COLLECTION NOTES

Much information on the depositories of entomological collectors and authors can be found in Horn *et al.* (1990) [for information up through the year 1960] and Gaedike (1995) [for information 1961–1994]. However, this information is by no means complete. It was decided by us to include brief biographical and collection information on selected authors and institutions below in order to supplement, correct, and synthesize that provided elsewhere.

A summary of the top twenty institutional and private collections (by number of types) housing bombyliid types is given in the table below.

Table 1. **Summary of Number of Bombyliidae Types by Museum**

Museum	Types	Museum	Types
BMNH	1063	ZMUC	131
SAMC	549	BPBM	122
ZMHB	516	ANIC	87
USNM	456	UMO	77
MNHN	301	MSNM	70
ZIS	239	ESEC	67
SIZK	221	MEUC	64
CAS	189	AMNH	56
NMSA	188	JB	56
NMW	157	QM	53

1. **Bigot Collection**

Jacques Marie Frangile Bigot (1818–1893) was a French dipterist of independent means who, over the years, acquired a large collection of Diptera from various sources many of which were described by Macquart. Bigot's collection was purchased after his death by G.H. Verrall and now resides in two major parts: a Palaearctic collection of Diptera in UMO; and an exotic (i.e., non-European) Diptera collection divided between UMO and BMNH (all "exotic" Bombyliidae are in BMNH). A complete inventory of the Bigot collection made by Verrall at the time of purchase exists in UMO. Bigot described 85 species-group names of Bombyliidae, of which 49 (58%) are currently considered taxonomically valid.

Through the benefit of a concurrent project on all of Bigot's types (conducted by Adrian Pont, Neal Evenhuis, and John Chainey), detailed information on Bigot bombyliid type specimens in UMO, BMNH, MNHN and cabinet names located in collections elsewhere have been incorporated into this study. Results of the Bigot types study will be published elsewhere. Thompson (1988) provides further details on Bigot and his collection.

2. **Bowden Collection**

John Bowden (1924–) did most of his work on Bombyliid systematics in the Afrotropical Region and is best known for his *Bombyliidae of Ghana* monograph (Bowden, 1964), the series on Studies in African Bombyliidae, and his bombyliid chapter

in the Afrotropical Diptera Catalogue (Bowden, 1980). Bowden described 118 species-group names of Bombyliidae, of which 113 (96%) are currently considered taxonomically valid.

As of this writing, Bowden is retired and living in Colchester, England. His personal collection (JB) contains many of his own types as well as some syntypic material from the Efflatoun collection. Unfortunately, his collection could not be examined during this study.

3. Doleschall Collection

Carl Ludwig Doleschall (1827–1859) was an Austrian naturalist who spent the last half of his life in the Indonesian Archipelago (mostly on the island of Ambon). His collections and observations of the natural history of the area were of great interest to Alfred Wallace, for in 1857 Wallace visited Doleschall on Ambon, examined his collections, and forwarded letters onward for him. Doleschall unfortunately died in Ambon a few years after Wallace's visit as a result of consumption. Doleschall described 6 species-group names of Bombyliidae, of which 4 (67%) are today considered taxonomically valid.

The eventual deposition of the Doleschall Collection was chiefly in NMW, where many specimens and type material can still be found. However, what is not well known, is that through the efforts of Dr. Cajetan Felder in Vienna (Doleschall's friend, main correspondent, and a former mayor of Vienna), a portion of the Doleschall collection was shipped to ZMHB on 15 April 1860 as part of an exchange of specimens (an itemized list of this exchange exists in the Diptera section of ZMHB). Types of bombyliids of Doleschall, therefore, can be found in both NMW and ZMHB.

4. Efflatoun Collection

Hassan Chaker Efflatoun-Bey (1893–1957) was born in Cairo and, after schooling in Lebanon, Switzerland, and England, returned to Egypt to work at the Ministry of Agriculture and later at the University of Cairo. Efflatoun described 37 species-group names of Bombyliidae, of which 32 (86%) are considered taxonomically valid.

Much of the collection of Efflatoun, which also contained some Egyptian types of Becker, Bezzi, Engel, and Paramonov, was moved to the Entomological Society of Egypt in Cairo. It remained there for many years in a mostly neglected state. Its contents were last published by Steyskal & El-Bialy (1967), where it was then noted that certain types could not be found. Other material of the Efflatoun Collection was deposited in the Ministry of Agriculture (PPDD). Through the efforts of Magdi Shabaan Ali El Hawagry at the University of Cairo, the Efflatoun collections at the University of Cairo (CUE), the Entomological Society of Egypt (ESEC), and the Ministry of Agriculture (most of the bombyliid type material in the last depository was unfortunately destroyed through neglect; other material previously stored there has been transferred to ESEC) have been assessed and this information incorporated into this catalog.

