A comparison of collection management practices between two collections of Diptera

[Vergleich des Sammlungsmanagements der Dipterenkollektionen der Schottischen Nationalmuseen (Edinburgh) und des Natal Museums (Pietermaritzburg)]

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Abstract

The Diptera collections of the Natal Museum (Pietermaritzburg, South Africa) and the National Museums of Scotland (Edinburgh, Scotland) are distinctly different. A direct comparison of curatorial techniques aims to assess the methods of collection management used and the constraints facing these two museums.

Each institution has a unique historical background, which has had a particular influence on how collection management practices have developed. Thus, the two museums in question use different techniques to accomplish the same job. These differences are compared and evaluated and the strengths of each institution are highlighted. Some comment on collection management practices in the Diptera collections of other museums is included.

The main limitation facing the National Museums of Scotland collection stems from its age and certain traditional methods of organisation used. Being a younger collection, the Diptera collection at the Natal Museum is largely free from such limitations.

Current political and economic factors are discussed relative to operations at both museums. These factors (including the means by which finances are obtained) effect the two institutions and what they expect from their staff, differently. As a result, collection management practices are also distinctively influenced.

Certainly, some positive changes can be made to improve the Diptera collections at National Museums of Scotland, but the constraints facing the Natal Museum are more complicated and sometimes more difficult to overcome.

Key words Collection Management, Natal Museum, National Museums of Scotland

Zusammenfassung

Die Dipterenkollektionen des Natal Museums (Pietermaritzburg, Südafrika) und der Nationalmuseen von Schottland (Edinburgh, Schottland) sind sehr unterschiedlich angelegt. Ein direkter Vergleich der angewendeten kuratorischen Techniken und Gepflogenheiten verhilft dazu, die im Sammlungsmanagement genutzten Methoden einzuschätzen und die Zwänge, mit denen beide Sammlungen konfrontiert sind, zu werten.

Beide Institutionen haben ihren eigenen historischen Hintergrund. Dieser ist wiederum jeweils dafür verantwortlich zu machen, wie sich das Sammlungsmnagement entwickelt hat. Daraus ergibt sich, daß beide Einrichtungen unterschiedliche Techniken benutzen, um dieselben Arbeitsaufgaben zu verrichten. Die Unterschiede werden verglichen und bewertet, sowie die Stärken jeder Institution herausgestellt. Es werden auch Anmerkungen zum Sammlungsmanagement in anderen Museen gemacht.

Das hohe Alter und verschiedene althergebrachte Organisationsmethoden sind als Gründe für Defizite in den Nationalmuseen Schottlands zu benennen. Weil die Sammlungen im Natal Museum wesentlich jünger sind, kann man gleichartige Beschränkungen hier nicht ausmachen. Aktuelle politische und ökonomische Faktoren werden in bezug zu organisatorischen Maßnahmen in beiden Museen diskutiert. Diese Faktoren, sowie die in beiden Häusern gängigen Finanzierungsmethoden, beeinflussen beide Institutionen und die Erwartungshaltung gegenüber den Angestellten in unterschiedlicher Weise.

Mit Sicherheit sind einige positive Veränderungen in der Dipterenkollektion der Schottischen Nationalmuseen zu erreichen. Andererseits sieht sich das Natal Museum Zwängen ausgesetzt, die sehr komplex und schwieriger zu überwinden sein werden. [Übers. d. Red.]

Stichwörter Sammlungsbetreuung, Natal Museum, Schottische Nationalmuseen

Introduction

The Diptera collections of the Natal Museum (Pietermaritzburg, South Africa) and the Royal Museum (National Museums of Scotland, Edinburgh, Scotland) are distinctly different (Table 2). The emphasis on content is the most noticeable difference between these two collections, but there are many management systems that differ too. Other institutes use other management systems, not in use at either of these Museums. And yet, these collections all serve their local and international communities in informative and meaningful ways.

