris croatica (Esper, 1800)
Hemaris fuciformis (Linnaeus, 1758)
Hemaris thetis Boisduval, 1855
Hemaris thysbe (Fabricius, 1775)
Hemaris tityus (Linnaeus, 1758

Tribe: Macroglossini

Subtribe: Acosmerygina

Acosmeryx anceus (Stoll, 1781)
Acosmeryx castanea Rothschild & Jordan, 1903
Acosmeryx naga (Moore, [1858])
Acosmeryx sericeus (Walker, 1856)
Deidamia inscriptum (Harris, 1839)

Subtribe: Choerocampina

Basiothia charis (Walker, 1856)
Basiothia medea (Fabricius, 1781)
Basiothia schenki (Möschler, 1872)
Cechetra lineosa (Walker, 1856)
Cechetra minor (Butler, 1875)
Centroctena rutherfordi (Druce, 1882)
Deilephila askoldensis (Oberthür, 1879)
Deilephila elpenor (Linnaeus, 1758)
Deilephila porcellus (Linnaeus, 1758)

Euchloron megaera (Linnaeus, 1758)
Hippotion balsaminae (Walker, 1856)
Hippotion boerhaviae (Fabricius, 1775)
Hippotion brennus (Stoll, 1782)
Hippotion celerio (Linnaeus, 1758)
Hippotion echeclus (Boisduval, [1875])
Hippotion eson (Cramer, 1779)
Hippotion osiris (Dalman, 1823)
Hippotion rafflesii (Moore, 1858)
Hippotion scrofa (Boisduval, 1832)
Hippotion velox (Fabricius, 1793)
Hyles annei (Guérin-Méneville, 1839)
Hyles dahlii (Geyer, 1828)
Hyles euphorbiae (Linnaeus, 1758)
Hyles gallii (von Rottemburg, 1775)
Hyles hippophaes (Esper, 1789)
Hyles lineata (Fabricius, 1775)
Hyles livornica (Esper, 1780)
Hyles nicaea (von Prunner, 1798)
Hyles tithymali (Boisduval, 1834)
Hyles vespertilio (Esper, 1780)
Hyles zygophylli (Ochsenheimer, 1808)
Pergesa acteus (Cramer, 1779)
Rhagastis acuta (Walker, 1856)
Rhagastis olivacea (Moore, 1872)
Rhagastis velata (Walker, 1866)
Theretra alecto (Linnaeus, 1758)
Theretra cajus (Cramer, 1777)
Theretra capensis (Linnaeus, 1764)
Theretra gnoma (Fabricius, 1775)
Theretra japonica (Boisduval, 1869)
Theretra jugurtha (Boisduval, [1875])
Theretra latreillii (Macleay, W.S., 1826)
Theretra nessus (Drury, 1773)
Theretra oldenlandiae (Fabricius, 1775)
Theretra orpheus (Herrich-Schäffer, 1854)
Theretra silhetensis intersecta (Butler, 1876)
Xylophanes anubus (Cramer, 1777)
Xylophanes ceratomioides (Grote & Robinson, 1866)
Xylophanes chiron nechus (Cramer, 1777)
Xylophanes crotonis (Walker, 1856)
Xylophanes damocrita (Druce, 1894)
Xylophanes docilis (Butler, 1875)
Xylophanes germen (Schaus, 1890)
Xylophanes hannemanni Closs, 1917
Xylophanes libya (Druce, 1878)
Xylophanes meridanus Rothschild & Jordan, 1910
Xylophanes neoptolemus (Cramer, 1780)
Xylophanes pistacina (Boisduval, [1875])
Xylophanes pluto (Fabricius, 1777)
Xylophanes porcus continentalis Rothschild & Jordan, 1903
Xylophanes pyrrhus Rothschild & Jordan, 1906
Xylophanes rufescens (Rothschild, 1894)
Xylophanes tersa (Linnaeus, 1771)
Xylophanes thyelia (Linnaeus, 1758)
Xylophanes titana (Druce, 1878)
Xylophanes tyndarus tyndarus (Boisduval, [1875])

