

Notes on a Catalogue of Culicidae of the Ethiopian Region

G. B. White
Department of Entomology
British Museum (Natural History)
London SW7 5BD
England

ABSTRACT. Explanatory notes are given, and certain procedural steps taken, concerning compilation of an up-to-date Catalogue of Culicidae occurring in the Ethiopian faunal region. Following critical appraisal of each endemic nominal taxon, the forthcoming Catalogue currently contains a total of 615 valid species, grouped in 14 genera and 30 subgenera. A further 41 nominal subspecies and 14 varieties or forms are accepted as differing from the type-forms. Numbers of currently recognised species in each genus are plotted for the period 1900-1975.

A name is proposed, *ungujae* ssp. n., and the holotype fixed for a subspecies of *Anopheles (Cellia) wellcomei* Theobald, 1904, from Zanzibar.

Lectotypes are designated for *africanus* Theobald, 1910 (as renamed *stenoscutus* Edwards, 1912); *congolensis* Edwards, 1927; *dunni* Evans, 1928; *goughii* Theobald, 1911; *montforti* Ventrillon, 1905; *neavei* Theobald, 1906; *neobiannulatus* Theobald, 1910; *perexiguus* Theobald, 1903 *sudanensis* Theobald, 1911, and *univittatus* Theobald, 1901.

The following names are reinstated with independent specific rank: *Aedes (Aedimorphus) stenoscutus* (Edwards, 1912), resurrected from synonymy with *neobiannulatus* Theobald, 1910; *An. (Cel.) arabiensis* Patton, 1905: 625, resurrected from synonymy with *gambiae* Giles, 1902, and *Culex (Culex) perexiguus* Theobald, 1903, resurrected from synonymy with *univittatus* Theobald, 1901. *Ae. (Adm.) cumminsi* var. *mediopunctatus* (Theobald, 1910) and *Cx (Cux) pruina* var. *eschirasi* Galliard, 1931, are also reinstated as distinct from their respective type-forms.

New status is given to *adensis* Edwards, 1941, raised from variety to subspecies of *Ae. (Adm.) hirsutus* (Theobald, 1901); to *arabiensis* (Patton, 1905: 633), resurrected as a subspecies of *Ae. (Adm.) vexans* (Meigen, 1830); to *dunni* Evans, 1928, raised from variety to subspecies of *Ae. (Pseudarmigeres) argenteoventralis* (Theobald, 1910); to *capensis* De Meillon, 1935, raised from variety to subspecies of *Cx (Eumelanomyia) salisburyensis* Theobald, 1901; to *coursi* Doucet, 1949, reduced to a subspecies of *Cx (Eum.) salisburyensis*; to *musarum* Edwards, 1936, raised from variety to subspecies of *Uranotaenia (Pseudoficalbia) ornata* Theobald, 1910, and to *hamoni* Grjebine, 1953, which is raised from a variety of *chorleyi* Edwards, 1936, to full specific status.

New synonymies are established between *Ae. (Adm.) stenoscutus* (Edwards, 1912), and *congolensis* Edwards, 1927; between *Ae. (Adm.) rickenbachi* Hamon & Adam, 1959, and *hamoni* Mattingly, 1963; between *Ae. (Adm.) tarsalis* (Newstead, 1907), and *neobiannulata* Theobald, 1910; between *Cx (Cux) pipiens quinquefas-*

ciatus Say, 1983, and *zeltneri* Neveu-Lemaire, 1906, and between *Cx (Eum.) salisburyensis capensis* De Meillon, 1935, and *naudeanus* Muspratt, 1961.

Locality records are clarified for the following: *Ae. (Adm.) boneti kumbae* Chwatt, 1948; *Ae. (Adm.) capensis* Edwards, 1924; *Ae. (Stegomyia) contiguus* Edwards, 1936; *Ae. (Stg.) simpsoni* (Theobald, 1905); *An. (Cel.) marshallii* (Theobald, 1903); *Cx (Cux) astridianus* De Meillon, 1942; *Cx (Cux) musarum* Edwards, 1932; *Cx (Cux) neavei* Theobald, 1906; *Cx (Cux) univittatus* Theobald, 1901, and *Ur. (Pfc.) henrardi* Edwards, 1935.

Other taxa discussed are: *An. (Cel.) gambiae* Giles, 1902; *An. keybergi* Lips, 1960; *An. (Cel.) durenii millecampsi* Lips, 1960; *An. (Cel.) quadriannulatus* (Theobald, 1911); *An. (Cel.) upemba* Lips, 1960; *Cx (Cux.) neireti* Ventrillon, 1906; *Cx (Cux) pipiens fatigans* Wiedemann, 1828; *Cx (Cux) p. quinquefasciatus* Say, 1823; *Cx (Eum.) mundulus* Grunberg, 1905; *Eretmapodites productus* Edwards, 1941; *Er. oedipodeios marcellei* Adam & Hamon, 1959; *Ingramia* Edwards, 1912; *Ur. (Pfc.) ornata* Theobald, 1910, and *Ur. (Pfc.) o. musarum* Edwards, 1936.

Introduction

Staff of the Diptera Section of the Department of Entomology at the British Museum (Natural History), in collaboration with other appropriate specialists around the world, are currently completing the compilation of an up-to-date catalogue of the Diptera occurring in the Ethiopian faunal region (i.e. sub-Saharan Africa, southern Arabia and peri-African oceanic islands including Madagascar and Mauritius). Publication of this major work is planned for 1977. It is intended to complement recent catalogues covering the Oriental Region (Delfinado & Hardy, 1973 and in press) and both parts of the New World (Stone et al, 1965; Papavero et al, 197-). In the chapter on Culicidae of the Ethiopian Region, it has been found necessary, or in some cases at least desirable, to introduce changes from the entries given in the first edition of "A Synoptic Catalog of the Mosquitoes of the World" (Stone et al, 1959) and its supplements (Stone, 1961; 1962; 1967; 1970). These notes are intended to explain and justify the various taxonomic and nomenclatural steps taken. While most cases are of trivial concern, or are unquestionably required by the modern Rules of Zoological Nomenclature, some of these changes may not coincide with the highly evolved opinions or the unpublished findings of other systematists. By publishing these preliminary notes well before the full Catalogue of Ethiopian Diptera goes to press, it is hoped to elicit constructive discussion about the changes proposed, so that further alterations can be made if necessary. As a result, the ultimate text of the forthcoming Catalogue should be as correct, as widely acceptable and thus as useful as possible.

Reasons for the corrections and changes thought to be necessary in presenting an accurate and up-to-date catalogue of African mosquitoes are essentially of four kinds. Firstly, despite the remarkably high standards achieved by Stone, Knight and Starcke in the World Catalog and supplements, some errors and omissions remained and are rectified here. Straightforward minor

corrections of spelling or pagination are not mentioned; they are being brought directly to the attention of those concerned with production of the second edition (Knight and Stone, in press). Secondly, nomenclatural changes required by the revised edition of the International Code of Zoological Nomenclature (1964) were not all implemented in supplements to the World Mosquito Catalog. Thirdly, some involved arguments concerning priority, availability and applicability of names have been reinterpreted. Finally, and most importantly, in a few cases of doubtful taxonomy it has proved beneficial to examine the mosquitoes themselves and to formulate a fresh view of the significance of a specimen or the status of a taxon.

The following list explains and summarises these alterations to the prevailing nomenclature. Classification is based on that accepted by Stone et al (1959), but genera and species are arranged here alphabetically. Reclassifications of *Culex* subgenera *Neoculex*, *Maillotia* and *Eumelanomyia* by Sirivanakarn (1971) and of *Uranotaenia* subgenera *Pseudoficalbia* and *Uranotaenia* by Peyton (1972) have been followed exactly. Separation of *Mimomyia*, comprising three subgenera, as a genus apart from *Ficalbia*, follows Mattingly (1971). Inclusion of *Coquillettidia* as a subgenus of *Mansonia* reverts to the arrangement originally used by Stone et al (1959), as readopted by Mattingly (1971), and does not concur with the intervening elevation of *Coquillettidia* to separate generic status by Ronderos and Bachman (1963) as incorporated by Stone (1967: 203). Effects of an important revision of southern African *Aedimorphus* by McIntosh (in press), containing descriptions of two new species and other taxonomic steps, have been incorporated in the forthcoming Catalogue and in the statistics discussed at the end of these notes.

Genus *Aedes* Meigen
Subgenus *AEDIMORPHUS* Theobald

africanus Theobald, 1910:263

Edwards (1912:21) transferred *africanus* from *Stenoscutus* to *Ochlerotatus* in which, at that time, it fell as a junior secondary homonym of *africanus* Newstead, 1907:20. He therefore proposed the replacement species-group name *stenoscutus* Edwards, 1912:22, which remains the correct name for this taxon under the Code. A lectotype *africanus* Theobald female is designated below under the name *stenoscutus* Edwards.

Stone et al (1959:195) gave *africanus* and *stenoscutus* as junior synonyms of *neobiannulatus* Theobald, 1910:255, because the female syntypes were indistinguishable. In doing this they failed to follow Edwards' (1941:174) removal of *neobiannulatus* to synonymy with *tarsalis* Newstead, 1907:18, on the more reliable features of male terminalia. So that the forthcoming Catalogue can revert to Edwards' interpretation, which is taxonomically to be preferred, a lectotype male of *neobiannulatus* is designated accordingly below.

boneti Gil Collado, 1936:323
 spp. *kumbae* Chwatt, 1948:184

The type-locality of this subspecies at Kumba is clearly in Cameroun, not Nigeria as listed by Stone et al (1959:191) in the World Catalog.

capensis Edwards 1924:162

Although Edwards cited the type-locality of this species as Oudebosch, Caledon Division, Cape Province, South Africa, the type-locality was given as being in Ovamboland by Stone et al (1959:191) in the World Catalog. The error was significant because it wrongly added Namibia to the alleged range of the species.

congolensis Edwards, 1927:351

Edwards (1941:179) could not distinguish the three female syntypes of this species from the two syntype females of *africanus* Theobald (1910:263) or the single syntype female of *neobiannulata* Theobald (1910:255). At the same time he synonymised *neobiannulata* (which has been based partly on the holotype male of *biannulata* Theobald, 1907:263) with *tarsalis* Newstead (1907:18) on terminalic features of the syntype males. Re-examination of these and additional specimens in the BM(NH) has confirmed the absence of any noticeable differentiation of the females. While it is not impossible that a reliable means might yet be found for separating females of this species group, the lack of any syntype *africanus* males makes it necessary to treat the names *congolensis* and *africanus* as synonymous for the time being. Since *africanus* has been replaced by the name *stenoscutus* Edwards, 1912:22, as explained above, *congolensis* will be listed under *stenoscutus* in the forthcoming Catalogue. The single syntype *congolensis* male (data: "Belgian Congo./Stanleyville./Dr. Mouchet./B.M. 1927-226.") now in the BM(NH) collection has now been marked as lectotype and so stands also as the reference male for *stenoscutus*. The essential point to clarify is that only two species, *stenoscutus* and *tarsalis*, are recognized as represented by the five names in question, i.e. *africanus* (q.v.) [= *stenoscutus*], *biannulata* [= *tarsalis*], *congolensis* [= *stenoscutus*], *neobiannulatus* (q.v.) [= *tarsalis*] and *stenoscutus* (q.v.) itself. These names were wrongly listed under three separate species, *congolensis*, *neobiannulatus* (with *stenoscutus* as junior synonym) and *tarsalis* (with *africanus* and *biannulata* as junior synonyms), by Stone et al (1959) in the World Catalog of Culicidae.

cumminsi Theobald, 1903:214
 form *mediopunctatus* Theobald, 1910:304. Stat.n.

Because they found small numbers of ssp. *mediopunctatus* and ssp. *holocinctus* Edwards, 1941:193, together with a majority of *cumminsi* s. str. at Bwamba, Uganda, Haddow et al (1951:224) suggested that both nominal subspecies should be reduced to varietal rank. However, *holocinctus* has since been elevated to full specific status by Ovazza et al (1956:161). It seems worthwhile,

therefore, to enter *mediopunctatus* in the forthcoming Catalogue as an infra-specific form, rather than leaving it sunk in the synonymy of *cumminsii* as was done in the World Catalog by Stone et al (1959:191). By maintaining the currency of this name for the form having small median basal white spots on abdominal tergites the attention of geneticists and systematists may be drawn to deciding its true status. McIntosh (in press) also views the relationship of *cumminsii* to *mediopunctatus* as in need of further study, and points out that the latter only is present in southern Africa. Elsewhere, both forms are widely sympatric through most of tropical Africa.

The holotype female in the BM(NH) is labelled "Culicada/mediopunctata/n.sp./ (Type)♀. F.V.T./20.3.09" in Theobald's writing, and "C. in bush/5pm//Obuasi,/Ashanti,/W.Africa./3.x.1907./Dr. W. M. Graham./1909-271". As the first reference male for this species, the BM(NH) has the holotype of the junior synonym *fuscopalpalis* Theobald, 1910:307; it is labelled "Culicada/fuscopalp/-alis/n.sp./Type ♂. F.V.T./30.3.09" in Theobald's writing, and "C. in bush/10am//Obuasi,/Ashanti,/W.Africa./2.x.1907./Dr. W. M. Graham/1909-271."

hirsutus Theobald, 1901:392

ssp. *adenensis* Edwards, 1941:198. Stat.n.

Despite the notorious variability of scaling obtained in this and many other *Aedimorphus* species, Edwards proposed *adenensis* as the name for a variety of *hirsutus* from Aden. The taxon is differentiated by presence of large, median, apical, pale scale patches on the abdominal tergites and yellower tergal pale scaling than in nominotypical *hirsutus* of continental Africa. Now that varietal criteria are more limited, and subspecies more strictly defined, it is appropriate to regard *adenensis* as a subspecies of *hirsutus*, pending sufficient evidence for the true rank of this taxon to be ascertained.