It is the material itself which has the intrinsic value, not the collection management techniques employed. Thus, one can ask if the curation and collection management is incidental to the user. The important point is that the needed material or data can be found and imparted to the user. This need is what drives the organisation of the collection systems. Like any filing system, the organisation of data and materials differs from one system to the next. We argue then, that a standardised system of collection management cannot be imposed on Diptera collections throughout the World.

Scope of the collections

The Royal Museum is much the older of the two museums, having its origins as early as 1812, due largely to the efforts of Professor Robert JAMESON (STEPHEN 1954, SWINNEY & SHAW 1998) (Table 1). At this time the Natural History specimens formed a museum collection belonging to the University of Edinburgh. This was combined in 1855 with the cultural and technological displays of the recently formed Industrial Museum of Scotland (ALLEN 1954, SWINNEY & SHAW 1998).

In 1864 the combined body of collections took on the name "Edinburgh Museum of Science and Art" and in the jubilee year (1904) the name was again changed to the "Royal Scottish Museum" (ALLEN 1954). As a consequence of a change in policy (formation of a Board of Trustees in 1985 - SWINNEY & SHAW 1998), together with more recent developments on an adjacent site, which will bring into being the "Museum of Scotland" (predominantly a museum of Scottish artefacts), the name was again changed to the "Royal Museum" under the umbrella organisation of the "National Museums of Scotland".

The natural history collections of the Royal Museum are thus part of a much broader accumulation of specimens and artefacts, that included insect material from these earliest of times (for example the JAMESON Coll., which is registered as 1837.41). In 1819 the renowned DUFRESNE Collection was purchased from Paris containing (among other natural history specimens) 12 000 insects (STEPHEN 1954), including many types. The insect collections have grown since then, to now include approximately a million insect specimens, of which about 83 000 are Diptera, divided into over 68 000 British and 14 000 specimens from the rest of the World. The collection is housed in 360 wooden drawers and numerous store-boxes, some of which are wooden, the remainder are firm cardboard. Two full-time curators, splitting their time across the insect orders, staff this collection. Only one curator is able to concentrate on Diptera.

A large proportion of the Royal Museum Diptera collections has come from a strong amateur entomological input, an aspect that is largely lacking in the Natal Museum collections. In addition, important collections of Diptera include those of E. B. BASDEN (1963.18 & 1979.76 & 105); Arthur B. DUNCAN (1984.40); Percy H. Grimshaw (1902.97); John R. MALLOCH (1910.20); Edward C. PELHAM-CLINTON (1985.38) and Lieut-Col. John W. YERBURY (1898.125, 1899.34 & 1904.124). These collections are predominantly of British (and especially Scottish) origin, reflecting the emphasis of the Diptera collection. We are presently extending the scope

Tab. 1: History of the The Royal Museum (National Museums of Scotland), Edinburgh

1812	Professor Robert JAMESON formed the Natural History collection (University of Edinburgh)
1855	combined with cultural and technological artifacts to form the Industrial Museum of Scotland
1864	renamed Edinburgh Museum of Science and Art
1904	(Jubilee year) the name changed to the "Royal Scottish Museum"
1985	with the formation of a Board of Trustees, plus development on an adjacent site, to bring into being the "Museum of Scotland" (predominantly a museum of Scottish artefacts), the name was again changed to the "Royal Museum" under the umbrella organisation of the "National Museums of Scotland".

of this parochial collection to include the western Palaearctic Region, since studying Scottish material in isolation to continental Europe has severe limitations.

From the early stages of the Royal Museum until 1960, there were Curators of Natural History, rather than curators dealing specifically with subsections of that discipline. That some of these curators were also entomologists (for example Percy H. GRIMSHAW and Andrew Rodger WATERSON) no doubt benefited the collections. In 1960 Edward Charles PELHAM-CLINTON was employed as Curator of the Insect Collections. So, although there was a long history of entomology at the Royal Museum and although it had received entomological attention at various times, it was only recently that dedicated full-time staff were employed to curate the material there.