Subtribe: Clarinina

Ampelophaga rubiginosa Bremer & Grey, 1853
Clarina syriaca (Lederer, 1855)
Darapsa choerilus (Cramer, 1779)
Darapsa myron (Cramer, 1779)
Darapsa versicolor (Harris, 1839)
Elibia dolichus (Westwood, 1847)

Subtribe: Macroglossina

Angonyx testacea (Walker, 1856)
Atemnora westermannii (Boisduval, [1875])
Cizara ardeniae (Lewin, 1805)
Daphnis hypothous (Cramer, 1780)
Daphnis layardii Moore, 1882
Daphnis moorei Macleay, W.J., 1866
Daphnis nerii (Linnaeus, 1758)
Daphnis placida (Walker, 1856)
Eurypteryx bhaga (Moore, 1866)
Hypaedalea insignis Butler, 1877
Leucostrophus alterhirundo d'Abrera, 1987
Macroglossum bombylans Boisduval, [1875]
Macroglossum corythus Walker, 1856
Macroglossum corythus fuscicauda Rothschild & Jordan, 1903
Macroglossum corythus pylene Felder, C., 1861
Macroglossum hirundo errans Walker, 1856
Macroglossum micacea Walker, 1856
Macroglossum nycteris Kollar, 1844
Macroglossum pyrrhosticta Butler, 1875
Macroglossum stellatarum (Linnaeus, 1758)
Macroglossum trochilus (Hübner, [1823])
Macroglossum troglodytus Boisduval, [1875]
Nephele accentifera (Palisot de Beauvois, 1821)
Nephele aequivalens (Walker, 1856)
Nephele argentifera (Walker, 1856)
Nephele comma Hopffer, 1857
Nephele densoi (Keferstein, 1870)
Nephele oenopion (Hübner, [1824])
Nephele peneus (Cramer, 1776)
Nephele subvaria (Walker, 1856)
Nephele vau (Walker, 1856)
Temnora elegans (Rothschild, 1895)
Temnora fumosa (Walker, 1856)
Temnora iapygoides (Holland, 1889)
Temnora inornatum (Rothschild, 1894)
Temnora marginata (Walker, 1856)
Temnora namaqua Rothschild & Jordan, 1903
Temnora pseudopylas (Rothschild, 1894)
Temnora zantus (Herrich-Schäffer, 1854)

'Sphingonaepiopsis genus-group'

Neogurelca masuriensis (Butler, 1875)
Sphingonaepiopsis gorgoniades (Hübner, [1819])
Sphingonaepiopsis kuldjaensis (Graeser, 1892)

Macroglossini incertae sedis

Eupanacra busiris (Walker, 1856)
Gnathothlibus eras (Boisduval, 1832)
Odontosida magnificum (Rothschild, 1894)
Odontosida pusillus (Felder, C. & Felder, R., 1874)

Subfamily: SMERINTHINAE

Tribe: Ambulycini

Adhemarius dariensis (Rothschild & Jordan, 1916)
Adhemarius gannascus (Stoll, 1790)
Adhemarius tigrina (Felder, C. & Felder, R., 1874)
Akbesia davidi (Oberthür, 1884)
Ambulyx schauffelbergeri Bremer & Grey, 1853
Amplypterus panopus (Cramer, 1779)
Batocnema coquerelii comorana Rothschild & Jordan, 1903
Protambulyx strigilis (Linnaeus, 1771)

Tribe: Leucophlebiini

Leucophlebia lineata Westwood, 1847
Rhadinopasa hornimani (Druce, 1880)

Tribe: Mimatini

Amorpha juglandis (Smith, J.E., 1797)
Mimas tiliae (Linnaeus, 1758)

Tribe: Sataspedini

Sataspes infernalis (Westwood, 1847)
Sataspes tagalica Boisduval, [1875]

Tribe: Sichiini

Marumba cristata cristata (Butler, 1875)
Marumba dyras dyras Walker, 1856
Marumba gaschkewitschii (Bremer & Grey, 1853)
Marumba maacki (Bremer, 1861)
Marumba quercus ([Denis & Schiffermüller], 1775)