Type-material in the BM(NH) consists of 1♂ and 8♀♀ marked "Taken at light" and "B. M. Exp. to/S. W. Arabia/H. Scott & E. B. Britton/B.M.1938-246." Mattingly and Knight (1956:101) and Mattingly (1956:39) corrected Edwards' (1941:198) locality data for these, the only known specimens. Mattingly (1956:39) also designated a female (data: "W. Aden Prot./Jebel Jihaf./ca.7,100 ft./x. 1937//40") as holotype, a male (data: "W. Aden Prot./Dhala./4,800 ft./14.ix.1937//24") as allotype and marked the remaining females (one from Jebel Jihaf, the other from Dhala) as paratypes.

neobiannulata Theobald, 1910:255

When proposed in the combination *Reedomyia neobiannulata* this taxon was based on a male from Sierra Leone, which Edwards (1941:174) later identified as *tarsalis* Newstead, 1907:18, together with a syntype female from Accra which Edwards (1941:179) tentatively ascribed to *congolensis* Edwards, 1927:351 [= *stenoscutus* Edwards, 1912:22]. No lectotype of *neobiannulata* has been designated until now. The male syntype was described previously as *R. bianulata* Theobald, 1907:263. Because the male terminalia provide the firmest

features for dealing with this taxon, *neobiannulata* is best treated as a junior objective synonym of *biannulata*, which itself is a junior subjective synonym of *tarsalis* Newstead, 1907:18. This taxonomic and nomenclatural interpretation will be applied in the forthcoming Catalogue, although Theobald's original descriptive emphasis on the female caused Stone et al (1959) to maintain recognition of *neobiannulata* for purposes of the World Catalog. Theobald's declared reason for omitting much about the male was that he had already described it under the earlier name! Should one have preferred to designate the female syntype of *neobiannulata* as lectotype, it would then fall in synonymy with *stenoscutus* due to our present incapacity to distinguish between the females of members of this confusing group.

To prevent further instability I am now marking the male holotype of *biannulata* as being also the lectotype of *neobiannulata*. Data labels on this male are in Theobald's handwriting and read: "2//Sierra Leone/Major Smith//Reedomyia/biannulata/Type.F.V.T." The terminalia are on a separate slide. A paratype male and female of *biannulata* are also in the BM(NH) collection and bear labels: "Sierra Leone,/W.Africa./12.VIII.1904./Major F. Smith.//"Bred fr. larva fr. Nicol Brook"/-note by donor." The former label is printed; the latter written by Major Austen. Another male paratype is labelled "Nichol Brook,/Sierra Leone,/Major Smith" by a different hand. Collection data for the female paralectotype of *neobiannulata* were given by Theobald (1910:255).

rickenbachi Hamon & Adam, 1959:151
hamoni Mattingly, 1963:166. Syn.n.

In a letter to Dr. Mattingly, Dr. Hamon (18.viii.63) pointed out that *hamoni* appears to be a junior synonym of *rickenbachi*. After the two initial records, from Nigeria and Ivory Coast respectively, the species has not been reported again.

In preparation for the forthcoming Catalogue, synonymy of *hamoni* with *rickenbachi* is published formally here, on the basis of their obviously similar descriptions and as agreed by both original authors. It has not been considered necessary to compare the actual male holotypes.

stenoscutus Edwards, 1912:22. Stat. rev.

Edwards (1941:178) decided that his 3♂ and 3♀ cotypes of *congolensis* (q.v.) were probably conspecific with *africanus* Theobald, 1910:263, which he had renamed *stenoscutus* Edwards, 1912:22, and had simultaneously placed as a variety of *minutus* Theobald, 1901b:319. When publishing this synonymy, he upheld the junior name *congolensis* on the grounds that *stenoscutus* was unavailable because it had been proposed only as a variety. He thus confused his act of renaming with his effectively secondary decision to downgrade the taxon. In any case, the availability of a varietal name from 1912 should not have been denied in 1941; even the modern Rules (Article 11b) stress that unavailability depends upon a name being established with infrasubspecific rank.

Edwards' paper in 1912 gave no indication that he considered varieties and subspecies as different entities, still less that he regarded the former as infrasubspecific. Although Stone et al (1959) followed Edwards (1941) in using the name *congolensis*, the forthcoming Catalogue will give *stenoscutus* as the priority name for the species concerned. Only one of the pair of syntype *africanus* (= *stenoscutus*) females is now present in the BM(NH). It bears a printed label with date "Obuasi, /Ashanti, /W. Africa. /2.x.1907. /Dr. W. M. Graham. /1909-271." and another, written by Theobald, saying "Stenoscutus /africanus. /n.sp. /Type.♀. F.V.T. /29.7.09.". I have now marked this specimen as lectotype.

vexans Meigen, 1830:241
ssp. *arabiensis* Patton, 1905:633. Stat.n.

That *vexans* occur in the Ethiopian Region was predicted by Edwards (1921:323) and first actually reported by Muspratt (1955:169). Both workers failed to appreciate that specimens had been described already as *arabiensis* Patton from Aden and as *sudanensis* Theobald, 1911b:154, from Sudan. The latter was sunk under the former by Edwards (1941:195), who saw their resemblance to *vexans* but also noted some differences. Material from Aden, Somalia, Sudan and Mauritania was later compared with *vexans* from Europe, America, Asia and the Pacific by Hamon et al (1966), who concluded that none of the differences was taxonomically significant. Having not seen the types of either *arabiensis* or *sudanensis*, the former having been lost, Hamon et al (1966:373) formally synonymised both with *vexans* s. str.

When revising the subgenus *Aedimorphus* in southeast Asia, Reinert (1973) recognised *vexans nipponii* Theobald, 1907:337, as a subspecies from China, Korea and Japan, and concluded that the type-form, *vexans vexans*, occupied the entire remaining world-wide distribution of the species. As noted by both Edwards (1941:195) and Muspratt (1955:169), however, adult *vexans* from Africa and Arabia differ from the nominotypical form by having broader pale tergal bands, shorter male palpi and a much narrower pale posterior stripe on the mid tibia. The combination of these features is sufficient to warrant recognition of a subspecies, for which the name *arabiensis* Patton has priority. As topotypic *arabiensis* material, the BM(NH) has a male and 2 females labelled "Aden. /vi.1914. /K.Chand. /Capt. P. J. Barraud. /1921-166". Single male and female syntypes of the junior synonym *sudanensis* Theobald are also in the BM(NH), on permanent loan from the Liverpool School of Tropical Medicine, and I have now marked the male as lectotype. Its data, in Theobald's hand, are "10.7.09 // *Culex sudanensis* Theob." without mention of any locality. The type-locality was published simply as Sudan (coll.H.H.King). Terminalia of the lectotype male seem to be lost, although they may come to light in the Liverpool collection; a drawing and two photographs of them were published by Theobald (1911b:156 and plate IX.5 & 6). The name *arabiensis* is formally given subspecific status here in readiness for the forthcoming Catalogue. Distribution of *vexans arabiensis* includes Aden, Gambia, Mauritania, Nigeria, Saudi Arabia, Somalia, South Africa (Transvaal), Sudan and the unproven records of Li and Wu (1933:105) from Pemba and Mauritius.

Subgenus *PSEUDARMIGERES* Stone and Knight

argenteoventralis Theobald, 1910:588
 ssp. *dunni* Evans, 1928:39. Stat.n.

The range of *argenteoventralis* extends through much of West Africa and the Congo basin. Specimens from Lagos, lacking pale scales anteriorly on the scutum, were described as var. *dunni* by Evans (1928:39), but wrongly attributed by her to the similar species *albomarginatus* Newstead, 1907:16. The variety was transferred to *argenteoventralis* by Edwards (1930:297) and has continued to be ranked at that level. Whereas var. *dunni* has not been reported from northern parts of the species range, it is the only form known from the forested zone extending southwards and eastwards from the level of Ibadan. While the relative status of *argenteoventralis* and *dunni* has not been adequately resolved, it seems most satisfactory to treat them as sister subspecies.

The male and female syntypes are both in the BM(NH) on permanent loan from the Liverpool School of Tropical Medicine. They bear data "Aedes (Armigeres)/albomarginata [var./dunni] Evans/Larvae from Bamboo/Lagos 1927/Major L.H.Dunn."; bracketed words being omitted, apparently as an oversight, from the male's label. I have now designated the male as lectotype of ssp. *dunni*, although it is in poor condition, having lost the head and most appendages. Three separate slides with the code B/549 bearing terminalia and associated pelts of larva and pupa presumably pertain to the lectotype male but their labelling is very confused. The remaining 7♂♂ and 4♀♀ paratypes mentioned by Evans appear to be lost.

Subgenus *STEGOMYIA* Theobald

contiguus Edwards, 1936:55

According to Ovazza et al (1956), this southern African species occurs also in Ethiopia. Further material is now available (coll. White) to confirm this important record which was omitted from the World Catalog.

simpsoni Theobald, 1905a:224

Being restricted to continental Africa, south of the Sahara, this species does not occur throughout the Ethiopian Region, as indicated in the World Catalog. It is present in Zanzibar and Pemba, but has not been found any further from the mainland.

Genus *Anopheles* Meigen
Subgenus *CELLIA* Theobald

arabiensis Patton, 1905:625

Among the names long regarded as synonyms of *gambiae* Giles, 1902:511, *arabiensis* is the only one certainly applicable to species B of the modern *gambiae* complex (Davidson et al, 1967; White, 1974). Before general use of the name *gambiae* for what is now recognised as a group of six sibling species was stabilised by the work of Edwards (1932:55), *arabiensis* and *gambiae* had both been treated as synonyms of *costalis* Loew, 1866:55, as misapplied by Giles, 1900:151, and authors. Topotypic *arabiensis* specimens were redescribed as *costalis* by Christophers and Chand (1915:192).

For its time, Patton's description of *arabiensis* was very thorough, being based on a year's field research in the Aden Hinterland. He gave illustrations and descriptions of the egg, larva and both sexes of adults, accompanied by a distribution map and an account of *arabiensis* as "the common anopheles of the district and... the only certain malaria transmitter". His paper also contains good descriptions of four other Aden anophelines: *dthali*, *tibani* [=pretoriensis Theobald, 1903:99], *jehafi* [=cinereus Theobald, 1901b: 161] and *azriki* [=turk-hudi Liston, 1901:441]; and one culicine: *Culex arabiensis* [=Aedes vexans (Meigen, 1830:241)]; and records the additional presence of *Stegomyia sugens* Wiedemann, 1828:545 [misidentification of *Aedes vittatus* (Bigot, 1861:227)], *Taenio-rhynchus tenax* Theobald, 1901c: 198 [=Culex bitaeniorhynchus Giles, 1901:607] and *Culex concolor* Robineau-Desvoidy, 1827:405 [misidentification of *tigripes* Grandpré & Charmoy, 1901:6].

Patton did not mention or mark types of his new species, although his descriptions were nicely based on reared series. Lectotypes of *tibani* and *jehafi* were designated by Mattingly in Mattingly & Knight (1956:95,96). Other Patton specimens that have survived in good condition in the British Museum (Natural History) are of *vittatus* and *tigripes*.

Exhaustive searches of the collections in the BM(NH) and the Liverpool School of Tropical Medicine have revealed, in the former, only a single fragmented male specimen of *arabiensis* collected by Patton. These fragments were apparently misidentified by Theobald, since the slide bearing them is labelled "Nyssorhynchus/stephensi./Aden/Hinterland/Capt.Patton" in Theobald's handwriting. All that remains of the specimen is the pair of forelegs, one broken mid-leg, one buckled and torn wing and part of the thorax. From the wing pattern and the leg spotting and morphology it seems reasonably certain that this incomplete specimen is *arabiensis*. The wing is too extensively dark for *stephensi* Liston, 1901:441, and Theobald's handwritten identification of it as this species was uncharacteristically not published. In any case, *stephensi* is otherwise unknown from the Aden Hinterland. Because the wing lacks a second pale interruption of the second main dark spot on vein 2 it is unlikely to be *pretoriensis*, the only other locally occurring species with spotted legs.

It is puzzling and frustrating that better *arabiensis* material from Patton has not been kept, especially since Patton (1905:627) himself mentions having sent specimens to Theobald, who worked in London and Wye, and others subsequently to Stephens in Liverpool. When describing *arabiensis*, Patton disagreed with Theobald's identification of the material sent to him, which Theobald determined first as *wellcomei* Theobald, 1904:64, (*in lit.* to Patton), and afterwards as *pharoensis* Theobald, 1901b: 169 (Theobald, 1904:70). The relevant entry in Theobald's monograph, issued 5 years later, complicates the matter still further. After repeating Patton's description of *arabiensis* verbatim, Theobald (1910:82) asserts that "it is certainly not an *Anopheles*". His desire to exclude it can be attributed simply to his exceedingly narrow concept of this genus at that time. However, he continues: "A much damaged specimen said to be this species was sent me by Patton (all ♀'s), and it could not be separated from *A. wellcomei*, Theobald. It was examined with that species and I could detect no difference; but according to Patton (p. 267), they were also compared by Stephens with the type of *A. wellcomei*, which I later sent to the British Museum and he informed Mr. Patton that they were distinct". Theobald's comments raise several questions. How many specimens purporting to be *arabiensis* did Theobald receive from Patton? Were all the syntypes of *wellcomei* in Theobald's private custody when Stephens was alleged by Patton to have seen "the type" in the British Museum collection? (The specimens now bear no record as to the date of their presentation.) Did Stephens see the actual specimen(s) on which Theobald's contrary opinion was based? Evidently, personal differences of opinion were exacerbated by the fact that Theobald used a 'much damaged specimen' for his principal determination, whereas Stephens saw additional and presumably more reliable material conforming with the description of *arabiensis* and not with the types of *wellcomei*. There are certainly no confirmed records of *wellcomei* from Arabia. Perhaps the existing slide-mounted male *arabiensis* fragments from Patton, albeit wrongly labelled as *stephensi*, constitute the same 'much damaged specimen' referred to by Theobald, despite his muddled contraindication that the material was female.