5. Fabricius Collections

Johann Christian Fabricius (1745–1808), a Danish entomologist and pupil of Linnaeus, was one of the founders of dipterology, publishing one of the first comprehensive works on world Diptera systematics with his *Systema Antliatorum* (1805). Fabricius traveled often to London and Paris to visit and study the Diptera material contained in the museums there as well as to visit his various patrons and colleagues. Fabricius described 79 species-group

names of Bombyliidae, of which 66 (84%) are currently considered taxonomically valid.

Fabrician collections can be found chiefly in the places where Fabricius did his work or where specimens originated. The main collection of Fabricius (the Kiel Collection) was transferred on loan to ZMUC in 1950, where it now resides. Other Diptera material containing bombyliid types has been examined by us in BMNH (Banks Collection), MNHN, UMO, and HMUG. Those specimens found in the last two institutions derive mainly from his first entomological work (1775) and are easily identified by the large stainless steel pins.

6. **Hamburg Collection**

The collections in the Zoologisches Museum, Universität Hamburg (ZMUH) originally contained much historic material including specimens of Winthem, Meigen, Lehmann, etc. In the 1930s Paramonov deposited some of his bombyliid types in ZMUH. Unfortunately, the museum and its collections were destroyed by bombing during World War II and, despite Liepa's (1969) listing that Paramonov's types originally deposited there should still be found there, material deposited in ZMUH previous to the war including the Paramonov bombyliid types no longer exists (R. Abraham, pers. comm.).

7. **Hesse Collections**

Albert John Hesse (1895-1987) was, throughout his career, entomologist at the South African Museum in Cape Town. He specialized on the Bombyliidae of southern Africa but also worked on Mydidae and other Diptera. He published 17 papers on Bombyliidae between 1936 and 1975 but his major work was *A revision of the Bombyliidae (Diptera) of southern Africa* (Hesse, 1938; 1956a, b). He was a meticulous and precise taxonomist, as shown by his very detailed descriptions and tendency to describe any variants as forms, varieties or, indeed, species; with further collecting, many of these variants have been shown to fall within the range of variation of more widespread species. He was also of the opinion that the southern African fauna was more distinct than it actually is and so was reluctant to recognize species as present in southern Africa if they had been described from north of the Zambesi River. Nonetheless, Hesse's work continues to provide a comprehensive and valuable conspectus of the southern African fauna and a useful guide to identifying many eastern African species. Hesse described 668 species-group names of Bombyliidae (more than any other author), of which 591 (88%) are here considered taxonomically valid.

When describing new species, it was always his practice to label a specimen, usually a male if available, as holotype, with a red label, and another of the opposite sex as allotype, also with a red label. Other specimens in the type series were labeled as paratypes with green labels. Unfortunately, in his publications, he rarely specified the identity or location of the holotype specimen when several specimens were before him. Thus, one finds statements such as "types in the South African Museum" or "types in the Durban and Transvaal museums". Therefore, it has been necessary in many instances to list his type series as syntypes to accord with the I.C.Z.N. *Code*. In these cases, it is recommended that the specimen labeled as holotype should be located and designated as lectotype to avoid future confusion (see Recommendation 72B of the I.C.Z.N. *Code*).

8. **Hull Collection**

The personal collection of Frank Montgomery Hull (1901–1982) was purchased in

1973 and 1981 by CNC. However, not all of the types of Diptera described by Hull as being in his personal collection have been located in CNC [see e.g., Cooper & Cumming (1993: 2)]. This is no doubt because much material in the Hull Collection was found to be damaged by dermestids and was thrown out by Hull's son before the purchase by CNC (J.R. Vockeroth, *in litt*.). A visit to CNC by the senior author to curate the Bombyliidae collection in 1989 turned up almost a dozen "informally" labeled Hull types that were previously thought to have been among those that were destroyed. A subsequent visit to CNC by D.K. Yeates identified a few more. These Hull types in CNC are enumerated in Cooper & Cumming (1993). Hull described 46 species-group names of Bombyliidae, of which 32 (70%) are here considered taxonomically valid.

As a result of intensive surveys for Hull types in various museums and corroboration of their fate through correspondence, it is believed that all Hull Bombyliidae types have now been accounted for. Those not found in CNC, CAS, or USNM are assumed to have been destroyed and are listed as such in this catalog.