Tribe: Smerinthini

Laothoe amurensis Staudinger, 1892
Laothoe austauti (Staudinger, 1877)
Laothoe populeti (Bienert, [1870])
Laothoe populi (Linnaeus, 1758)
Laothoe populi populetorum (Staudinger, 1887)
Pachysphinx modesta (Harris, 1839)
Paonias excaecata (Smith, J.E., 1797)
Paonias myops (Smith, J.E., 1797)
Smerinthus caecus Ménétries, 1857
Smerinthus cerisyi Kirby, 1837
Smerinthus jamaicensis (Drury, 1773)
Smerinthus kindermannii Lederer, 1853
Smerinthus ocellata (Linnaeus, 1758)
Smerinthus ocellata atlanticus Austaut, 1890
Smerinthus saliceti Boisduval, [1875]

'*Polyptychus* genus-group'

Pseudoclanis postica (Walker, 1886)

Smerinthinae *incertae sedis*

Coequosa australasiae (Donovan, 1805)
Coequosa triangularis (Donovan, 1805)
Lophostethus dumolinii (Angas, 1849)
Lophostethus morettoi Eitschberger & Ströhle, 2011
Platysphinx stigmatica (Mabille, 1878)
Poliodes roseicornis Rothschild & Jordan, 1903

Subfamily: SPHINGINAE

Tribe: Sphingini

'Psilogramma genus-group'

Psilogramma casuarinae (Walker, 1856)
Psilogramma increta (Walker, [1865])
Psilogramma lifuense (Rothschild, 1894)
Psilogramma menephron (Cramer, 1780)

Subtribe: Acherontiina

Acherontia atropos (Linnaeus, 1758)
Acherontia lachesis (Fabricius, 1798)
Acherontia styx (Westwood, 1847)
Agrius convolvuli (Linnaeus, 1758)
Agrius cingulata (Fabricius, 1775)
Coelonia fulvinotata (Butler, 1875)

Subtribe: Cocytiina

Cocytius antaeus (Drury, 1773)
Cocytius beelzebuth (Boisduval, [1875])
Cocytius duponchel (Poey, 1832)
Cocytius lucifer Rothschild & Jordan, 1903
Neococytius cluentius (Cramer, 1775)
Panogena jasmini (Boisduval, [1875])

Subtribe: Sphingina

Ceratomia undulosa (Walker, 1856)
Dolba hyloeus (Drury, 1773)
Euryglottis aper (Walker, 1856)
Lapara coniferarum (Smith, J.E., 1797)
Lintneria justiciae (Walker, 1856)
Lintneria merops (Boisduval, 1870)
Manduca afflicta (Grote, 1865)
Manduca albiplaga (Walker, 1856)
Manduca diffissa (Butler, 1871)
Manduca diffissa petuniae (Boisduval, [1875])
Manduca diffissa tropicalis (Rothschild & Jordan, 1903)
Manduca dilucida (Edwards, 1887)
Manduca florestan (Stoll, 1782)
Manduca hannibal (Cramer, 1779)
Manduca incisa (Walker, 1856)
Manduca lefeburii (Guérin-Méneville, 1844)
Manduca lichenea (Burmeister, 1855)
Manduca lucetius (Cramer, 1780)
Manduca ochus (Klug, 1836)
Manduca pellenia (Herrich-Schäffer, 1854)
Manduca quinquemaculatus (Haworth, 1803)
Manduca rustica (Fabricius, 1775)
Manduca schausi (Clark, 1919)
Manduca scutata (Rothschild & Jordan, 1903)
Manduca sexta (Linnaeus, 1763)
Neogene reevei (Druce, 1881)
Oligographa juniperi (Boisduval, 1847)
Paratrea plebeja (Fabricius, 1777)

Sphinx chersis (Hübner, [1823])
Sphinx drupiferarum Smith, J.E., 1797
Sphinx kalmiae Smith, J.E., 1797
Sphinx leucophaeata Clemens, 1859
Sphinx ligustri Linnaeus, 1758
Sphinx luscitiosa Clemens, 1859
Sphinx pinastri Linnaeus, 1758

Tribe: Sphingulini
Dolbina grisea (Hampson, [1893])
Dolbina tancrei Staudinger, 1887
Kentrochrysalis streckeri (Staudinger, 1880)

'Australian Sphingulini'
Coenotes eremophilae (Lucas, 1891)