Because Patton (1905:627) made the point that specimens of *arabiensis* had been received by both Theobald and Stephens before the type-description was written, one is able to conclude that the surviving slide, and any other such material that come to light, could not have been used by Patton when he described the species. Thus the remaining partial specimen is not a syntype. As it seems beyond doubt that Patton did not mark types for any of his species, the way is open for erection of a neotype. Specimens from Makzan near Shuqra in what is now Southern Yemen, as evaluated in detail by Coluzzi (1964) under the name *gambiae* species B, would be appropriate.

The case for resurrecting the name *arabiensis* from synonymy with *gambiae* s. str. is quite simple: species B is the only member of the *gambiae* complex known to occur in southern Arabia, it having been identified by Davidson (1966) from three localities: Shugayri in Saudi Arabia, Machzara in Yemen and Makzan in the former West Aden Protectorate. Whilst the possibility of other sibling species being found in the vicinity of Aden cannot be entirely ruled out (the most probable would be the zoophilic species C which is widespread beyond the

Bab el Mandeb Straits in the Ethiopian Highlands), the evidence indicates that species B predominates in the type-locality and fulfills the overall diagnosis of *arabiensis*. This name has already been reinvoked for species B by Brown & Pal (1971:123) and by Wright, Fritz & Haworth (1972:82) and will be used accordingly in the forthcoming Ethiopian Catalogue. Reasons for adopting different available names for certain other members of the *gambiae* complex are itemised below and will be discussed in a full revision of the group to be published elsewhere. Suffice it to be said here, in defense of *arabiensis*, that no other name is available for any population of the *gambiae* complex occurring where species B is known to be endemic.

gambiae Giles, 1902:511

Six sibling species are now recognised in the *gambiae* complex (Davidson et al, 1967; White, 1974a). Two breed in saltwater along West and East African coasts; for these the respective names *melas* (Theobald, 1903:76) and *merus* Dönitz, 1902:77, have stabilised since the work of Coluzzi (1964). The remaining four species are morphologically indistinguishable by present methods and have continued to be known as *gambiae* sensu lato. The more precise but non-Linnaean terminology of species A and B was introduced by Davidson and Jackson (1962) and Davidson (1964) for the first pair of species to be distinguished; species C was discovered by Paterson et al (1963) and by Davidson (1964), while species D has been added nearly a decade later by Davidson and White (1972). As time passes it becomes increasingly less likely that other sibling species of this complex will be found.

Resurrection from synonymy with *gambiae* of appropriate available names for these species is now overdue. Priority names for species B and C are discussed above and below. A description and a completely new name are required for species D, which is known only from the Uganda/Zaire border and has had no names previously applied to it. This name should be published elsewhere in time for its inclusion in the forthcoming Catalogue. It is omitted here for reasons of precedence. Retention of the name *gambiae* sensu stricto for species A is justified by the finding of this member of the complex at the *gambiae* type-locality (Anon., 1973:1) which, although published by Giles (1902:512) as 'The Gambia Valley', is shown in Theobald's correspondence to have been on MacCarthy Island in the River Gambia. Further discussion of the complex nomenclatural background will be given in the taxonomic revision under preparation. A long series of topotypic specimens has recently been added to the BM(NH) collection by courtesy of Drs. M.T.Gillies and G. Davidson who, respectively, obtained and identified them.

dureni Edwards, 1938:123
var. *keybergi* Lips, 1960a:49

According to Lips (1960a), this name and the name *millecampsi* (q.v.) were both used by Vincke to label one or more specimens in the collection of the Mission Anti-Paludique at Elizabethville in Zaire. There is no reason to doubt that all the specimens came from that part of Katanga Province; Lips implied that at least some were collected in 1943 at Keyberg, near Elizabethville.

Other examples of such mosquitoes had been sent by Vincke to De Meillon, who identified and described them as *dureni* Edwards, 1938:123 (vide De Meillon, 1947b:65), a species that had been originally described from Kinshasa Province. After having shown him the additional specimens labelled with the manuscript names *keybergi* and *millecampsii*, Lips (1960a: 49) reported DeMeillon's authoritative view that all the material represented no more than local Katangan variation of *dureni*. However, in honour of Mr. Millecamps who, with Dr. d'Ursel, is credited with having discovered these mosquitoes in Katanga, Lips (1960a:52) chose to try to propose the name *millecampsii* for the Katangan variety. Evidently, he considered the name *keybergi* to be an alternative that was not to be preferred (Lips, 1960a:49:53). The BM(NH) collection has 19 adult *millecampsii* specimens collected by Vincke, one bearing data "Keyberg/ON 4.8.44//A. millecampsii". All the others are labelled as being from Elizabethville. No specimens actually labelled *keybergi* are known to have been kept, unless they remain at Lubumbashi (Elizabethville).

Because Lips had neglected to provide any formal description, Stone (1963: 136) listed both *keybergi* and *millecampsii* as nomina nuda. Gillies and De Meillon (1968:73) later studied all available material of the Katangan population and noted small but consistent morphological differences from typical Kinshasan *dureni* s. str. They also regarded Lips' (1960a) publication as a satisfactory validation of Vincke's manuscript name *millecampsii*, on the basis of his full citation of papers by Vincke and coworkers in which some striking behavioural, ecological and vectorial contrasts between wild *dureni* s. str. and the Katangan population called var. *millecampsii* had been described. As noted by Stone (1970:140), *millecampsii* Lips was elevated to subspecific status by Gillies and De Meillon (1968:75), who commented that future research might well demonstrate the specific distinctness of *millecampsii* from *dureni*. Gillies and De Meillon overlooked the name *keybergi*, which will be included in the forthcoming Catalogue as a nomen nudum placed under *dureni millecampsii*. *Keybergi* is also invalid for the additional reason that it was first published in synonymy with *millecampsii*.

ssp. *millecampsii* Lips, 1960a:52

Preliminary discussion of this taxon is included under var. *keybergi* Lips, 1960a: 49 (q.v.). A lectotype female of *millecampsii* was designated by Gillies and De Meillon (1968:75), being one of a series of BM(NH) specimens bearing printed labels "Belgian Congo/Elizabethville/Dr. I. Vincke./B.M. 1947-57." Original data also on the lectotype are "E'ville/OG 2.xi.44//millecampsii" handwritten apparently by Vincke. I have now placed an official 'lectotype' label on this specimen in addition to an erroneous 'neotype' label handwritten by Gillies.

Finally, it may be commented that to credit Lips with authorship of *millecampsii* is based on the unconventional acceptance of his citation of previous literature (e.g. Vincke, 1954) in which this taxon was described in purely biological terms. The first morphological definition of *millecampsii* was given by Gillies and De Meillon (1968:75) and they could well be credited as the correct authors. For the sake of stability, however, their acceptance of *millecampsii* Lips will be repeated in the forthcoming Catalogue.

marshallii Theobald, 1903:77

According to Chauvet (1962), *marshallii* is absent from Madagascar. The many records of its occurrence there are all to be referred to *mascarensis* De Meillon, 1947a:116.

quadriannulatus Theobald, 1911a:242

The female holotype of *quadriannulatus* was collected at Onderstepoort, near Pretoria (alt. 4,500 ft) in the Transvaal, South Africa, by Dr. L. H. Gough on 3rd May 1909. His extensive mosquito surveys (Gough, 1910) employed three sampling methods: rearing from larvae, collecting adults from houses and capturing females in horse-baited traps. He left no individual records as to which of his specimens were taken in each of these ways. Labels on the single specimen of *quadriannulatus*, which is now in the BM(NH), were written by Theobald and read "Pyretophorus/quadriannulata/type.♀.F.V.T./Onderstepoort/Dr. Gough". Gough identified this uniquely marked specimen as *ardensis* Theobald, 1905b: 17, and sent it with most of his other material to Theobald, who elected to describe it as new. Although Gough recorded another *ardensis* female as collected on 18th April, 1909, the only further specimen labelled as *ardensis* that Theobald (1911a:241) mentions was one dated 5th May which he identified as *costalis* [=gambiae].

In discussing the importance of *costalis* (i.e. *gambiae*), Gough (1910: 119) wrote that it was "the commonest anopheline at Onderstepoort in March and April" and that he collected 153 specimens, including 19 males, between March and May. But it was left to Christophers (1924:62) and Evans (1927: 23) to realise that the unique *quadriannulatus* female is obviously a form of *gambiae* having abnormally dark palpi and wings. This conclusion has never been challenged.

Seasonal upsurges of *gambiae* s.l. are known to occur infrequently on the highvelds of Transvaal and the Witwatersrand (e.g. Bedford, 1928: 916; De Meillon, 1939:31). Such populations are often more zoophilic and exophilic than is usual for *gambiae* complex populations at lower altitudes (e.g. De Meillon, 1934, 1939). Recent identifications of the different sibling species of the *gambiae* complex have shown that species C is most widespread around the highlands while both species A and B also occur and are associated more closely with malaria (Davidson, Green, Smith & Van Eeden, pers. comms). Rediscovery of *gambiae* s. l. in the type-locality of *quadriannulatus* at Onderstepoort in 1974 by Muspratt (De Meillon & Muspratt, pers. comms) is being avidly pursued with a view to making a specific identification (by hybridisation tests or cytogenetically) in order to resolve the species to which this name applies. Should it transpire that species C is found at Onderstepoort, as can be expected from its surrounding distribution and its biology, use of *quadriannulatus* as the priority name for it will be fully justified. Clarification of this point is the sole remaining factor delaying a definitive revisionary paper on taxonomy and nomenclature of the entire *gambiae* complex. With luck, this paper can be published in time for the newly fixed names to be given added stability by their correct inclusion in the forthcoming Catalogue.

upemba Lips, 1960b:303

This taxon, which was overlooked by Gillies and De Meillon (1968), was based on a damaged female described, but not named, by Mattingly (1955:50). The holotype is not in the BM(NH) as stated by Stone (1970:141). It was returned to the Musée Royale de l'Afrique Noire at Tervuren, Belgium, by Dr. Mattingly immediately after its description.

wellcomei Theobald, 1904:64
 ssp. *ungujae* ssp. n.

The name *ungujae* is proposed here for the distinctive specimen of *wellcomei* described by Gillies (1958:11) as belonging to an indetermined subspecies found in Zanzibar. The epithet derives from Unguja, the Swahili term for Zanzibar.

The holotype female is in the BM(NH) and bears original data "Kibonde/Nzungu//Zanzibar/23.5.56". I have given it an official holotype label and appended the trinomial. According to Gillies and De Meillon (1968:176), no further specimens of *wellcomei* have been collected in Zanzibar or on the adjacent mainland. Apart from its discreet distribution, this subspecies is readily separable from other forms of *wellcomei* by extension of the pale sector wing-spot onto the costa and by the almost completely pale first wing vein (vide Figure 4 in Gillies, 1948:10; Plate 82b in Gillies & De Meillon, 1968:177).

Genus *CULEX* Linnaeus
 Subgenus *CULEX*

astridianus De Meillon, 1942:89

The type-locality of this species at Astrida is in Rwanda, not the Belgian Congo (i.e. Zaire) as given in the World Catalog.

musarum Edwards, 1932b:562

This species was formerly thought to be common and widespread in Ethiopia. However, it is now known that records refer exclusively to *shoae* Hamon & Ovazza, 1954:416, and that Ethiopia should have been deleted from the range of *musarum* as given in the World Catalog.

neavei Theobald, 1906:76

After clarification by Jupp (1971, 1972) that this species is valid, and not a variety of *univittatus* Theobald, 1901c:29, as it was considered by Edwards (1941:308), many records of *univittatus* should be referred to *neavei*. Limits of distribution of this species remain unclear for the present. It occurs in Réunion, presumably in Madagascar and in lowlands throughout much of tropical and southern Africa.

The type-series of three *neavei* females, all collected by Dr. Sheffield Neave in the vicinity of Mongalla in southern Sudan, contains one specimen labelled 'type' by Theobald. I have now marked this as the lectotype; it bears data "166//Lualas/28.1.05//Sudan/Dr. Balfour". Paralectotype female no. 175 has the same data, while the other is labelled "106//Lado/ii 1905".

neireti Ventrillon, 1906a:103, alias *neireti* Blanchard, 1907:188

Ventrillon proposed the name *neireti* correctly as a species of *Culex*. After examining all relevant syntypes from the Museum National d'Histoire Naturelle, Paris, Edwards (1920:136) placed *neireti* Ventrillon as a synonym of *giganteus* Ventrillon, 1906a:100, with the latter having priority by page precedence. The only subsequent report of the species as *C. neireti* Ventrillon seems to have been that by Enderlein (1920:48).

The matter would end there, were it not for the apparent misidentification by Blanchard (1907) of *neireti* as a variety of what is now classified as *Anopheles funestus* Giles, 1900:162. In a list of Madagascan mosquitoes, Blanchard (1907:188) included "*Myzomyia funesta* var *Neireti* = *Culex Neireti* Ventrillon, 1906". He then discussed the involvement of *funesta* var. *neireti* in malaria transmission. It seems very improbable that Blanchard had actually seen Ventrillon's type specimens which are so conspicuously *Culex*, and likely that he was thinking in biological terms of the abundant vector populations of *funestus* s. str. that were then present in much of Madagascar. Evidently, Blanchard was thoroughly confused about the taxonomic identity of *neireti* since, after equating *Culex neireti* with *Myzomyia funestus* var. *neireti*, he cited supporting references which in fact lead to descriptions of *Cellia tananariviensis* Ventrillon, 1906b:198 [= *Anopheles squamosus* Theobald, 1901b:167] and *Myzomyia funesta* s. str. in Blanchard (1905:180). Subsequent authors have failed to realise that there is no such nominal taxon as *neireti* Blanchard, and that Blanchard merely changed the status and generic assignment of the existing and available species-group name *neireti* Ventrillon.