In comparison the Diptera collection at Natal Museum, has a shorter history. The Natal Museum has its origins in the Natal Society (founded 1851) and being formally established by the Government of Natal in 1903. It has been a National Museum since 1910. The entomology collection is also part of a more extensive collection of artefacts and natural history specimens. In 1953, Dr Brian R. STUCKENBERG was the first entomologist appointed. Prior to this date, Dr C. AKERMAN had assembled an insect collection, but this was poorly kept, badly labelled and much faded due to the effects of light while on exhibit. Few of these specimens remain.

The remarkable foresight shown by Dr STUCKENBERG when he elected to concentrate on Diptera, rather than dilute his efforts on a general collection, has paid great dividends. Although the Diptera collections are also part of much broader Cultural and Natural History collections, they play a more significant role within the museum, than do those of the Royal Museum in Edinburgh. This is also certainly the largest collection of Diptera in Africa (BARRACLOUGH & WHITTINGTON 1994), contained in 910 wooden drawers. The emphasis is largely on African material, supplemented with extra-limital material which is largely used for comparison. Supplementing the Diptera collections are a collection of Mecoptera (mainly LONDT) and one of Heteroptera (mainly REAVELL & LONDT), but these collections are small (about 170–180 drawers) in comparison to the main collection of Diptera.

The core of the Natal Museum Diptera collection is formed by the material collected by STUCKENBERG, followed by members of staff over the years (LONDT, IRWIN, BARRACLOUGH, MILLER, and WHITTINGTON). Besides this strong staff input, important additional collections include: Dr H. BRAUNS (Willowmore district of the Cape Province); D. COOKSON (Eastern Highlands of Zimbabwe), P. USHER (largely southern African Tabanidae), F. K. E. ZUMPT (Calyptrate Diptera, notably of medical and veterinary importance).

Until recently when the Entomological and Arachnological departments merged, there were two full-time and one part-time staff members to service the Diptera collection. Here lies

Tab. 2: Comparison between the Diptera collections in the Royal Museum, Edinburgh, Scotland and the Natal Museum, Pietermaritzburg, South Africa

	Royal Museum, Edinburgh	**Natal Museum, Pietermaritzburg**
Age	186 years	45 years
First specific employment of Curator of Entomology	Edward C. PELHAM-CLINTON 1960	Dr Brian R. STUCKENBERG 1953
Current number of staff concentrating on Diptera	1.5	2.5
Collecting Emphasis		
1. geographical	Britain, particularly Scottish	Africa, particularly southern
2. content	general entomology	Diptera
Primary Collection policy	Curation orientated	Research orientated
Estimate of specimens	83 000	220 000
Estimate of specimens sorted to genus (at least)	?	180 000
Housed in number of drawers	366 (+ 137 unsorted)	758 (+ 152 unsorted)
Number of type specimens	79 primary 112 secondary (1998 count)	1 200 primary 4 832 secondary (1993 count)
Number of families (85 are common to both)	96 (93 British + 3 Extralimital)	121 (104 + 17 Extralimital)
Method of curation	Solid base drawers, divided into columns	Unit trays
Specimen labelling	Frequently poor, with little information	Old acquisitions poor, recent collections good
Accommodation	Entomology Studyroom	Two separate store rooms
Major pest threat	*Dermestes*	Fungus
Method of prophylactic pest control	Freeze fumigation of all incoming material	Isolation of the collection and dehumidification
Level of Documentation	Rudimentary species tick-list SIRI – Scottish Insect Records Index (records of literature citations)	Full species database for identified material
Accessioning	Non-staff collections registered, but not listed	No registration
Funding	Grant-in-Aid	Grant-in-Aid + R&D funding

another major difference between the two museums. The Natal Museum benefits from the concentrated efforts of the curators on a single order of insects, while the Royal Museum has only two staff members (supported by occasional staff) to manage the entire insect collection.