9. **Hungarian Museum Collection**

The Diptera collection of the Hungarian Natural History Museum (HNHM) was destroyed in the uprising of 1956 when an incendiary bomb exploded in the spirit collections of the museum. The subsequent fire and bomb damage completely destroyed all the Diptera, except many of the acalypterates that were temporarily being housed in another part of the museum and escaped damage. Bombyliid types of Kertész, Becker, and Bezzi that were stated in the original literature to have been deposited in HNHM exist today only if syntypes are known to be in collections elsewhere.

10. **Loew Collections**

Hermann Loew (1807–1879) was a German entomologist, teacher, and politician. He was initially a professor of mathematics and natural history in Posen [= Poznań], Poland, then became professor and later director of the Realschule in Meseritz [= Międzyrzecz], Poland. Loew described 315 species-group names of Bombyliidae, of which 248 (79%) are currently considered taxonomically valid.

The majority of Diptera types of Loew can be found in either MCZ (primarily North American) and ZMHB (all others), with some South African types from his 1860 work deposited in NHRS. Loew's amber specimens can be found in either MGUG or BMNH.

11. **Macleay Insect Collection**

The Macleay Museum (MAMU) contains some of the more historically important and older collections of insects. It was founded through a donation by William Sharp Macleay of his insect collection to the University of Sydney in 1888, which was combined with an endowment to support a curator and allow the collections to be accessible to other workers. Unfortunately, the collection fell into neglect and by 1970, examination showed a substantial amount of *Anthrenus* damage, as well as theft of other specimens. A transfer to ANIC of all type material that could be identified was initiated in 1970. By 1977, some 9,463 type specimens had been transferred. Some of the bombyliid specimens that F.W.H. Roberts recorded as being deposited in MAMU were not listed in the assessment of the types by Hahn (1962) and are thought to have suffered destruction by pests. Other species that Roberts initially indicated as having been deposited in MAMU are now in ANIC.

A complication with the transfer of type material from MAMU to ANIC happened

when it was discovered soon after transfer started that types of older authors (Macleay, Boisduval, Latreille, etc.) existed in the MAMU collection, but many were unlabeled. Both William Sharp and Alexander Macleay obtained many specimens through auctions and exchanges with other workers. Type specimens of bombyliid species such as *Anthrax bombyliiformis* Macleay, *Anthrax praeargentata* Macleay, and those described by Latreille, Olivier, Guérin-Méneville, and others may still be in MAMU and, if there, will only be found through diligent searching by specialists.

12. **Macquart Collection**

Pierre Justin Marie Macquart (1778–1855) was a French entomologist and botanist who specialized in Diptera in addition to his being director of the natural history museum in Lille and mayor of Lestrem. Macquart's *Diptères exotiques nouveaux ou peu connus* was essentially a medium for describing new species of Diptera collected on the various French voyages of discovery around the world. Macquart described 286 species-group names of Bombyliidae, of which 174 (61%) are currently considered taxonomically valid.

The material described by Macquart is found primarily in either MNHN, BMNH or UMO (the last two via the Bigot Collection). Macquart's private collection was bequeathed to MNVL where it still exists though it has been substantially damaged by *Anthrenus* attacks over the years. See Thompson (1988) for more details concerning Macquart types.

13. **Megerle Collection**

Material said to have originated from Megerle von Mühlfeld (1765–1840) should be in NMW. Megerle was a conchologist and entomologist and the first custodian of the natural history and mineralogy collection at the Imperial Court Museum in Vienna. Megerle's first collection was deposited at the Imperial Court Museum in 1808 and was destroyed with all the other zoological collections during the 1848 conflagration. A second collection was posthumously donated to NMW via J.A. Ferrari and these specimens can still be found there with either a "Alte Sammlung" and/or an "F" label.

14. **Meigen Collection**

Johann Wilhelm Meigen (1764–1845) lived for most of his life in Stolberg, Germany. In addition to being reknowned as the "Father of European Dipterology", Meigen was also at various times a private tutor, botanist, lepidopterist, draftsman, and church organist. Meigen is best known for his seven-volume "Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten" and his highly skilled illustrating talents. Meigen described 66 species-group names of Bombyliidae, of which 34 (56%) are today considered taxonomically valid.

The Meigen Collection was sold for 1800 francs to the Paris Museum where it resides today. Because Meigen exchanged types with contemporaries, the collection in MNHN contains not only Meigen type material, but types of other authors as well (such as Fabricius, Fallén, Wiedemann, and possibly Rossi). Other Meigen types, which were based on material from various collectors, are found primarily in NMW and ZMHB. See Pont (1986) for futher details on Meigen and his collections.