The false idea that *Anopheles funestus* var. *neireti* Blanchard was valid as well as *Culex neireti* Ventrillon became entrenched when both were listed as separate entities in the Genera Insectorum volume on world Culicidae by Edwards (1932a:52,202). For some reason, Edwards (1932a) placed the wrongly accredited *funesta* var. *neireti* Blanchard as a junior synonym of *marshallii* Theobald, 1903:77, rather than listing it under *funestus* itself. The most plausible explanation for this transfer arises from the existence in Madagascar, in addition to *funestus* s. str., of another widespread anopheline later described as *mascarensis* DeMeillon, 1947a:116. Because of strong resemblances, *mascarensis* was customarily misidentified as *marshallii* prior to 1947 (e.g. Edwards, 1920:133; Enderlein, 1920:48). The interpretation Edwards (1932) gave to *neireti* as misapplied by Blanchard (1907:188) may well have been influenced by the fact that some of the so-called *marshallii* (i.e. *mascarensis*) specimens seen by Edwards in 1920 had been collected by Drs. Neiret and Ventrillon in 1904. It is now held that the widely distributed African species *marshallii* is completely absent from Madagascar (Chauvet, 1962; Grjebine, 1966) and that all records of it, including that of Edwards (1920:133) under the synonym *transvaalensis* Carter, 1910:237, therefore apply to *mascarensis*.

When describing *mascarensis*, De Meillon (1947a:116;1947b:77) suggested that *neireti* Blanchard might be the priority name for it, but that lack of specimens had prevented his resolving the point. He thus raised fresh nomenclatural doubts about the status, authorship and availability of *neireti*. These doubts should effectively have been solved when Grjebine and Chauvet (1961) published a strong rejection of *neireti* Blanchard for *mascarensis* on the grounds that (i) no description of *neireti* had been published by Blanchard, (ii) the reference to *neireti* Ventrillon originally cited by Blanchard led to an adequately described *Culex* species (for which they overlooked the extant types), (iii) no type specimens of *neireti* Blanchard had ever been mentioned or seen. They could have added that authorship of *neireti* should never have been attributed to Blanchard in any case! Following this conclusive discussion of the taxonomy and nomenclature, no amendment appeared in supplements to the World Catalog, in which both *neireti* Blanchard and *neireti* Ventrillon had appeared as synonyms of *A. marshallii* and *C. giganteus* respectively (Stone et al, 1959: 48, 248). For purposes of the forthcoming Ethiopian Catalogue, *neireti* Ventrillon will be placed only as a synonym of *giganteus*, while *neireti* of authors will be listed for misidentifications of *funestus* and *mascarensis*.

perexiguus Theobald, 1903:199. Stat. rev.

This species was sunk under *univittatus* Theobald, 1901c:29, by Edwards (1912:32) and remained in synonymy until treated as a form by Mattingly (1954:56) and as a variety by Mattingly and Knight (1956:104). *Perexiguus* is now reinstated to full species rank, on the evidence marshalled by Jupp (1971, 1972). From the pair of *perexiguus* syntypes in the BM(NH), both bearing data "Sidon./ain ed dill/13.6.01//117.Palestine./Dr. J. Cropper//Culex/perexiguus/(Type). Theobald", I hereby designate the male as lectotype and the female as paralectotype.

Mattingly (1954) and Jupp (1971, 1972) showed that *perexiguus* has a different geographical distribution from that of *univittatus* (q.v.). On the other hand, it is widely sympatric with *neavei* Theobald, 1906:76, from which it can only be separated by the length of the male aedeagal spine (see key under *univittatus*). The range of *perexiguus* extends from the Middle East across the Sudan savanna belt of West Africa and eastwards to northwestern India. Studies of *perexiguus* independantly of other members of the *univittatus* group should help to distinguish their separate roles as vectors of arboviruses (Jupp, 1972; McIntosh, 1975).

pipiens Linnaeus, 1758:602
ssp. *fatigans* Wiedemann, 1828:10

Applied entomologists of the Old World are habituated to the name *fatigans* for the familiar domestic subspecies of *pipiens* known as *quinquefasciatus* Say, 1823:10, in the New World. Representativeness of the *fatigans* syntypes from 'Ostindien' (Indonesia), which are kept in the Naturhistorisches

Museum in Vienna, Austria, is unquestioned. Prof. J. N. Belkin has recently confirmed (*in lit.* to Mattingly, 9.ix.66; 8.xi.66) the existence of male and female *fatigans* syntypes. It is most unsatisfactory, therefore that doubts about the interpretation and applicability of *quinquefasciatus* (q.v.) were not fully resolved before this other name was given priority over *fatigans* in the World Catalog of Culicidae (Stone et al, 1959:254). Whatever the truth of the issue, the cosmopolitan taxon concerned has since been listed as *quinquefasciatus* in Catalogues of Nearctic (Stone et al, 1965) and Oriental (Delfinado & Hardy, 1973) Diptera and in recent revisions of Oriental *Culex* by Belkin (1962), Delfinado (1966) Bram (1967) and Sirivanakarn (*in press*). All but the first of these publications include *fatigans* as a junior synonym. Thus a considerable, if somewhat contrived, stability has accrued to the name *quinquefasciatus* as having priority and currency in both New and Old Worlds. Under these circumstances, the interests of increasing worldwide stability seem to require that *fatigans* is placed subordinate to *quinquefasciatus* in the forthcoming Catalogue, although hitherto the latter name has not been applied in the Ethiopian Region except by passing workers from the New World.

ssp. *quinquefasciatus* Say 1823:10

Stone (1956:342) presented a case for priority of *quinquefasciatus* over *fatigans* Wiedemann, 1828:10, as the name for the subspecies of *pipiens* known in North America as 'the southern house mosquito'. His pragmatic argument was that, since the types of both were, at that time, held to be lost and since the two names have been wilfully and consistently applied to the same taxon since the early 20th Century, the correct name upon which to standardize is that having five years seniority. He also discussed how shortcomings of both type-descriptions give ample grounds for dissent among taxonomists.

Most subsequent taxonomic publications of any great relevance, notably two extensive revisions of Oriental *Culex* (Bram, 1967; Sirivanakarn, *in press*) and three faunal Catalogues (Stone et al, 1959; 1965; Delfinado & Hardy, 1973), together with several regional reviews (e.g. Belkin, 1962; Delfinado, 1966), have followed Stone's acceptance of the *de facto* seniority of *quinquefasciatus* over *fatigans*. This has strongly consolidated the case in favour of *quinquefasciatus*. It cannot be denied, however, that this name is scarcely familiar to field entomologists and public health workers throughout the Old World. Even Forattini (1965:46) has eschewed *quinquefasciatus* in favour of *fatigans* for use in the Neotropical region.

Some specimens sent by Say to Wiedemann as *quinquefasciatus* from New Orleans (Wiedemann, 1828:12) are now known to have survived in poor condition in the Vienna Museum (Belkin, 1968:47). Unfortunately for Stone's argument in favour of *quinquefasciatus*, the material supplied by Say as this species turns out to be represented at the present time by three females of the taxon known as *Anopheles atropos* Dyar & Knab, 1906:160 (Belkin, 1968:10). This explains why Wiedemann saw fit to describe them in *Anopheles* as *ferruginosus* Wiedemann, 1828:12. Belkin (1968:9) designated one as lectotype of *ferruginosus*. Had these specimens been in agreement with our concept of *pipiens quinquefasciatus*, as it was claimed they were by Coquillett (1906:7) on Howard's authority, there would be an end to the debate. As things stand, the status of the *ferruginosus* specimens as syntypes of *quinquefasciatus* depends

strictly upon interpretation of a cryptic footnote by Wiedemann (1828:12) stating that they were 'originals' of *quinquefasciatus* from Say. It simplifies the case to consider that he meant merely that Say had identified, or rather misidentified, them and not that they were actual syntypes. Wiedemann clearly realised their difference from Say's description of *quinquefasciatus* because he took the pains to describe and name them anew. He was certainly not in the habit of renaming other people's species. It may be more than chance that *pungens* Wiedemann, 1828:9, an accepted synonym of *quinquefasciatus* (and one having page precedence over *fatigans*!), is described earlier in the same paper from New Orleans specimens that Say must have supplied. The whole confusion could very well have originated if Say's labels had been inadvertently interchanged before Wiedemann wrote-up. It is also feasible, but equally impossible to prove, that Say described a mixture of *quinquefasciatus* and *atropos*, but sent only specimens of the latter to Wiedemann. Both species undoubtedly occur in the type-locality of 'Mississippi' (restricted to New Orleans by Belkin et al, 1966:5) and are as troublesome as Say said.

An expedient solution to this nomenclatural impasse would be for the International Commission on Zoological Nomenclature to set aside Wiedemann's type-specimens of *ferruginosus* for purposes of priority in relation to the name *quinquefasciatus*. A more suitable neotype could then safely be erected. If it is universally accepted that Wiedemann's claim to having 'original' specimens of Say's does not prove that he had syntypes, then the problem is solved without recourse to the Commission. In the mean time, and subject to the outcome of any debate that this note is able to stimulate, it is tentatively intended that the case in favour of *quinquefasciatus* be strengthened by listing it with priority over *fatigans* in the forthcoming Catalogue covering the Ethiopian Region.

pruina Theobald, 1901a:8.
form *eschirasi* Galliard, 1931:227. Stat. rev.

This well known larval variety was given subspecific status by Stone et al (1959) in the World Catalog. That such larvae often occur together with normal larvae and a range of intermediate forms, as first reported by Mattingly (1947:251) and by Mattingly in Hopkins (1952:337), indicates that *eschirasi* is neither a subspecies nor a separate species. It will accordingly be listed simply as a variety (= form in the terminology to be employed) in the forthcoming Catalogue, this being the rank in which it was originally proposed, as accepted by both Edwards (1941:350) and Hopkins (1952:337).

univittatus Theobald, 1901c:29

After removal by Jupp (1971, 1972) of *neavei* Theobald, 1906:76, and *perexiguus* Theobald, 1903:199, from confusion with this species, its confirmed distribution is restricted to Dahomey, Ethiopia, Kenya, Niger, Rhodesia, South Africa, Upper Volta and Madagascar. It tends to occupy highlands whereas *neavei* predominantly occupies lowlands. On the whole it is

more southerly than *perexiguus*, but records from Yemen and Spain (Mattingly, 1954:57; Mattingly & Knight, 1956:104) are thought to apply to *univittatus* s. str.

Theobald (1901c:31) published that the type-locality of *univittatus* was 'Durban, Salisbury and Singapore'. Edwards (1941:306) cited only Salisbury, whereas Stone et al (1959:263) gave both Durban and Salisbury in combination. All of the definite *univittatus* syntypes (5♂♂, 7♀♀) now in the BM(NH) are from Salisbury, Rhodesia. Among them, one male and one female were each marked 'Type' by Theobald himself. However, Edwards (1941) distinguished two species in the *univittatus* type-series, so described Theobald's *univittatus* 'type' male as the holotype of *terzii* Edwards, 1941:312. Two female syntypes of *univittatus* were also identified as *terzii* and became paratypes of it. To fix the name *univittatus* according to usage, I am now marking as lectotype the same female as selected originally by Theobald; it bears data "Salisbury/Mashonaland/G. A. K. Marshall/March 1900". All eleven paralectotypes have similar data, with dates in February-April. The same kind of label is on the female holotype of *Heptaphlebomyia simplex* Theobald, 1903:337, so that, since Edwards (1911:262) correctly sank *simplex* under *univittatus* and relegated *Heptaphlebomyia* (of which it is the type-species) to synonymy with *Culex* s. str., the latter conspecific specimen is probably another paralectotype of *univittatus*.

A *quinquefasciatus* Say, 1823:10, female in the BM(NH) labelled "Singapore/House/30.7.99./P.de Fontaine//4.9.99/Singapore/R. Hanitsch" fits the place, date and sender's name cited by Theobald (1901c:31) when he gave Singapore as one of the *univittatus* type-localities. While it seems almost certain that this specimen is another *univittatus* paralectotype, wrongly included by Theobald, I am refraining from marking it as such in the absence of proof.

Edwards (1911:262) treated *montforti* Ventrillon, 1905:448, from Ankajobé, Madagascar, as another junior synonym of *univittatus*, although Theobald in Ventrillon (1905:450) had approved of *montforti* as a new *Heptaphlebomyia*. As 2♂ and 2♀ syntypes of *montforti* are in the BM(NH), and these are the specimens used for taxonomic investigations by Theobald, Edwards, Mattingly and myself after Ventrillon, I am designating as lectotype the male for which the genitalia appear to have been prepared by Edwards. Data on these four members of the type-series are "Madagascar./Dr. Ventrillon./Recd.Fr./F. V. Theobald./Jan. 1905/? Co-type."

The only other synonym of *univittatus* might be *goughii* Theobald, 1911a:268, because, as Edwards (1912:32; 1913:55) appreciated, both female syntypes of *goughii* are *univittatus* whereas the male syntype is *quinquefasciatus*. For taxonomic expediency, I am now designating the *goughii* male as lectotype (data "M.S.II/28.2.10/115.//Pres. by/F.V.Theobald./1911-27//Culex/goughii n.sp/Type.♂. F.V.T.//Onderstepoort/Dr. Theiler"); *goughii* thus becomes a junior synonym of *quinquefasciatus*. The sole paralectotype *goughii* female now in the BM(NH) (data as for lectotype, but "M.S.3/12.4.10./501") remains under *univittatus*.