The emphasis at Natal Museum is on quality and research output, unlike that at the Royal Museum, where, until very recently, the emphasis is on dealing with the overwhelming backlog of work. We believe that concentrated staff effort accounts for the success at Natal Museum, intuitively recognised by Brian STUCKENBERG 45 years ago at the inception of the collection. The only solution for general collections where effort is much more diluted is to employ

more staff, such that each staff member has responsibility for an order or group of small orders. Where this cannot be achieved because of real or perceived financial constraints, then it would be sensible to allow some of the collection to become dormant in favour of strengthening and concentrating on other parts. Instead the Royal Museum has pursued a method of sporadically concentrating on a single order (by employment of a single curator with specific interests in one order). Meanwhile, the remainder of the collection stagnates until the next curator with a new specialisation is appointed.

Content

It is difficult to fully compare the content of these two collections for two reasons. Firstly, the direction of research effort within the flies has been fundamentally different over the years of operation. Secondly, there are families from each specific region, which do not occur in the alternate collecting area.

The Natal Museum has representatives of all 104 Afrotropical families of Diptera (BARRACLOUGH & WHITTINGTON 1994 – Appendix 1) plus the following 17 extra-limital families:

Acartophthalmidae
Axymyiidae
Cypselosomatidae
Deuterophlebiidae
Dryomyzidae
Fergusoninidae
Helosciomyzidae
Megamerinidae
Mystacinobiidae
Pachyneuridae
Pallopteridae
Pelecorhynchidae
Periscelididae
Richardiidae
Ropalomeridae
Sciadoceridae
Trichoceridae

A further complication is the proliferation of subfamilies recently elevated to family status. Acceptance of these new families is varied and some are still to be ranked phylogenetically. The Natal Museum collection is not organised to include all of these subfamilies, thus complicating the comparison. The British list published by KLOET & HINKS (1976) lists 87 families, of which the Royal Museum lacks representatives of Xylomyidae and Tanypezidae only. The new list by Peter CHANDLER (1998), lists 102 families of which Royal Museum lacks four families: Xylomyidae, Pseudopomyzidae, Tanypezidae and Stenomicridae.

Even although the Royal Museum has a World collection, most of the families within that collection are also found in the UK (Appendix 2). Those that are not, are the Mydidae, Pyrgotidae and Diopsidae. Families found in the Natal Museum that are not in the collections at the Royal Museum include:

Apioceridae
Axymyiidae
Blephariceridae
Celyphidae
Corethrellidae
Cryptochetidae
Ctenostylidae
Curtonotidae
Cypselosomatidae
Deuterophlebiidae
Fergusoninidae
Helosciomyzidae
Marginidae
Mormotomyiidae
Mystacinobiidae
Nemestrinidae
Neminidae
Neriidae
Neurochaetidae
Pachyneuridae
Pelecorhynchidae
Richardiidae
Sciadoceridae
Streblidae
Tachiniscidae
Tanyderidae
Vermileonidae
Xenasteiidae
Xylomyidae

With the exception of Xylomyidae, none of these are found in Britain. Conversely the only family in the collections at the Royal Museum that is not in the Natal Museum is the Xylophagidae.

Type specimens

There are an estimated 1 300 primary and 5 300 secondary types in the Natal Museum, respectively representing 0.6 % and 2.4 % of the total estimated number of Diptera specimens. This compares dramatically with the 79 primary and 102 secondary type specimens in the Royal Museum, Edinburgh, each of which represent approximately 0.1 % of the total estimated number of Diptera specimens.

The marked difference between the numbers of type specimens is clearly a result of the different faunal compositions and research emphasis of the two institutions. It is nevertheless remarkable that the Natal Museum has accumulated such a high number of types in the relatively shorter period of its existence.

Curatorial method

As is commonly the case with Diptera collections, the vast bulk of material in both collections consists of pinned or double-mounted specimens. This paper therefore concentrates specifically on pinned material and excludes alcohol stored or slide mounted specimens. The two collections rely on single series of drawers for easy access. In the Natal Museum, extra-limital material is interspersed at family level, while that in the Royal Museum runs parallel to the main (Palaearctic) collection. The Natal Museum collection generally follows the sequence set out in CROSSKEY (1980) and the collection at the Royal Museum will follow the new list produced by Peter CHANDLER (1998) supplemented by the Palaearctic catalogue series (SOÓS & PAPP 1984–1992).