15. Mikan Collection

Efforts to locate the Mikan collection in Prague, Vienna, or other museums in that area have proven fruitless. However, one Mikan type (*Bombylius concolor*) was found in ZMHB. Most likely this specimen was exchanged with or given to Hoffmansegg when he was curator in Berlin. It was apparently seen by Wiedemann who mentions it in his study of extra-European Diptera (Wiedemann, 1828). No other Mikan "*Bombylius*" types were found in ZMHB during this study. Mikan described 12 species-group names of Bombyliidae, of which 8 (67%) are today considered taxonomically valid.

16. Museum für Naturkunde, Humboldt Universität, Berlin

The Museum für Naturkunde is possibly one of the most historically important museums with holdings of Bombyliidae. Though the Natural History Museum, London, and the South African Museum, Cape Town harbor more bombyliid types, ZMHB has some of the oldest and some of the rarest bombyliid material in the world. This results from the Museum becoming established as early as 1810 and its curators continually acquiring many old and historical collections from various central European entomologists, some of whom specialized in Bombyliidae.

For Bombyliidae types, the collection is most important because of its holdings of Hoffmannsegg material (described by both Meigen and Wiedemann), the Loew Collection (non-New World Diptera) and the Becker Collection. In addition to these large collections, a lesser-known but important find during the senior author's research visit there in the autumn 1998 was that of a large portion of the Paramonov Collection (see also Note 21 for more information on that collection and its history). Other important historical material in ZMHB includes types of Rossi, Mikan, and Fabricius.

A summary of the history of Diptera curators or those responsible for Diptera curation at ZMHB is given below. This list can be used in association with the collection registers in determining origin and ultimate fate of various Diptera material in the collection.

Table 2. Summary of Diptera Curators at the Museum für Naturkunde, Humboldt Universität, Berlin.

1810–1818	Hoffmannsegg, Johann Centurius Graf von (1766–1849)
1818–1856	Klug, Johann Christoph Friedrich (1775–1856)
1842–1848	Erichson, Wilhelm Ferdinand (1808–1849)
1843–1850	Stein, Johann Philip Emil Friedrich (1818–1885)
1850–1876	Hopffer, Carl Heinrich (1810–1876)
1857–1876	Gerstaecker, Carl Eduard Adolph (1828–1895)
1877–1880	Harold, Edgar [Freiherr] von (1830 –1886)
1878–1892	Karsch, Ferdinand Anton (1822–1892)
1893–1898	Wandolleck, Benno Edward Max Julius (1864– [D])
1899–1906	Enderlein, Günther (1872–1968)
1906–1919	Grünberg, Karl (1878–1931)
1919–1937	Enderlein, Günther (1872–1968)
1937–1945	Delkeskamp, Kurt (1902–1988)
1945–1978	Peus, Friedrich Ferdinand Christian "Fritz" (1904–1978)
1978–1997	Schumann, Hubert (1930–)
1997–present	Kotrba, Marion (1957–)

17. **Natural History Museum**, **London**

The collections of the Natural History Museum (BMNH) [formerly British Museum (Natural History)] in London harbor the largest number of bombyliid types (over 1,000) of any museum in the world. These collections reflect the results of British exploration as well as colonial surveys and collecting expeditions. The majority of the types of bombyliids in BMNH are those described by Francis Walker. Other major collections include those of Austen, Bezzi, Brunetti, Edwards, and Hesse.

Labeling of type material during WWII has historically posed a problem with regard to subsequent interpretation of actual type specimens by specialists researching the collections. In order to prevent damage to the collections by potential bombing during WWII, the insect collections were evacuated from the museum. Type material was evacuated separately from the remainder of the collection. In order to save space and expedite the evacuation, a characteristic red-ringed "Type" label was placed on a single representative specimen of each species regardless of whether or not there were numerous syntypes in the type series. The choosing of this single representative was done by E.E. Austen for the Diptera and the resultant choice did not necessarily represent either a "typical" specimen in a type series, or in some cases even an actual type specimen (though for Bombyliidae the latter case has not been found).

Upon return of the type collection and remaining collection to the BMNH after the war, the red-ringed "Type" labels were not consistently removed. This has resulted in subsequent researchers regarding those specimens with "Type" labels as types or holotypes, when in fact, many were part of larger syntypic series. Because of this historical situation regarding the types and labeling in BMNH, we do not necessarily regard the mention of a "type" of a certain species of subsequent authors as being in the BMNH to automatically represent a lectotype designation as is now indicated by the I.C.Z.N. *Code* Art. 74a. Only if these indications intentionally represented lectotype designations do we accept them as such.

18. **Naturhistorisches Museum**, **Wien**

The early zoological collections in Vienna were originally kept in a wing of the court library ("Hofbibliothek"). During civil disturbances of 1848, the city was shelled and one of the bombs landed in this portion of the library causing a fire in which all the zoological collections were destroyed. Wiedemann's and Meigen's type specimens deposited in Vienna prior to 1848 were destroyed. Material deposited subsequently (including Wiedemann types deposited in NMW through the Winthem Collection) still exists.