With the present unsatisfactory state of our knowledge of the *univittatus* group, the following key, based on the findings of Mattingly (1954) and Jupp (1971, 1972), affords the best means of identifying adults of the three African species. Their immature stages have not been compared.

1. Mid femur with complete anterior pale stripe. *univittatus*
(highlands throughout Ethiopian region, including
southern Arabia and Madagascar; possibly also
north Africa and southern Spain)
Mid femur without complete anterior pale stripe. 2
2. Females. *neavei*
(humid lowlands of tropical and southern Africa,
Madagascar and Réunion)
perexiguus
(dry savanna lowlands of West and central Africa,
through Middle East to northwestern India)
Males. 3
3. Outer division ('spine') of aedeagal plate
longer than width of plate at point of attachment. *neavei*
Outer division ('spine') of aedeagal plate
shorter than width of plate at point of attachment. *perexiguus*

zeltneri Neveu-Lemaire, 1906:251

As suggested on morphological and biological grounds by Edwards (1941: 353) *zeltneri* clearly falls as a synonym of *fatigans* Wiedemann, 1828:10, and will therefore be listed under the priority name *quinquefasciatus* Say, 1823: 10, in the forthcoming Catalogue. The types of this and all five other species proposed in the same paper appear to be lost. Stone et al (1959) treated the similar case of *pygmaeus* Neveu-Lemaire, 1906:256, as a straight synonym of *quinquefasciatus* for purposes of the World Catalog, but for no obvious reason upheld *zeltneri*.

Part of the original account of *zeltneri* translates as follows (Neveu-Lemaire, 1906:254): "This species was collected by Brumpt at Harrar and at Comboltcha near Harrar. 10 ♂ and 5 ♀ were reared from larvae at Harrar in May 1901; 15 ♀ were collected at the same time, in the same locality; a single ♀ was captured 20th April at Comboltcha." While Comboltcha and Harrar (various other transliterations of the Amharic scripts are frequent) are not exactly near to each other, being over 200 miles apart, both towns are infested thoroughly nowadays with *zeltneri* (i.e. *quinquefasciatus*). Specimens from Harrar (coll. White) are in the BM(NH) should a neotype be required.

Subgenus *EUMELANOMYIA* Theobald, 1909:10

mundulus Grünberg, 1905:388

By commenting in the original description that he thought this species closely resembled *nebulosus* Theobald, 1901a:10, Grünberg gave Edwards (1911: 266) the impression that he was unsure of its validity. Without having seen the type-specimen, Edwards (1932a:199) went on to list *mundulus* as a doubtful

synonym of *cinereus* Theobald, 1901c:58, and later "as a possible synonym of *cinereus*, but it is perhaps more likely to be one of the *rima* group" (Edwards, 1941:353). Accordingly, *mundulus* was given validity but listed as of uncertain subgenus in the World Catalog by Stone et al (1959:283).

For purposes of the forthcoming Ethiopian Catalogue, the unique *mundulus* holotype female has been borrowed from the Museum für Naturkunde of the Humboldt University, Berlin, by courtesy of Dr. H. Schumann. It is clearly a member of the *rima* Theobald, 1901b: 11, species group. This places it in subgenus *Eumelanomyia* as revised by Sirivanakarn (1971). Although species of this group cannot usually be distinguished as females, there are enough features of the specimen that differ from all similar species represented in the British Museum (Natural History) to warrant upholding *mundulus* as a recognised species. While the specimen has been generally well preserved, it appears to have been pinned when rather dry, causing the loss of most dorsal thoracic bristles. Other missing parts are both lower mesepimeral setae, the left antenna, the entire right hindleg and terminal tarsal segments of two other legs. Data are: Kamerun/Dr. Zupitser/s.S./1901 and the code number 14258. Taxonomy of the *rima* group has been largely based on features of the male terminalia in recent years. This is partly due to the short series available for most of the dozen species known. It may well prove possible to identify females, as well as males, from their combination of scale and integumental patterns, when their limits of variation have been worked out. Under the circumstances it is considered of no advantage to redescribe *mundulus* from the same female at present. Grünberg's original description of *mundulus* is quite adequate until new standards are developed for females of the *rima* species group as a whole.

Subgenus MAILLOTIA Theobald, 1907:274

salisburyensis Theobald, 1901c:112
ssp. *capensis* De Meillon, 1935:354. Stat. n.
naudeanus Muspratt, 1961:97. Syn. n.

The name *capensis* was proposed for a superficially described dark variety of *salisburyensis* found in lowlands at the Cape. In the original description, De Meillon went so far as to imply that *capensis* would have been ranked higher if males had been captured and their terminalia examined. Despite the loss of all *capensis* type-material (Muspratt, personal communication), the brief description and locality record together remain sufficient to make *capensis* an available name under the Rules and thus to give it seniority over *naudeanus*, as proposed for a subspecies of *salisburyensis* from Cape Province.

When describing *naudeanus*, Muspratt (1961:97) dismissed the availability of the name *capensis* because of the lack of type-material. He might also have wanted to allow for it being a species distinct from *salisburyensis*, since its identity cannot be completely resolved until further topotypic material is obtained. However, the published description of *capensis* quite supports its inclusion as a form of *salisburyensis*.

Stone (1963:133) added *ssp. naudeanus* to the World Catalog while leaving *var. capensis* in synonymy with *salisburyensis* s. str. (Stone et al, 1959:229). Pending clarification of the true biological situation, *capensis* is resurrected here for inclusion in the forthcoming Catalogue as being the priority name for the subspecies of *salisburyensis* that was subsequently better described under the name *naudeanus*.

ssp. coursi Doucet, 1949:144. Stat. n.

This taxon was described from Madagascar as a full species and included at that level in the World Catalog by Stone et al (1959:226). Both adult sexes are unknown. Although I have not been able to see the type-series of larvae, which are kept in Madagascar, their published description differs insufficiently from that of *salisburyensis* type-form to warrant maintaining *coursi* above subspecific rank.

Genus *ERETMAPODITES* Theobald

productus Edwards, 1941:241

From several distinctive features of the male terminalia, a new subspecies of *leucopous* Graham, 1909:88, was described from Zaire as *productus* Edwards, 1941:408. An accompanying partial description of the pupa, based on a specimen from a *productus* locality, was ascribed simply to *leucopous*.

The modern morphological species concept for *Eretmapodites* (e.g. van Someren, 1949; Hamon & van Someren, 1961; Rickenback & Eouzan, 1970) would give greater emphasis than was placed by Edwards on the terminalic differences between *leucopous* and *productus*. Having checked the types in the BM(NH) and found them to be rather more strikingly contrasted than Edwards' sketches indicate, it seems best to rank both names as species-group taxa in the forthcoming Catalogue.

Biological confirmation of this taxonomic inference comes from the very recent paper by Rickenbach and Lombrici (1975) reporting the presence of sympatric *productus* and *leucopous* populations in Cameroun. On that evidence, coupled with some supplementary observations on morphology, they have already taken the formal step (Rickenbach & Lombrici, 1975:39) of elevating *productus* to separate specific rank.

oidipodeios Graham, 1909:86
ssp. marcellei Adam and Hamon, 1959:524

Original spelling of *marcellei* was grammatically incorrect; it comprised a female personal noun with a masculine latin suffix. Under Article 31 of the first edition of the Code (I.C.Z.N. 1961) feminization of the species epithet to *marcelleae* would have been desirable, were it not for Article 32 (ii) which stated that improper original latinization does not warrant a spelling correction. In any case, Rule 31 was reduced to recommendation 31A

in the second edition of the Code (I.C.Z.N., 1964). The name was correctly emended to *marcelleae* in the World Catalog by Stone et al (1959:134), while Hamon (1961:905) emended it erroneously to *marcellae*. Because the original spelling is now the proper one to maintain it will be used in the forthcoming Ethiopian Catalogue.

Genus *MIMOMYIA* Theobald
Subgenus *INGRAMIA* Edwards, 1912:43

An account has already been given (White, 1974b) of the reasons why *Ingramia* is a senior primary objective synonym of *Dasomyia* Leicester, 1908:102, and a senior secondary subjective synonym of *Ravenalites* Doucet, 1957:2. It was placed in synonymy under *Ficalbia* Theobald, 1903:296, by Stone et al (1959:96) in the World Catalog, as had been initiated by Edwards (1932a:109). With the renewed separation of *Ficalbia* and *Mimomyia* by Mattingly (1971:30) subgenus *Ingramia* remained in the latter genus, along with subgenera *Mimomyia* and *Etorleptiomyia* Theobald, 1904:71. All three subgenera are represented in the Ethiopian Region and will appear in the forthcoming Catalogue.

Genus *URANOTAENIA* Lynch Arribálzaga
Subgenus *PSEUDOFICALBIA* Theobald

henrardi Edwards, 1935:96

Addition of Ivory Coast to the distribution of *henrardi*, as listed by Stone (1963:123) on the evidence of Doucet (1961:810), is negated by the subsequent description of *andreae* Doucet, 1962:1157, which the earlier record represents.

An important distribution record not added to the World Catalog is the occurrence of *henrardi* in Tanzania (van Someren, 1962:25).

ornata Theobald, 1910:521
ssp. *musarum* Edwards, 1936:54. Stat. n.

Described as a variety of *ornata* on the basis of several conspicuous adult features, *musarum* is known only from the highlands of northwestern Uganda, where it breeds abundantly, but not exclusively, in wild banana axils (Hopkins, 1952:61). Supplementary larval, pupal and adult material has been described well by van Someren (1951) so as to modify the distinctions between the two forms. Adult *musarum* differ from typical *ornata* by having lateral yellow scale patches on the head, 6-8 lower sternopleural bristles as opposed to 4-6, tori paler and abdominal tergites III-VII banded basally. Nontypical larvae and pupae remain undescribed.

Since *ornata* and *musarum* apparently do not intergrade or occur sympatrically, the latter is best catalogued for the present as a subspecies of the former, rather than as a variety of it. However, the true relative

statuses of these taxa remain to be properly clarified.

The male holotype and two female paratypes of *musarum* are all labeled "Mpumu/Uganda/July 1910/Capt.A.D.Fraser,/R.A.M.C./1911-193.". The comparable type-series of *ornata* s. str. is as Theobald described it, being four males with original data "Obuasi,/3.11.07/in bush/5pm/WMG" in Dr. W. M. Graham's handwriting. The *ornata* holotype male is also marked as such in Theobald's customary style with the date 21.3.09.

Subgenus *URANOTAENIA* Lynch Arribálzaga

hamoni Grjebine, 1953:465. Stat.n.

This taxon will be entered in the forthcoming Catalogue as a full species and is here formally elevated to this rank on the advice of Dr. J. Brunhes (*in lit.*) who has reared the species and has been able to examine the distinctive type-series in Tananarive. Brunhes is preparing to publish descriptions of all life stages showing that there are ample features warranting specific status.

When originally described, *hamoni* was proposed as a Madagascan variety of the mainland species *chorleyi* Edwards, 1936:54, and so appeared in that position in the World Catalog (Stone et al, 1959:111).

Discussion

It is apposite to conclude these notes with a summary and break-down of the composition of the Culicid fauna of the Ethiopian Region. Table 1 shows the totals of taxa currently recognised as valid. Fourteen genera and 30 subgenera are recorded. These comprise totals of 615 species, 41 nominal subspecies and 14 other named infrasubspecific varieties.

Sizes of the genera have been plotted graphically in Figure 1 to show how the numbers of currently accepted species have grown during the 20th Century. By the end of the 19th Century only three mosquito species (*minutus* Macquart, 1834; *costalis* Loew, 1866; *mucidus* Karsch, 1887) had been described from the Ethiopian Region. The first two of these are now held as nomina dubia. Another ten endemic species (*pipiens* L., 1758; *aegypti* L., 1762; *caspius* Pallas, 1771; *sitiens* Wiedemann, 1828; *vexans* Meigen, 1830; *longiareolata* Macquart, 1838; *pusillus* Macquart, 1850; *vittatus* Bigot, 1861; *vigilax* Skuse, 1889; *albopictus* Skuse, 1895) had been described from elsewhere. On average, therefore, species that we now accept have been described and recorded from the Region at a rate of eight per year in the period 1900-75. The literature also contains another 289 synonyms and 5 nomina dubia applicable to these species in the Ethiopian Region.

Several regional monographs on the mosquitoes of sub-Saharan Africa and the Malagasy sub-region have succeeded the comprehensive series on Culicidae of the World completed by Theobald in 1910. The most recent revisions are by

Grjebine (1966) and Gillies and De Meillon (1968) on Anophelinae and those on Toxorhynchitinae and Culicinae by Edwards (1941), who covered adults and pupae, and by Hopkins (1952) who dealt with larval stages. With the possible exception of the most recent treatments of *Anopheles*, the various monographs have little affected the rate of species addition manifest in Figure 1. Even today, with the recent relative reduction of taxonomic interest in this comparatively well worked family in Africa, the discovery of new species in the major genera continues unabated. In *Aedes*, *Culex* and *Eretmapodites* there is no indication that we are approaching the end of the road in the quest for all the African species. The more static composition of certain other genera, particularly difficult groups like *Uranotaenia* and *Toxorhynchites*, arouses strong suspicions that undescribed species are being overlooked.