The Diptera collection in Edinburgh is pinned directly into cork-and-papered drawers. Newer drawers are being received that are plastazote lined. Nevertheless, this type of storage suffers the problem that when new material results in an overflow situation, entire drawers of material have to be moved to accommodate that material. Considerable time is lost in re-curating drawers. The alternative method of using unit trays has not been adopted, because of concern that this will take more space in already cramped accommodation. This traditional method of pinning provides an average number of 230 specimens per drawer.

In contrast the Natal Museum uses a system of three different sizes of unit trays within the drawers. These are rigid plastic units lined with plastazote. Labels are slotted into the front of each unit and a variety of colours provide a quick reference to the status of the material. White labels are standard, representing mainland Afrotropical specimens, while blue labels represent oceanic Afrotropical material, most of which are from Madagascar. Buff coloured labels isolate the material donated by Zumpt and green labels are used for extra-limital material.

The dimensions of the unit trays are proportional, such that two units of the lowest size are equal to the next size up, and four equal the largest size. Likewise two of the middle size equal one of the largest. This combination means that the maximum number of units can be housed per draw, with minimal loss of space. The unit tray method results in approximately 290 specimens per drawer, thus dispelling the notion that this system takes up more space. It is unlikely, however, that the Royal Museum at Edinburgh will transfer fully to the unit tray method, although there are plans to convert at least the type collection to this form of curation.

Until recently the Royal Museum at Edinburgh has not made use of coloured labels to separate material. The emphasis has been on a British collection, with "exotic" material banished to second-rate storage under the displays in the gallery. We are now moving toward a more integrated approach, with the emphasis on a Palaearctic collection. The old "exotic" collection, being small in comparison, is being re-curated as a parallel collection and housed

beside the Palaearctic collection in the Entomology Studyroom. Such a parallel collection, while being individually labelled, will not necessarily use colour to make this distinction.

This brings us to a further noticeable difference, which is a result of environmental constraints. The Diptera in Edinburgh are part of the main collection in the Entomology Studyroom. This is preferential to the system at the Natal Museum, where the collections are in two storerooms with minimal ventilation. The reason for this unsociable storage arrangement is that high humidity (resulting in the growth of fungus) is a continuous problem that prohibits the long term storage of material outside of controlled conditions. De-humidifying units are now in place in the two rooms and this has led to elimination of fungus infestations. On the contrary, the Entomology Studyroom in Edinburgh seldom has humidity higher that 45-50 %. The major threat to the collection there arises from the invasion of various species of *Dermestes*. Infestation is guarded against by freeze-fumigating all incoming material for two to three days at < - 40 °C.

Another development recently put into action in Edinburgh, is an attempt to document the collection content. Initially this will be in the form of the number of specimens per species and may develop further in the future. A catalogue of Type material is currently being worked on and there is a long standing, but no longer up-to-date, database of literature citations of Scottish insect records (called SIRI). The Natal Museum recently employed a person for three years (part-time working on a 5/8th basis) to document all material identified to genus or below, including label data, for families where sufficient material has been identified. About 85 % of the collection is documented in this way. This mammoth undertaking is supplemented by a similar incomplete database of type material, in which all literature and label data are included.

A form of documentation occurring at the Royal Museum, is the use of an accession register. Non-staff collections of particular importance or of large size are given a unique register number. For some collections accession registers make good sense, since the material is arranged in numerical sequences. This is less useful in Natural History collections where the material tends to be organised in taxonomic sequence. In practical terms, the only use this really has is to tie all the material together by association with the number. This is useful if a collection is compiled from more than one collector, but further than that has little actual value.