19. **Newman Collection**

The specimens that formed the basis of Newman's (1841) paper on *Neuria* and *Ligyra* belonged at the time to the Entomological Club in London. The majority of the Entomological Club collection was acquired by BMNH in 1844, including many types of Newman (Waterhouse, 1906: 585). However, no type material of *Neuria* species has ever been subsequently located there. Yeates (1991a,b) in his revisionary studies of *Aleucosia* and *Comptosia* was unable to locate any of Newman's types. Edwards (1934: 81 [footnote]) stated that the types of Newman are in the "Museum of the Zoological Institute at Halle". A check by the curator there at the request of the senior author in 1980 and a recent check by Andreas Stark at the senior author's request during this study failed to find any remnants of such material. Interestingly, a syntype of *Neuria atherix* Newman was found during this study in UMO, which probably represented part of some syntypic material of

this species sent to colleagues (in this case to Westwood).

Material identified as various species of *Neuria* from Australia in ZMHB does not include types.

20. **Pallas Collection**

The manuscripts and collections of Peter Simon Pallas (1741–1811) came into the hands of C.R.W. Wiedemann through the auspices of a Herr Schüppel in Berlin. Wiedemann (1818a) published one of Pallas' manuscripts and made comments and additions to some of Pallas' new species (see Note 28). The whereabouts of the Pallas Collection of bombyliid types is not known. Both Horn *et al.* (1990) and Pont (1995: 146) indicated that the Pallas material should be in NMW. However, no type material of Pallas Bombyliidae has yet been located there. Only one Pallas syntype (*Bombylius autumnalis*) has been located in ZMHB. Although it was expected that more would be found in ZMHB, an exhaustive search by the senior author in September 1998 was unsuccessful in finding further material.

21. **Paramonov Collection**

The personal collection of Sergei Jakovlevich Paramonov (1894–1967) was thought to have been lost or destroyed—even by himself (see Liepa, 1969). A portion of this collection (primarily taxa within the Bombyliinae) was deposited in the ZMHB by Paramonov when he was in Berlin after fleeing Kiev during WWII. This collection is in fair to excellent condition and has been studied extensively by the senior author during this study. A list of the remaining Paramonov collection in ZMKU is being prepared by Drs. V.F. Zaitzev (St. Petersburg) and V. Korneyev (Kiev). Paramonov described 405 species-group names of Bombyliidae, of which 320 (79%) are today considered taxonomically valid.

Where Paramonov states "Typus in meiner Sammlung", we have taken that to mean that a holotype exists in the Paramonov Collection in either ZMHB or SIZK, and in most cases this is corroborated by the presence of a single specimen labeled as type by Paramonov in either of these collections. In some cases, lectotypes have been chosen for Paramonov species (e.g., Zaitzev & Kandybina, 1983) though Paramonov explicitly indicated in the original description "Typus" [i.e., holotype] and not "Typen" [i.e., syntypes] for those species. These lectotypes are thus unnecessarily and invalidly designated.

When specimens of a type series were represented by both sexes, Paramonov would most often label a male as "Typus" and a female as "Typus" in the collection. In these cases, the intention of Paramonov was to treat the male as the "type" (cf. Paramonov, 1950c: 11). Unfortunately, the rules of the I.C.Z.N. *Code* do not take into consideration unpublished intentions of the author, hence all specimens in the type series of those species must be considered syntypes.

22. **Philippi Collection**

Parts of the insect collection of Rodolpho Amando Philippi (1808–1904), thought to have been lost or destroyed, have been located in the MNNC. Specimens are not labeled, making it difficult or impossible to ascertain type status. Though a specific search for Syrphidae types proved fruitless (F.C. Thompson, *in litt*.), some Philippi Tabanidae types have been identified (see Philip, 1968). Some syntypes of Diptera were sent by Philippi to Camillo Rondani in Italy, the names of many of which were validated by Rondani (1863), which predates their use in Philippi (1865). An itemized list of these Philippi spec-

imens was given by Costa (1866) as being deposited by Rondani in MZUN in 1863. Philippi described 53 species-group names of Bombyliidae, of which 33 (62%) are considered taxonomically valid.

23. **Rossi Collection**

Pietro Rossi (1738–1804) was an Italian entomologist in Pisa and the world's first university professor of entomology. Rossi described 9 species-group names of Bombyliidae, of which 8 (89%) are today considered taxonomically valid.