Figures 2 and 3 portray further data showing the way in which the various African subgenera of *Aedes* and *Culex* have expanded in the past 75 years. From these graphs it becomes clear that most additions in *Aedes* are of *Aedimorphus* species, while most recent descriptions or resurrections in *Culex* are of *Culex* s. str., *Eumelanomyia* and *Culiciomyia*. An ever increasing component of the new taxa described in these growing subgenera is made up of species differentiated initially on the basis of male terminalia. Failure of other genera and subgenera to be expanded likewise, probably reflects their truly greater biological homogeneity. However, the advent of the application of genetical species criteria is bound to have increasing impact on classification of all groups of Culicidae in the future.

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Table 1

Known numbers of endemic taxa in genera and subgenera of Culicidae occurring in the Ethiopian zoogeographic region.

	species	subspecies	forms
Anophelinae			
<i>Anopheles</i> (<i>Anopheles</i>)	10	1	0
(<i>Cellia</i>)	112	7	1
Toxorhynchitinae			
<i>Toxorhynchites</i> (<i>Toxorhynchites</i>)	12	1	0
Culicinae			
<i>Malaya</i>	6	0	0
<i>Aedeomyia</i> (<i>Lepiothauma</i>)	3	0	0
<i>Aedes</i> (<i>Aedimorphus</i>)	86	6	1
(<i>Diceromyia</i>)	9	0	0
(<i>Finlaya</i>)	14	0	0
(<i>Mucidus</i>)	6	0	0
(<i>Neomelaniconion</i>)	22	0	0
(<i>Ochlerotatus</i>)	9	0	0
(<i>Pseudarmigeres</i>)	5	2	0
(<i>Skusea</i>)	2	0	0
(<i>Stegomyia</i>)	38	3	1
<i>Culex</i> (<i>Barraudius</i>)	2	0	0
(<i>Culex</i>)	66	14	5
(<i>Culiciomyia</i>)	17	1	1
(<i>Eumelanomyia</i>)	38	0	0
(<i>Lasiosiphon</i>)	1	0	0
(<i>Lutzia</i>)	1	0	0
(<i>Maillotia</i>)	7	2	0
(<i>Neoculex</i>)	1	0	0
<i>Culiseta</i> (<i>Allotheobaldia</i>)	1	0	0
(<i>Theomyia</i>)	1	0	0
<i>Eretmapodites</i>	43	3	0
<i>Ficalbia</i>	4	0	0
<i>Hodgesia</i>	4	0	0
<i>Mansonia</i> (<i>Coquillettidia</i>)	21	0	0
(<i>Mansonioides</i>)	2	0	1
<i>Mimomyia</i> (<i>Etorleptiomyia</i>)	2	0	0
(<i>Ingramia</i>)	7	0	0
(<i>Mimomyia</i>)	10	0	0
<i>Orthopodomyia</i>	6	0	0
<i>Uranotaenia</i> (<i>Pseudoficalbia</i>)	29	1	1
(<i>Uranotaenia</i>)	17	0	3
Totals:	615	41	14

References

- Adam, J. P. & Hamon, J. 1959. Description de deux nouvelles sous-espèces d'*Eretmapodites oedipodius* Graham, capturées en Afrique Occidentale. Bull. Soc. Path. exot. 51(1958):524-527.
- Anonymous. 1973. Mosquito studies at the Ross Institute of Tropical Hygiene, London. Progress Report No. 26 (July to December, 1973). 9pp.
- Bedford, G. A. H. 1928. South African mosquitoes. Rep. Vet. Res. S. Afr. 13 & 14, 881-990.
- Belkin, J. N. 1962. The mosquitoes of the South Pacific (Diptera, Culicidae). Berkley, University of California Press. 2 vols. ix + 608pp.;412pp.
- Belkin, J. N. 1968. The type specimens of New World mosquitoes in European museums. Contr. Amer. ent. Inst. 3:1-69.
- Belkin, J. N., Schick, R. X. & Heinemann, S. J. 1966. Mosquitoes originally described from North America. Contr. Amer. ent. Inst. 1:1-39.
- Bigot, M. J. 1861. Trois diptères nouveaux de la Corse. Anns Soc. ent. Fr. (4) 1:227-229.
- Blanchard, R. 1905. Les Moustiques. Paris, F. R. de Rudeval. xiii + 673pp.
- Blanchard, R. 1907. Le paludisme à Madagascar. Archs Parasit. 11:185-214.
- Bram, R. A. 1967. The genus *Culex* in Thailand (Diptera:Culicidae). Contr. Amer. ent. Inst. 2:iii + 1-296.
- Brown, A. W. A. & Pal, R. 1971. Insecticide Resistance in Arthropods. World Health Organisation, Monograph No. 38. 491pp. Geneva.
- Carter, H. F. 1910. A new Anopheline from South Africa. Entomologist 43: 237-8.
- Chauvet, G. 1962. Variabilité géographique chez les femelles d'*Anopheles mascarensis* de Meillon, 1947. Absence d'*A. marshalli* Theobald, à Madagascar. Bull. Soc. Path. exot. 55:1145-56.
- Christophers, S. R. 1924. Provisional list and reference catalogue of the Anophelini. Ind. med. Res. Mem. 3:1-105.
- Christophers, S. R. & Chand, K. 1915. Notes on some Anophelines from Arabia and Mesopotamia. Ind. J. med. Res. 3:180-200.
- Chwatt, L. J. 1948. A new *Aedes* from the Camerouns, *A. (Aedimorphus) boneti* s. sp. *kumbae* s. sp. nov. Ann. trop. Med. Parasit. 42:184-189.

- Coluzzi, M. 1964. Morphological divergences in the *Anopheles gambiae* complex. Riv. Malar. 43:197-232.
- Coquillett, D. W. 1906. A classification of the mosquitoes of north and middle America. U. S. Dept. Ag. Ent. Bur. Tech. Ser. 11:1-31.
- Davidson, G. 1964. The five mating-types in the *Anopheles gambiae* complex. Riv. Malar. 43:167-90.
- Davidson, G. 1966. Distribution records of member species of the *Anopheles gambiae* complex. Unpublished report WHO/Mal/66.570 - WHO/Vector Control /66.215. 16pp + appendices.
- Davidson, G. & Jackson, E. 1962. Incipient speciation in *Anopheles gambiae*. Bull. Wld Hlth Org. 27:303-305.
- Davidson, G., Paterson, H. E., Coluzzi, M., Mason, G. F. & Micks, D. W. 1967. The *Anopheles gambiae* complex. pp. 211-250 in:Wright, J. W. & Pal, R. (Eds) Genetics of Insect Vectors of Disease. Elsevier, Amsterdam-London-New York. xix + 794pp.
- Davidson, G. & White, G. B. 1972. The crossing characteristics of a new, sixth species in the *Anopheles gambiae* complex. Trans. R. Soc. trop. Med. Hyg. 66:531-532.
- Delfinado, M. D. 1966. The Culicine mosquitoes of the Philippines, tribe Culicini (Diptera, Culicidae). Mem. Amer. ent. Inst. 7:252pp.
- Delfinado, M. D. & Hardy, D. E. 1973. A Catalog of the Diptera of the Oriental Region. Vol. I. Suborder Nematocera. University Press of Hawaii, Honolulu. 618 pp. [Vols II & III in press].
- De Meillon, B. 1934. Observations on *Anopheles funestus* and *Anopheles gambiae* in the Transvaal. Publs S. Afr. Inst. med. Res. 6:195-248.
- De Meillon, B. 1935. Studies on insects of medical importance in South Africa - Part II. Publs S. Afr. Inst. med. Res. 6:323-366.
- De Meillon, B. 1939. Entomology. Culicidae. Rep. S. Afr. Inst. med. Res. 1939:30-32.
- De Meillon, B. 1942. New Nematocera from the Ethiopian Region. J. ent. Soc. sthn Afr. 5:87-98.
- De Meillon, B. 1947a. New records and new species of biting insects from the Ethiopian Region. J. ent. Soc. sthn Afr. 10:110-124.
- De Meillon, B. 1947b. The Anophelini of the Ethiopian geographical Region. Publs S. Afr. Inst. med. Res. No. 49. 272pp.
- Dönitz, W. 1902. Beitrage zur kenntniss der Anopheles. A. Hyg. Infektkr. 41:15-88.

- Doucet, J. 1949. Etude des Culicidae (Diptera) du lac Alaotra. Mem. Inst. Scient. Madagascar (A) 3:121-145.
- Doucet, J. 1957. Foreword, p. 2 in : Mattingly, P. F. The culicine mosquitoes of the Indomalayan area. Part I. Genus *Ficalbia* Theobald. London, British Museum (Nat. Hist.). 61pp.
- Doucet, J. 1961. Moustiques forestiers de la République de Côte-d'Ivoire, I. Notes biologiques et systématiques sur *Uranotaenia henrardi* Edwards, *Eretmapodites oedipodius marcellei* Hamon, *Aedes (Pseudarmigeres) kummi* Edwards et *Aedes (Pseudarmigeres) argenteoventralis* Theobald. Bull. Soc. Path. exot. 53(1960):810-814.
- Doucet, J. 1962. Moustiques forestières de la République de Côte-d'Ivoire. 3. Notes biologiques et systématiques sur *Uranotaenia andreae* sp. n. et *Culex (Neoculex) vinckei* Hamon, Holstein & Rivola, 1957. Bull. Soc. Path. exot. 54(1961):1156-1164.
- Dyar, H. G. & Knab, F. 1906. Notes on some American mosquitoes with descriptions of new species. Proc. biol. Soc. Wash. 19:159-72.
- Edwards, F. W. 1911. The African species of *Culex* and allied genera. Bull. ent. Res. 2:241-268.
- Edwards, F. W. 1912. A synopsis of the species of African Culicidae other than the Anopheles. Bull. ent. Res. 3:1-53.
- Edwards, F. W. 1913. Further notes on African Culicidae. Bull. ent. Res. 4:47-59.
- Edwards, F. W. 1920. Notes on the mosquitoes of Madagascar, Mauritius and Reunion. Bull. ent. Res. 11:133-138.
- Edwards, F. W. 1921. A revision of the mosquitoes of the Palaearctic region. Bull. ent. Res. 12:263-351.
- Edwards, F. W. 1924. Some mosquitoes from Ovamboland, S. W. Africa, and from the Cape Province. Ann. S. Afr. Mus. 19:159-163.
- Edwards, F. W. 1927. Four new mosquitoes from the Belgian Congo. Rev. Zool. afr. 15:351-355.
- Edwards, F. W. 1930. Mosquito Notes.-IX. Bull. ent. Res. 21:287-306.
- Edwards, F. W. 1932a. Diptera Fam. Culicidae. Fasc. 194. General Insectorum. Belgium. 258pp.
- Edwards, F. W. 1932b. Mosquito Notes.-XI. Bull. ent. Res. 23:559-562.
- Edwards, F. W. 1935. A new *Uranotaenia* from the Belgian Congo (Diptera, Culicidae). Rev. Zool. Bot. afr. 27:96.

- Edwards, F. W. 1936. New African Culicine mosquitoes (Diptera, Culicidae). Proc. R. ent. Soc. Lond. (B)5:49-55.
- Edwards, F. W. 1938. p. 123 in:Evans, A. M. Mosquitoes of the Ethiopian Region. II. Anophelini. Adults and early stages. London, British Museum (Nat. Hist.). 417pp.
- Edwards, F. W. 1941. Mosquitoes of the Ethiopian Region. III. Culicine adults and pupae. London, British Museum (Nat. Hist.). 499pp. + IV plates.
- Enderlein, M. 1920. Die Culiciden fauna Madagascar. Wien. ent. Ztg. 38: 47-52.
- Evans, A. M. 1927. A short illustrated guide to the Anophelines of tropical and southern Africa. University Press, Hodder & Stoughton, Liverpool, London. 54pp + XII plates.
- Evans, A. M. 1928. A new variety of *Armigeres* from Lagos, with descriptions of the larval and pupal stages. Ann. trop. Med. Parasit. 22:39-42.
- Forattini, O. P. 1965. Entomologia Medica. 2^o Volume. Culicini:Culex, Aedes e Psorophora. Sao Paulo University. 506pp.
- Galliard, H. 1931. Culicides de Gabon. I.-Culicines, avec la description d'une espèce et de deux variétés nouvelles. Annls Parasit. hum. comp. 9:225-232.
- Gil Collado, J. 1936. Culicidos de la Isla de Fernando Poo recogidos par la expedicion J. Gil - F. Bonet. Eos, Madr. 11:311-329.
- Giles, G. M. 1900. A handbook of the Gnats or mosquitoes. London, John Bale, Sons & Danielsson, Ltd. 374pp.
- Giles, G. M. 1901. A plea for the collective investigation of Indian Culicidae, with suggestions as to moot points for enquiry, and a prodromus of species known to the author. J. Bombay nat. Hist. Soc. 13:592-610.
- Gillies, M. T. 1958. Notes on the biology of a new subspecies of *Anopheles wellcomei* (Diptera:Culicidae) from East Africa, and on the distribution of related forms. Proc. R. ent. Soc. Lond. (A) 33:9-14.
- Gillies, M. T. & De Meillon, B. 1968. The Anophelinae of Africa South of the Sahara. Publs S. Afr. Inst. med. Res. No. 54. 343pp.
- Gough, L. H. 1910. On a collection of *Anopheles* made at Onderstepoort in the Autumn of 1909. Rep. Govt Bact. Un. S. Afr. 1908-09:115-121.
- Graham, W. M. 1909. Four new species of the genus *Eretmapodites* (Theobald) from Ashanti. Entomologist 42:86-89, 157-159.