Collection profiles in the detail produced by MCGINLEY (1989, 1993) have not been carried out on either collection. Such figures are in a constant state of flux, and so a more expedient exercise was carried out on both collections. These data are represented in Figure 1 and clearly indicate a reasonable profile for both collections. This statement is made with the knowledge that the portions of the collections falling into the first two categories (i.e. unsorted or at most sorted to family) are presently being dealt with.

There is little difference between the two collection profiles, except that the Royal Museum has a slightly higher percentage of material sorted only to Family and consequently a lower proportion sorted to at least genus. Thus, in this respect the two collections are perhaps comparable.

Outside influences

The financial structures behind the two museums are, at baseline, very similar. Both museums derive a proportion of their funding directly from a government grant. These grants have a tendency through time to become more and more restricted, requiring honing down of operations, or seeking outside financial support.

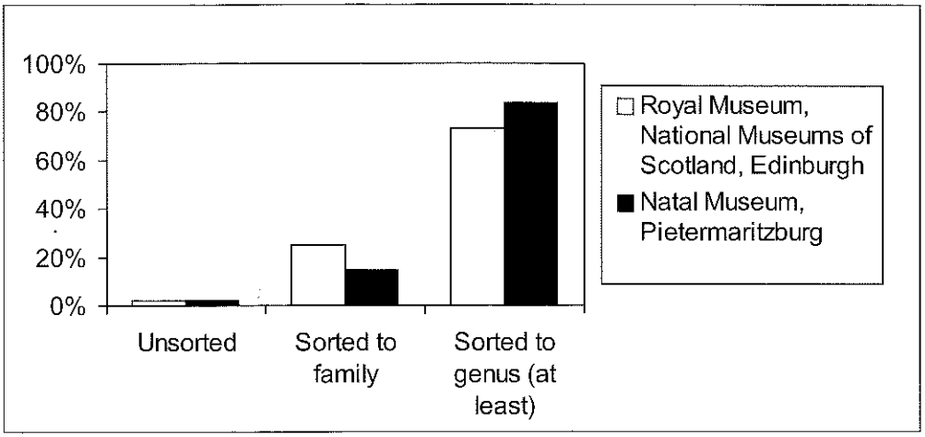

Fig. 1: Collection profiles for the Diptera collections at Royal Museum, National Museums of Scotland, Edinburgh and Natal Museum, Pietermaritzburg.

In South Africa there is a second tier of financial support provided by the Foundation for Research Development. Funding is provided to individuals based on research achievement via peer review. This money provides for research activities and materials, as well as for popularisation of science. It can be supplemented by the FRD to provide for visiting scientists, post-doctorates and students; and is sometimes used for overseas travel. It is this invaluable source of income to the Museum that drives research output and that is largely lacking at the Royal Museum. Such research funding does not exist in Britain for taxonomic research. However, the use of research output as an achievement-indicator does play a role in the provision of the Grant in Aid from the Scottish Office. Indirectly, the research output ensures that the budget provided to the Entomology Section remains sufficient to pay for research activities, materials, fieldwork and overseas travel. Finance for overseas travel is often supplemented by funding from organisations such as Friends of the National Museums of Scotland, Charitable Trust and finances from associated institutions with whom collaborative work is being performed. Furthermore, members of each organisation have carried out limited amounts of contractual work, but this is not viewed as a means of self-sufficiency. The effect on the Royal Museum has been less drive to conduct research and carry out fieldwork. The emphasis has been on curation of the collections for their own sake and in order to serve a local amateur society. It is only in recent years (since perhaps the mid 1980s) that there has been a greater emphasis toward research and the subsequent yield in terms of collection growth and quality is now becoming apparent.

The effect on the Natal Museum has been the outstanding achievement in research and development of the collections. The result is a collection of national and regional importance and a valuable research tool. This achievement is of course closely linked to other factors such as the focus of the collection on one order and on a relatively unknown fauna.