The collection of Pietro Rossi was passed on to F. de Santevale of Parma and subsequently ended up in ZMHB via J.W. Hellwig in Brunswick. Despite the reports of previous authors of not finding types, there are some Rossi types that still exist in ZMHB (F.C. Thompson, pers. comm.). A few Rossi types of Bombyliidae were located in ZMHB by the senior author during his visit there in the autumn of 1998. They are in good to excellent condition; they can be recognized by the typical thick short pin used by Rossi, and can be confirmed as being Rossi material by the notes in the collection register.

24. **Santos Abreu Collection**

Elias Santos Abreu (1856–1937) lived and worked in La Palma in the Canary Islands. In bombyliid circles, he is known for having written the 1926 monograph of the Bombyliidae of the Canary Islands. Santos Abreu described 6 species-group names in Bombyliidae, of which only 1 (16%) is today considered taxonomically valid.

The whereabouts of his collection, which contains types of many different families of Diptera, was in doubt until it was discovered by Marcos Báez in the house of the grandson of Santos Abreu in La Palma (see Cranston & Armitage, 1988). It was transferred to the Departamento de Biología Animal de la Universidad de La Laguna (Báez, pers. comm.).

25. **Say Collection**

Thomas Say (1787–1834), famous American entomologist, naturalist, and conchologist, was co-founder of the Academy of Natural Sciences in Philadelphia. He participated in some of the earliest exploring expeditions across the American continent and amassed a collection of New World Diptera that he described in various papers from 1816 to 1832. Say described 14 species-group names of Bombyliidae, of which 11 (79%) are currently considered taxonomically valid.

The insect collection of Thomas Say in ANSP has been recorded as destroyed, probably through a combination of neglect over the years and damage in transit from Say's home in New Harmony, Indiana, back to Philadelphia. Nevertheless, syntypes of Say specimens are known to exist in other collections as a result of exchange of these types by Say with colleagues. This is the case with Say's Diptera specimens that were sent to Wiedemann. Wiedemann (1828, 1830) specifically recorded these Say specimens in his work. When the notation is "in meiner Sammlung", the specimens may now be in NMW. The bombyliid specimens in NMW that are most likely syntype Say specimens have been listed in this catalog.

26. **Walker Collection**

Francis Walker (1809–1874) was curator at the British Museum where he is notoriously known for his superficial descriptions of almost 20,000 new taxa of insects in most

orders. Walker described 217 species-group names of Bombyliidae, of which 150 (69%) are today considered taxonomically valid.

Types of Walker are found chiefly in BMNH. Other types of Walker, including some bombyliid types, have been located in MVMA. These apparently derive, at least in part, from W.W. Saunders material and represent type material from Indonesia and South America. Some of the types of species based on specimens collected by J.K. Lord in northeast Africa and Arabia have not been found in BMNH and are thought to have most likely been destroyed (see Waterhouse, 1906).

27. **Wiedemann Collection**

Christian Rudolph Wilhelm Wiedemann (1770–1840) was a German entomologist, court obstetrician, and primary patron of J.W. Meigen. Pont (1995) gives an excellent biographical account of Wiedemann and is the premier source of information concerning type localities in Wiedemann's works. Wiedemann described 179 species-group names of Bombyliidae, of which 143 (80%) are today considered taxonomically valid.

Wiedemann's types are found primarily in ZMUC, NMW, and ZMHB, with others in ZMAN and SMFD. See also Notes 13 and 20 above concerning the fate of material based on Megerle or Pallas collections.

NOMENCLATURAL NOTES

28. **Pallas names in Wiedemann (1818)**

Thanks to the research and translation efforts of Adrian Pont, all names proposed in Wiedemann (1818) have been incorporated in this catalog with correct author attribution and synonymy. Previous cataloging of these names has attributed authorship solely to Wiedemann. However, after reading through this work, it is evident that in some cases Pallas provides enough descriptive notes to give him authorship or — in other cases — coauthorship with Wiedemann of some of the new names proposed.

29. **Multiple publications of new taxa**

As mentioned in the introductory section, some works describing new taxa were published in more than one form (e.g., journal and separate; school program and separate; journal and book chapter; etc.). All known occurrences of multiple publications of new taxa are indicated in this catalog in chronological order. Subsequent or simultaneous publications are indicated in either parentheses or brackets.