- Grandpre, A. D. de & Charmoy, D. d'E. de 1901. Les Moustiques. Port Louis (Mauritius), The Planters and Commercial Gazette (1900). 59pp.
- Grjebine, A. 1966. Faune de Madagascar XXII. Insectes Diptères Culicidae Anophelinae. Paris, Lahure. 487pp. + VIII plates.
- Grjebine, A. & Chauvet, G. 1961. Position systématique d'*Anopheles mascarensis* De Meillon, 1947 et description de la larve et de la nymphe.
- Grünberg, K. 1905. Zur kenntnis der Culicidenfauna von Kamerun und Togo. Zool. Anz. 29:377-390.
- Haddow, A. J., van Someren, E. C. C. Lumsden, W. H. R., Harper, J. O. & Gillett, J. D. 1951. The mosquitoes of Bwamba County, Uganda. VIII. - Records of occurrence, behaviour and habitat. Bull. ent. Res. 42: 207-238.
- Hamon, J. 1961. Les *Eretmapodites* du groupe *oedipodius* Graham. I. Descriptions complémentaires et position systématique des six sous-espèces actuellement connues. Bull. Soc. Path. exot. 54:892-906.
- Hamon, J. & Adam, J. P. 1959. Description de deux nouveaux *Aedes* de Côte d'Ivoire appartenant au sous-genre *Aedimorphus*: *A. ovazzaï* sp. n. et *A. rickenbachi* sp. n. Bull. Soc. Path. exot. 52:147-154.
- Hamon, J., Maffi, M., Grenier, P., Ouedraogo, C. S. & Djime, D. 1966. Notes sur les moustiques de la République Islamique de Mauritanie [Dipt. Culicidae] (II^e Partie). Anns Soc. ent. Fr. 11:371-383.
- Hamon, J. & Ovazza, M. 1954. Une nouvelle espèce de moustique (*Culex shoae* n. sp.) vivant sur les bananiers du haut plateau d'Ethiopie. Bull. Soc. Path. exot. 47:416-421.
- Hamon, J. & van Someren, E. C. C. 1961. Les *Eretmapodites* du groupe *oedipodius* Graham. II. Description de *E. grenieri* sp. n. et clé de détermination des espèces et sous-espèces du groupe *oedipodius*. Bull. Soc. Path. exot. 54:907-913.
- Hopkins, G. H. E. 1952. Mosquitoes of the Ethiopian Region. I. Larval bionomics of mosquitoes and taxonomy of Culicine larvae. London, British Museum (Nat. Hist.). 355pp.
- International Code of Zoological Nomenclature. 1961 (1st. edn). 1964 (2nd edn). London, International Trust for Zoological Nomenclature. xix + 176pp.
- Jupp, P. G. 1971. The taxonomic status of *Culex (Culex) univittatus* (Diptera: Culicidae) in South Africa. J. ent. Soc. sthn Afr. 34:339-357.
- Jupp, P. G. 1972. A morphological study of *Culex (Culex) univittatus* Theobald and *Culex (Culex) neavei* Theobald from various African countries. Mosq. Syst. 4:103-113.
- Leicester, G. F. 1908. The Culicidae of Malaya. Stud. Inst. med. Res. F. M. S. 3:18-261.

- Li, F-S. & Wu, S-C. 1933. The mosquitoes of Hangchow, Chekiang. Yb. Bur. Ent. Hangchow 3:97-123.
- Linnaeus, C. 1758 (10th edn). Systema natura per regna tria naturae. Vol. 1. 824pp.
- Lips, A. H. 1960a. Anopheles du Congo Belge. 2. Quelques espèces des galeries forestières. Riv. Parassit. 21:39-64.
- Lips, A. H. 1960b. Anopheles du Congo. 3. Faune des grottes et des anfractuosités. Riv. Parassit. 21:289-306.
- Liston, W. G. 1901. A year's experience of the habits of *Anopheles* in Ellichpur. Ind. med. Gaz. 36:361-366, 441-443.
- Loew, H. 1866. Beschreibung einiger afrikanischen Diptera nemocera. Berl. ent. Z. 10:55-62.
- Mattingly, P. F. 1947. Notes on the early stages of certain Ethiopian mosquitoes with some locality records from British West Africa. Ann. trop. Med. Parasit. 41:239-252.
- Mattingly, P. F. 1954. The distribution of some African mosquitoes. Proc. Linn. Soc. Lond. 165:49-61.
- Mattingly, P. F. 1955. Culicidae (Diptera Nematocera). Explor. Parc natn Upemba Miss. G. F. deWitte 32(3):49-66.
- Mattingly, P. F. 1956. Lectotypes of mosquitoes (Diptera: Culicidae) in the British Museum. Part II. Genera *Toxorhynchites*, *Aedes* (Subgenera *Aedimorphus*, *Banksinella*), *Culex* (Subgenera *Neoculex*, *Culiciomyia*, *Mochthogenes*, *Culex*). Proc. R. ent. Soc. Lond. (A) 31:37-44.
- Mattingly, P. F. 1963. New and remarkable *Aedes* (Diptera: Culicidae) from Africa. Proc. R. ent. Soc. Lond. (B)32:165-170.
- Mattingly, P. F. 1971. Illustrated keys to the genera of mosquitoes (Diptera, Culicidae). Contr. Amer. ent. Inst. 7:1-84.
- Mattingly, P. F. & Knight, K. L. 1956. The mosquitoes of Arabia. I. Bull. Brit. Mus. (Nat. Hist.) 4:91-141.
- McIntosh, B. M. 1975. Mosquitoes as vectors of viruses in southern Africa. Entomology Memoir No. 43. Dept. Ag. Tech. Serv., South Africa. 19pp.
- McIntosh, B. M. In press. A taxonomic revision of certain *Aedes* species (Diptera: Culicidae) of the subgenus *Aedimorphus* in Southern Africa. J. ent. Soc. sthn Afr.
- Meigen, J. W. 1830. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Hamm, Schultz. 6:iv + 401pp.

- Muspratt, J. 1955. Research on South African Culicini (Diptera, Culicidae). III.-A check-list of the species and their distribution, with notes on taxonomy, bionomics and identification. J. ent. Soc. sthn Afr. 18:149-207.
- Muspratt, J. 1961. Research on South African Culicini (Diptera: Culicidae). VI. Two new sub-species and notes on bionomics and distribution. J. ent. Soc. sthn Afr. 24:92-103.
- Neveu-Lemaire, M. 1906. Etude des Culicides Africains. Archs Parasit. 10: 238-288.
- Newstead, R. 1907 in: Newstead, R., Dutton, J. E. & Todd, J. L. Insects and other arthropoda collected in the Congo Free State. Being the seventh interim report of the expedition of the Liverpool School of Tropical Medicine to the Congo, 1903-05. Ann trop. Med. Parasit. 1:1-112 + 20 figs.
- Ovazza, M., Hamon, J. & Neri, P. 1956. Contribution a l'étude des Diptères vulnérants de l'Empire d'Ethiopie. Bull. Soc. Path. exot. 49:151-182.
- Papavero, N. (Ed.) et al, 197-. A Catalogue of the Diptera of the Americas South of the United States. Sao Paulo, Dept. Zoologia, Secretaria da Agricultura do Estado de Sao Paulo. (Uncompleted series).
- Paterson, H. E., Paterson, J. S. & Van Eeden, G. J. 1963. A new member of the *Anopheles gambiae* complex. A preliminary report. Med. Proc. 9: 414-418.
- Patton, W. S. 1905. The culicid fauna of the Aden Hinterland, their haunts and habits. J. Bombay nat. Hist. Soc. 16:623-637.
- Peyton, E. L. 1972. A subgeneric classification of the genus *Uranotaenia* Lynch Arribálzaga, with a historical review and notes on other categories. Mosq. Syst. 4:16-40.
- Reinert, J. F. 1973. Genus *Aedes* Meigen, Subgenus *Aedimorphus* Theobald in Southeast Asia. Contr. Amer. ent. Inst. 9:1-218.
- Rickenbach, A. & Eouzan, J-P. 1970. Description de quatre *Eretmapodites* nouveaux du groupe *plioleucus* Edwards 1941, capturés au Cameroun (Diptera, Culicidae). Cah. Org. Rech. sci. tech. outre-mer, Ent. med. Parasit. 8:131-135.
- Rickenbach, A. & Lombrici, G. 1975. Les *Eretmapodites* du groupe *leucopus* Graham, 1909. Position systématique des deux sous-espèces actuellement connues et description de deux espèces nouvelles. Bull. Soc. ent. Fr. 80:39-42.
- Robineau-Desvoidy, A. J. B. 1827. Essai sur la tribu des Culicides. Mém Soc. Hist. nat. Paris 3:390-413.

- Ronderos, R. A. & Bachmann, A. O. 1963. A proposito del complejo *Mansonia* (Diptera, Culicidae). *Revta Soc. ent. argent.* 25:43-51.
- Say, T. 1823. Descriptions of dipterous insects of the United States. *J. Acad. Nat. Sci. Philad.* 3:9-54.
- Sirivanakarn, S. 1971. A proposed reclassification of *Neoculex* Dyar based principally on the male terminalia. *Contr. Amer. ent. Inst.* 7:62-85.
- Stone, A. 1956. Corrections in the taxonomy and nomenclature of mosquitoes (Diptera, Culicidae). *Proc. ent. Soc. Wash.* 58:333-344.
- Stone, A. 1961. A synoptic catalog of the mosquitoes of the world, Supplement I (Diptera: Culicidae) *Proc. ent. Soc. Wash.* 63:29-52.
- Stone, A. 1963. A synoptic catalog of the mosquitoes of the world, Supplement II (Diptera: Culicidae) *Proc. ent. Soc. Wash.* 65:117-140.
- Stone, A. 1967. A synoptic catalog of the mosquito of the world, Supplement III (Diptera: Culicidae) *Proc. ent. Soc. Wash.* 69:197-224.
- Stone, A. 1970. A synoptic catalog of the mosquitoes of the world, Supplement IV (Diptera: Culicidae) *Proc. ent. Soc. Wash.* 72:137-171.
- Stone, A., Knight, K. L. & Starcke, H. 1959. A Synoptic Catalog of the Mosquitoes of the World (Diptera, Culicidae). Washington, D. C.; Entomological Society of America. Thomas Say Foundation, vol. 6. 358pp.
- Stone, A., Sabrosky, C. W., Wirth, W. W., Foote, R. H. & Coulson, J. R. 1965. A Catalog of the Diptera of America north of Mexico. Washington, D. C., United States Department of Agriculture. U.S.D.A. Handb. No. 276. iv + 1696pp.
- Theobald, F. V. 1901a. Notes on a collection of mosquitoes from West Africa, and description of new species. Report of the malaria expedition to Nigeria of the Liverpool School of Tropical Medicine and Medical Parasitology. Part II. Filariasis. *Mem. L'pool Sch. trop. Med.* No. 4, app. ii:1-14.
- Theobald, F. V. 1901b. A Monograph of the Culicidae or Mosquitoes. Vol. I. London, British Museum (Nat. Hist.). xviii + 424pp.
- Theobald, F. V. 1901c. A Monograph of the Culicidae or Mosquitoes. Vol. II. London, British Museum (Nat. Hist.). viii + 391pp.
- Theobald, F. V. 1903. A Monograph of the Culicidae or Mosquitoes. Vol. III. London, British Museum (Nat. Hist.). xviii + 359pp + XVII plates.
- Theobald, F. V. 1904. The mosquitoes of Egypt, the Sudan and Abyssinia. *Rep. Wellcome trop. Res. Labs* 1:62-83.

- Theobald, F. V. 1905a. A new *Stegomyia* from the Transvaal. Entomologist 38:224-225.
- Theobald, F. V. 1905b. New Culicidae from India, Africa, British Guiana and Australia. J. econ. Biol. 1:17-36.
- Theobald, F. V. 1906. Second report on the mosquitoes or Culicidae of the Sudan. Rep. Wellcome trop. Res. Labs 2:67-83.
- Theobald, F. V. 1907. A Monograph of the Culicidae or Mosquitoes. Vo. IV. London, British Museum (Nat. Hist.). xix + 639pp. + XVI plates.
- Theobald, F. V. 1909. Descriptions of the new mosquitoes collected by Dr. Graham in Ashanti. Colon, Rep. misc. ser. 237:1-31pp.
- Theobald, F. V. 1910. A Monograph of the Culicidae or Mosquitoes. Vol. V. London, British Museum (Nat. Hist.). xiv + 646pp. + VI plates.
- Theobald, F. V. 1911a. The Culicidae or mosquitoes of the Transvaal. Rep. Dir. vet. Res. Dept. Agric. S. Afr. 1:232-272.
- Theobald, F. V. 1911b. A new genus and two new species of Culicidae from the Sudan. Rep. Wellcome trop. Res. Labs 4:151-156.
- van Someren, E. C. C. 1949. Ethiopian Culicidae - Eretmapodites Theobald: description of four new species of the *chrysogaster* group with notes on the five known species of this group. Proc. R. ent. Soc. Lond. (B) 18: 119-129.
- van Someren, E. C. C. 1951. New Culicini from Kenya and Uganda. Proc. R. ent. Soc. Lond. (B)20:1-9.
- van Someren, E. C. C. 1962. Ethiopian Culicidae: three new *Aedes* from Tanganyika, with a description of the male of *Aedes usambara* Mattingly and the female of *Uranotaenia henrardi* Edwards. Proc. R. ent. Soc. Lond. (B) 31:19-26.
- Ventrillon, E. 1905. Culicides nouveaux de Madagascar. Archs Parasit. 9: 441-450.
- Ventrillon, E. 1906a. *Culex* nouveaux de Madagascar. Bull. Mus. natn. Hist. nat. Paris 12:100-106.
- Ventrillon, E. 1906b. *Cellia Tananariviensis*, Culicide nouveau de Madagascar, 9^e genre de la sous-famille des Anophelina. Bull. Mus. natn. Hist. nat. Paris 12:198-202.
- Vincke, I. H. 1954. Natural history of *Plasmodium berghei*. Ind. J. Malar. 8:245-256.