Prior to the recent political changes in South Africa, there were parts of Africa to which members of staff could not go. Thus, a great deal of the emphasis for fieldwork was on South Africa and Namibia. Notable exceptions are collections from Madagascar and Mozambique by Brian STUCKENBERG in the 1950s, the Eastern Highlands of Zimbabwe, by David COOKSON

(1960s) and collections made since then by Jason LONDT in Malawi and the Ivory Coast. More recently was a collecting trip to Kenya (LONDT and WHITTINGTON). It is hoped that other African material will continue to be added to the collections. Although there have been fewer political barriers to the staff at the Royal Museum, the parochial emphasis on the British fauna has had a limiting effect on collection growth. This barrier is being torn down and it is hoped will yield similar positive results.

Appendix 1: Afrotropical Diptera families represented in the Natal Museum. [Updated from BARRACLOUGH & WHITTINGTON 1994; see text for extra-limital families]

A. Nematocera
1. Tipulidae
2. Tanyderidae
3. Psychodidae
4. Ptychopteridae
5. Blephariceridae
6. Dixidae
7. Chaoboridae
8. Corethrellidae?
9. Culicidae
10. Thaumaleidae
11. Ceratopogonidae
12. Chironomidae
13. Simuliidae
14. Anisopodidae
15. Bibionidae
16. Mycetophilidae
17. Sciaridae
18. Scatopsidae
19. Cecidomyiidae

B. Brachycera
1. Xylomyidae
2. Stratiomyidae
3. Tabanidae
4. Rhagionidae
5. Vermileonidae
6. Athericidae
7. Therevidae
8. Scenopinidae
9. Apioceridae
10. Mydidae
11. Asilidae
12. Nemestrinidae
13. Acroceridae
14. Bombyliidae
15. Empididae
16. Hybotidae
17. Microphoridae
18. Dolichopodidae

C. Cyclorrhapha
1. Lonchopteridae
2. Phoridae
3. Platypezidae
4. Pipunculidae
5. Syrphidae
6. Conopidae
7. Tephritidae
8. Tachiniscidae
9. Ctenostylidae
10. Pyrgotidae
11. Platystomatidae
12. Otitidae
13. Neriidae
14. Micropezidae
15. Marginidae
16. Diopsidae
17. Strongylophthalmiidae
18. Psilidae
19. Sepsidae
20. Sciomyzidae
21. Chamaemyiidae
22. Lauxaniidae
23. Celyphidae
24. Coelopidae
25. Heleomyzidae
26. Sphaeroceridae
27. Braulidae
28. Chyromyidae
29. Lonchaeidae
30. Piophilidae
31. Opomyzidae
32. Clusiidae
33. Odiniidae
34. Agromyzidae
35. Aulacigastridae
36. Neminidae
37. Periscelididae
38. Anthomyzidae
39. Asteiidae
40. Xenasteiidae
41. Neurochaetidae
42. Camillidae
43. Ephydridae
44. Diastatidae
45. Campichoetidae
46. Curtonotidae
47. Drosophilidae
48. Milichiidae
49. Carnidae
50. Cryptochetidae
51. Tethinidae
52. Canacidae
53. Chloropidae
54. Mormotomyiidae
55. Scathophagidae
56. Anthomyiidae
57. Fanniidae
58. Muscidae
59. Glossinidae
60. Hippoboscidae
61. Streblidae
62. Nycteribiidae
63. Calliphoridae
64. Sarcophagidae
65. Rhinophoridae
66. Tachinidae
67. Oestridae

Appendix 2: Diptera Families represented in the Royal Museum, Edinburgh. * = Families not found in Britain

A. Nemotocera
1. Tipulidae
2. Bibionidae
3. Mycetophilidae
4. Sciaridae
5. Cecidomyiidae
6. Psychodidae
7. Trichoceridae
8. Anisopodidae
9. Mycetobiidae
10. Scatopsidae
11. Ptychopteridae
12. Dixidae
13. Chaoboridae
14. Culicidae
15. Thaumaleidae
16. Simuliidae
17. Ceratopogonidae
18. Chironomidae