30. **Bezzi's African names**

During the 1920s, Bezzi embarked on a series of papers describing African bombyliids and other Diptera based on specimens in various museum collections. His intention was to publish 5 papers based on material in the following collections: 1) BMNH; 2) SAMC; 3) HNHM; 4) MCSN; and 5) Alluaud and Jeannel (MNHN). The paper on Hungarian Museum Diptera was never published. As a consequence of these papers, each of which anticipated the other, complications arise as to the nomenclature of certain new species that were mentioned in more than one paper. Previous catalogs (e.g., Bowden, 1980) have treated these names as being validated in one publication and merely published again as new in a subsequent publication. Close examination of the material examined in each paper shows that Bowden's approach oversimplified the actual nomenclatural situation. Many of the new species described in more than one of the papers were based on different material. This is not surprising since these papers dealt with specimens found in different museums. The unfortunate result of this situation is that if new species names were validated in more than one of these papers and were found to have been based on different type material, the names must then be treated as separate and the subsequent validations of these names must be listed as junior synonyms and homonyms. We have checked through all of Bezzi's papers and new species descriptions and have listed all occurrences as either *nomina nuda* (if they preceded the first validation of the name), valid (the first validation of the name), or synonymous and homonymous (if the same name was published subsequently and was based on different type material than the first validation of the name).

31. ***Bombylius phaeopterus*** **Bezzi vs**. ***Bombylius phaeopteroides*** **Greathead**

Bombylius modestus var. *phaeopterus* was never formally described by Bezzi, but was nonetheless validated in Bezzi (1924). *Bombylius phaeopteroides* was described by Greathead (1967) for a specimen in BMNH. Bowden (1975c) elucidated the situation of

the two species, but made a statement that Bezzi (1924) referred to a "type specimen" of *B. phaeopterus* as being in HNHM. This is not quite correct and the mistake is critical to the type status of each species.

Bezzi never referred to a "type" specimen, but instead stated the following [material in square brackets added here for clarification]:

> "Distinguished from the typical form [*Bombylius modestus* Loew] by having its wings decidedly infuscated. Described by me from Erythraea, in my paper on the Bombyliidae of the Hungarian Museum."

This is yet another case of one of Bezzi's publications anticipating the other (see Note 30). Bezzi's Hungarian Museum bombyliid paper was never published and the only specimen mentioned in this meager treatment of *phaeopterus* in the 1924 work is the same specimen that Greathead used as the holotype of his *Bombylius phaeopteroides* (Bowden assumed that the type of *phaeopterus* was destroyed in HNHM in 1956 and that the BMNH specimen represented a different species concept from what Bezzi had in mind). In actuality then, this specimen (a male from S. Abyssinia, R.J. Stordy) is the holotype of both *Bombylius phaeopterus* and *B. phaeopteroides.* Thus, the neotype designation of this specimen for *B. phaeopterus* Bezzi by Bowden (1975c: 312) was unnecessary and is invalid.

32. **Use of "i" vs. "j" in Wiedemann names**

The I.C.Z.N. *Code* (I.C.Z.N., 1985) has a section dealing with spelling of names having "i" vs. "j" and specifically mentions Wiedemann's (1830) paper as having emended his previous orthography by treating more than one name as being "consistently" spelled differently. Unfortunately, the example in the *Code* is inaccurate because, although the text does indeed treat some names consistently with a different spelling, the index to the 1830 work retains the original orthography. Thus, no justified emendation takes place in Wiedemann 1830. We have retained in this catalog the original orthography of the Wiedemann names in question that use "i" vs. "j".

33. ***Bombylius sericeus*** **Meigen, 1820**

Bombylius sericeus Meigen (1820: 203) was proposed in synonymy with both *Bombylius canescens* Mikan, 1796 and *Bombylius nubilus* Meigen, 1804, making it essentially a new replacement name for both. Using the First Revisor Principle, we select *Bombylius canescens* as the name for which *Bombylius sericeus* was proposed as a new replacement name.

PHYLOGENETIC CONSIDERATIONS

The synthesis of Becker (1913) as extended by Bezzi (1924a) formed the basis for the subfamily classification of the Bombyliidae used by subsequent authors with only minor variation and the addition of further subfamilies, mainly to contain newly discovered genera. Mostly these changes were proposed in regional works or in catalogs. Hull (1973) reviewed the world fauna and considered that the classification had become top heavy. He introduced a tribal classification to remedy this, reducing some subfamilies to tribes and proposing other new tribes to divide very large subfamilies into more manageable units. Unfortunately, his work contained many inconsistencies and poorly supported changes that were not accepted by other authors. Mühlenberg (1971) undertook pioneering phylogenetic analysis including new characters discovered in a study on the female genitalia, but it was based on only 25 genera and chiefly served to draw attention to the importance of the sand chamber. Phylogenetic principles were not applied to the entire family until Yeates (1994) carried out a rigorous phylogenetic analysis of the Bombyloidea using 154 morphological characters of the exoskeleton, many of them new or not previously used. His study included representatives of all currently accepted subfamilies and tribes, except Villoestrini and Xenoprosopinae, and arrived at a reclassification based for the first time on synapomorphies. This classification has been accepted for this Catalog with a few exceptions, which are discussed.