- White, G. B. 1974a. *Anopheles gambiae* complex and disease transmission in Africa. Trans. R. Soc. trop. Med. Hyg. 68:278-301.
- White, G. B. 1974b. Priority of *Ingramia* Edwards, 1912, over *Ravenalites* Doucet, 1957, as the name for a subgenus of *Mimomyia* Theobald, 1903 (Diptera:Culicidae). Mosq. Syst. 6:239-242.
- Wiedemann, C. R. W. 1828. Aussereuropaische zwiflugeline Insekten. Hamm, Schultz. 1:xxxii + 608pp. + 7 plates.
- Wright, J. W., Fritz, R. F. & Haworth, J. 1972. Changing concepts of vector control in malaria eradication. Ann. Rev. Ent. 17:75-102.

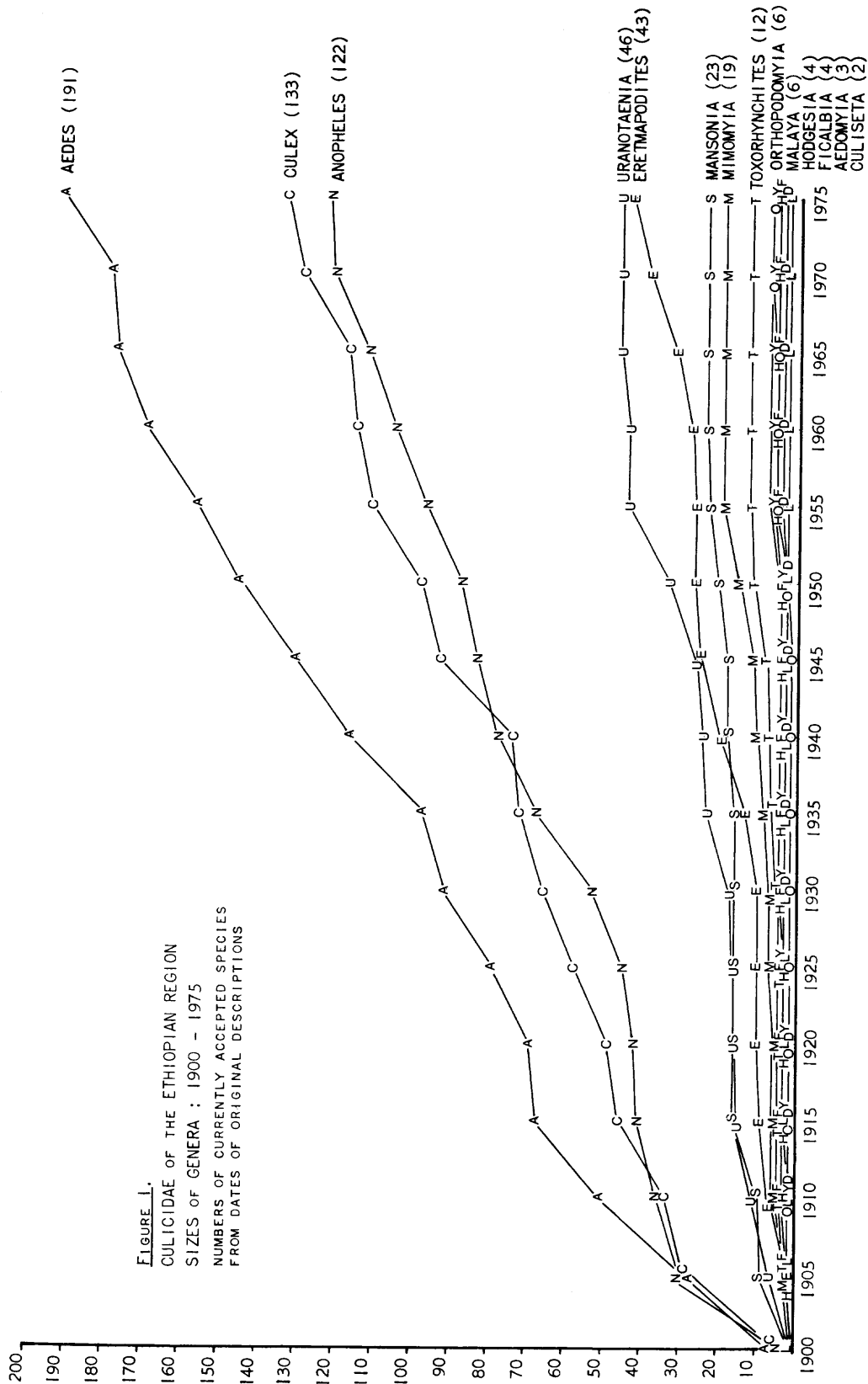


Figure 1.Key

- A = *Aedes* (191 species)
C = *Culex* (133 species)
N = *Anopheles* (122 species)
U = *Uranotaenia* (46 species)
E = *Eretmapodites* (43 species)
S = *Mansonia* (23 species)
M = *Mimomyia* (19 species)
T = *Toxorhynchites* (12 species)
O = *Orthopodomyia* (6 species)
Y = *Malaya* (6 species)
H = *Hodgesia* (4 species)
F = *Ficalbia* (4 species)
D = *Aedomyia* (3 species)
L = *Culiseta* (2 species)

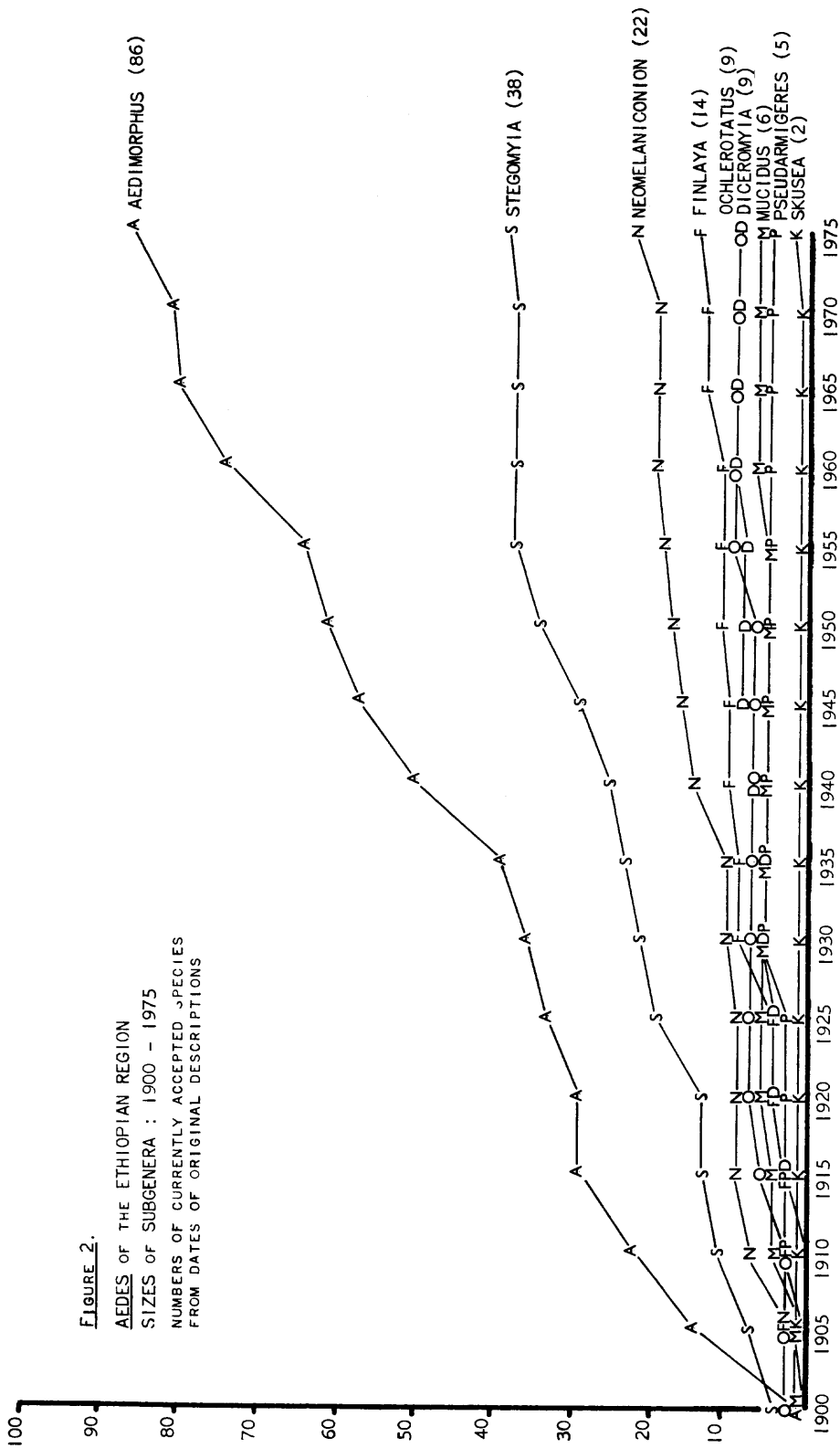


Figure 2.Key

- A = *Aedimorphus* (86 species)
S = *Stegomyia* (38 species)
N = *Neomelaniconion* (22 species)
F = *Finlaya* (14 species)
O = *Ochlerotatus* (9 species)
D = *Diceromyia* (9 species)
M = *Mucidus* (6 species)
P = *Pseudarmigeres* (5 species)
K = *Skusea* (2 species)

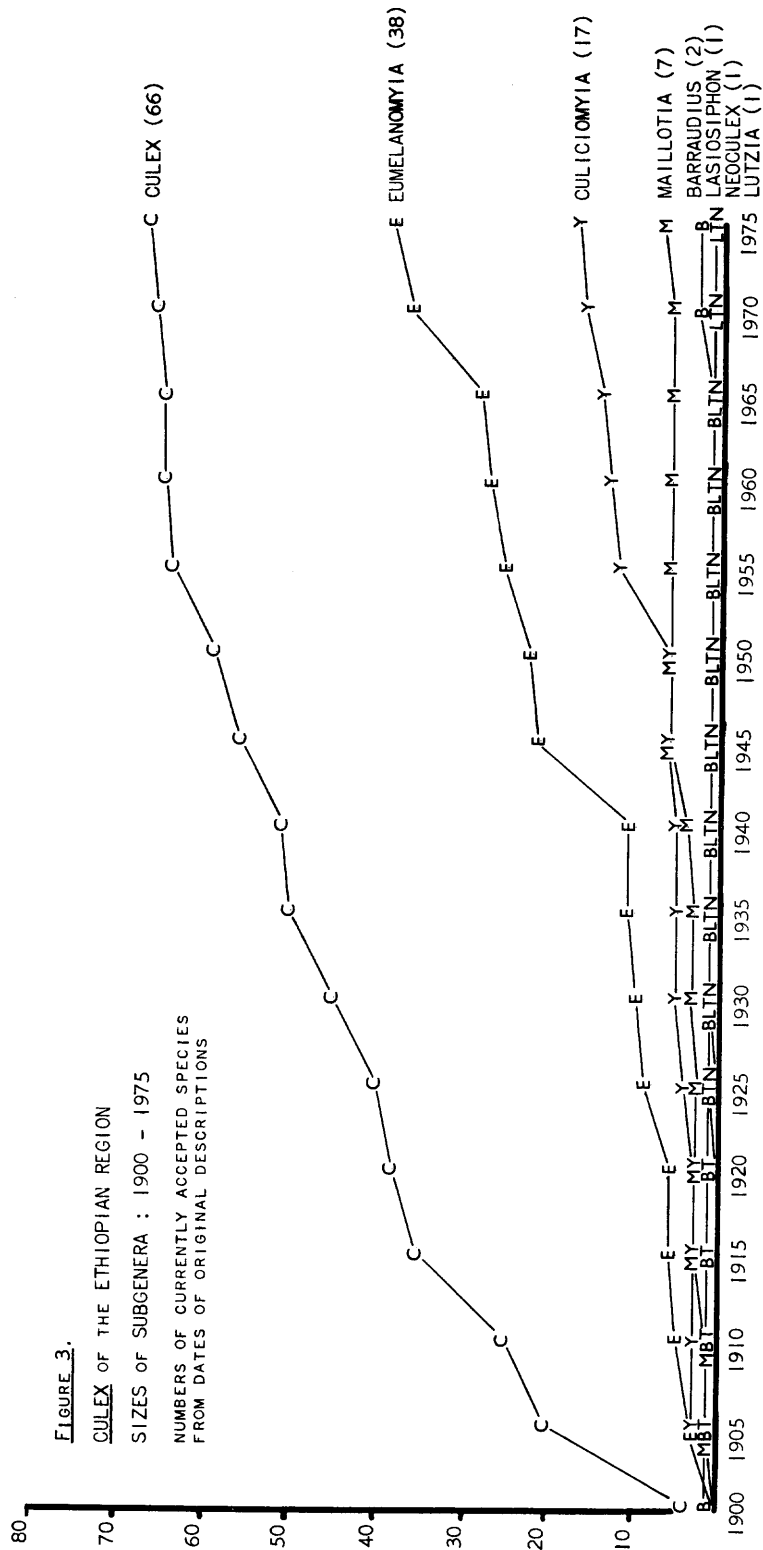


Figure 3.Key

- C = *Culex* (66 species)
E = *Eumelanomyia* (38 species)
Y = *Culiciomyia* (17 species)
M = *Maillotia* (7 species)
B = *Barraudius* (2 species)
L = *Lasiosiphon* (1 species)
T = *Lutzia* (1 species)
N = *Neoculex* (1 species)