B. Brachycera
1. Xylophagidae
2. Athericidae
3. Rhagionidae
4. Tabanidae
5. Stratiomyidae
6. Acroceridae
7. Bombyliidae
8. Therevidae
9. Scenopinidae
10. Mydaidae *
11. Asilidae
12. Atelestidae
13. Empididae
14. Hybotidae
15. Microphoridae
16. Dolichopodidae

C. Cyclorrhapha
1. Opetiidae
2. Platypezidae
3. Phoridae
4. Lonchopteridae
5. Syrphidae
6. Pipunculidae
7. Micropezidae
8. Strongylophthalmyiidae
9. Megamerinidae
10. Psilidae
11. Conopidae
12. Diopsidae *
13. Lonchaeidae
14. Pallopteridae
15. Piophilidae
16. Ulidiidae

17. Platystomatidae
18. Tephritidae
19. Pyrgotidae *
20. Lauxaniidae
21. Chamaemyiidae
22. Coelopidae
23. Dryomyzidae
24. Phaeomyiidae
25. Sciomyzidae
26. Sepsidae
27. Clusiidae
28. Acartopthalmidae
29. Odiniidae
30. Agromyzidae
31. Opomyzidae
32. Anthomyzidae
33. Aulacigastridae
34. Stenomicridae
35. Periscelididae
36. Asteiidae
37. Milichiidae
38. Carnidae
39. Braulidae
40. Tethinidae
41. Canacidae
42. Chloropidae
43. Heleomyzidae
44. Chyromyidae
45. Sphaeroceridae
46. Drosophilidae
47. Campichoctidae
48. Diastatidae
49. Camillidae
50. Ephydridae
51. Hippoboscidae
52. Nycteribiidae
53. Scathophagidae
54. Anthomyiidae
55. Fanniidae
56. Muscidae
57. Glossinidae
58. Calliphoridae
59. Rhinophoridae
60. Sarcophagidae
61. Tachinidae
62. Oestridae

Literature

ALLAN, D. A. (1954): The Royal Scottish Museum General Survey. – Pp. 5-24 in: The Royal Scottish Museum 1854-1954. – 56 pp., Edinburgh: Oliver & Boyd.

BARRACLOUGH, D. A. & WHITTINGTON, A. E. (1994): Forty years of Diptera studies at the Natal Museum. – South African Journal of Science **90**: 449-454, Johannesburg.

CHANDLER, P. (ed) (1998): Checklists of insects of the British Isles (New series). Part 1: Diptera. A check list of British Diptera. – 234 pp., Handbooks for the identification of British insects **12**. Royal Entomological Society of London.

CROSSKEY, R. W. (1980): Catalogue of the Diptera of the Afrotropical Region. – 437 pp., London: British Museum (Natural History).

KLOET G. S. & HINCKS, W. D. (1975): A check list of British Insects. Part 5: Diptera and Siphonaptera. 2nd Edition. – 139 pp., London: Royal Entomological Society.

MCGINLEY, R. J. (1989): Entomological Collection Management – Are we really managing? – Insect collection news **2**(2): 19-25, Washington.

MCGINLEY, R. J. (1993): Where's the Management in Collection Management? Planning for improved care, greater use and growth of collections. – International Symposium and First World Congress on the preservation and conservation of Natural History Collections, Madrid 10-15.5.95. Volume 3. Current issues, Initiatives and future: 309-338.

SOÓS, Á & PAPP, L. (1984-1992): Catalogue of Palaearctic Diptera, Volumes 1 –13. – Budapest: Akadémiai Kiadó & Amsterdam [and other localities]: Elsevier.

STEPHEN, A. C. (1954): The Department of Natural History. – Pp. 35-41 in: The Royal Scottish Museum 1854-1954. – 56 pp., Edinburgh: Oliver & Boyd.

SWINNEY, G. N. & SHAW, M. R. (1998): History of the Zoological Collections of the National Museums of Scotland. – Bush Telegraph (June 1998) **27**: 23-32.

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