The Mythicomyiinae were shown to be a monophyletic group, basal to, and the sister group of all other Bombyliidae by Yeates (1994), but he preferred to retain it as a subfamily. However, Evenhuis (1994) adopted full family status, as was proposed by Zaitzev (1991b), and supported by his own unpublished phylogenetic analysis and minimum ages for the two families: Mythicomyiidae (Jurassic), Bombyliidae (Tertiary). Consequently, the Mythicomyiidae are not included in the present catalog.

The North American genera *Lordotus* and *Geminaria* were traditionally considered to belong to the Bombyliinae, but they have highly modified ovipositors, described by Hall & Evenhuis (1982), and lack entirely any vestige of the sand chamber found in the Bombyliinae and succeeding subfamilies. For this reason these two genera segregate in Yeates' (1994) cladogram between the Toxophorinae and Heterotropinae, and he proposed a separate subfamily, Lordotinae, for them. However, as he noted, in other respects these genera exhibit characters found within the Bombyliinae, in particular the genus *Conophorus*, and also share characters with the Ecliminae. Yet, within the Bombyliinae, the genus *Beckerellus* has greatly modified female genitalia, but retains traces of a sand chamber. Elsewhere in the Bombyliidae, the genus *Cyrtomyia* has modified female genitalia and the genus *Antonia* lacks a sand chamber. In these instances, the loss of a functional sand chamber is accepted as a character reversal consequent on a change in oviposition behavior. Thus, we consider that this argument applies to *Lordotus* and *Geminaria* also, and that the characters shared with the Bombyliinae are of greater phylogenetic significance than the female genitalia. Therefore, these two genera have been returned to the Conophorini, which share a similar arrangement of the wing veins and contain genera such as *Conophorus,* which also has a mid-tibial spur.

As discussed by Yeates (1994), the genera included in the Bombyliinae exhibit a high degree of homoplasy, but as usually understood it is a readily recognized subfamily—usually robust flies with dense hair on the body and a well developed sand chamber guarded by long dense hair. In his analysis the Ecliminae form a clade adjacent to the Bombyliinae on the same branch of the cladogram and basal to the Crocidiinae. For this reason he placed the Eclimini as a tribe within the Bombyliinae. However, the Ecliminae are very distinctive, elongate, usually rather bare flies having a modified sand chamber with fea-

tures suggesting that it may represent a stage in the development of this structure, rather than a reversal. Because of the marked difference in habitus and the differences in the female genitalia, subfamily status has been retained for the Ecliminae.

On Yeates' (1994) cladogram, the genus *Sericosoma* lies between the Crocidiinae and Mariobezziinae and, along with its sister genus *Sericothrix*, was left *incertae sedis* because of uncertainties as to its correct placement. However, he commented that he expected future phylogenetic studies to ally these two genera with the Mariobezziinae, the most plesiomorphic of the subfamilies with a concave postcranium and two occipital foramina, the "Tomophthalmae" of authors. Since the subfamilies at the base of the "Tomophthalmae" are weakly defined at present and further work is required to develop a more robust classification, rather than leave the two genera in limbo, we have provisionally listed them in the Cythereinae where they have been traditionally located.

Evenhuis (1990) revised the Usiinae and Phthiriinae on a world basis and defined the Phthiriinae based on wing, antennal, and female genitalic characters, as well as the bases of the procoxae being separate (they are attenuate in Usiinae). Yeates (*in litt.*) could not verify the procoxal character, considered (1994) the antennal characters of both subfamilies to be of similar structure, and consequently treated Phthiriinae as a tribe within the Usiinae in his phylogenetic study. A re-examination in this study of the characters given by Evenhuis (1990) to separate the two subfamilies shows them to be valid and we thus reinstate the Phthiriinae as a good subfamily in this Catalog.

The subfamilies Xenoprosopinae and Oniromyiinae (each monogeneric) were not included in Yeates (1994) study. The position of *Xenoprosopa* is unresolved, since it is known from only a single specimen and was not available for inclusion in Yeates' phylogenetic analysis. As noted by Yeates (1994) it shares a number of features with *Oniromyia* but differs in having vestigial mouthparts. However, this does not preclude affinity between the two and, if they are shown to be sister genera, the name Xenoprosopinae will take priority over Oniromyiinae.

The tribe Villoestrini (*Marleyimyia*, *Oestranthrax, Oestrimyza,* and *Villoestrus*) was proposed by Hull (1973) for those genera of Villini with nonfunctional mouthparts. However, there is no other justification for separating them from genera with fully functional mouthparts, since the degree of reduction is different between genera and there is no synapomorphy to separate them from the Villini.