

The Identity of Specimens Described by Theobald  
Under the Names *Anopheles sinensis annularis*  
and *Anopheles varus*

J. A. Reid<sup>1</sup>

ABSTRACT. The specimens remaining in the British Museum (Natural History) described by Theobald (1901a) as *Anopheles sinensis* Wiedemann 1828 sub-species *annularis* Van der Wulp 1884, and (1903) as *An. varus* Walker 1859, are shown to consist of five and six different species respectively.

Theobald's *An. sinensis annularis* s.s. is shown to be chiefly *An. crawfordi* Reid 1953, whilst his *annularis* var. A, though principally *An. nitidus* Harrison, Scanlon and Reid 1973 as suggested by those authors, also includes *An. peditaeniatus* (Leicester 1908). Theobald's *An. varus* includes *An. nigerrimus* Giles 1900 as well as the five species included under his *sinensis annularis* s.l.

#### INTRODUCTION

Harrison, Scanlon and Reid (1973) showed that the type of *An. indiensis* Theobald (1901a:145), described by Theobald as a subspecies of *sinensis*, is lost and that the species described as *indiensis* by Reid (1953, 1968) from Malaysia where it is common, does not occur in Madras, the type locality of *indiensis*. Accordingly they proposed a new name, *nitidus*, for Reid's *indiensis* and placed *indiensis* Theobald in the synonymy of *An. nigerrimus* Giles 1900. They concluded from Theobald's discussion of variation in the width of the pale hindtarsal bands of his *sinensis annularis* s.l. that he had at least two of the currently recognized species in the *An. hyrcanus* species group.

They also concluded that the single specimen which had been wrongly treated as the type of *indiensis* and which is conspecific with Reid's species and led him to call his species *indiensis*, very probably came from a series of specimens from Perak, Malaysia, sent by L. Wray in 1899, on which Theobald largely based his description of *sinensis annularis* and *annularis* var. A.

Examination of the remaining specimens in the British Museum (Natural History) from Wray's series confirms both these conclusions.

Theobald's use of the name *annularis* Van der Wulp (subgenus *Cellia*) is a misidentification which he corrects later (1903:90), substituting the name *varus* Walker 1859 which he had earlier (1901a) placed as a synonym of *sinensis*. This is a further error as *varus* belongs to the *An. barbirostris* species group.

---

<sup>1</sup>43 The Orchard, North Holmwood, Dorking, Surrey RH5 4JT, England.

## RESULTS OF EXAMINING THE SPECIMENS

On 22 November and 21 December 1899 Theobald (1901b:361) received a collection of Diptera, including 66 anophelines, from Leonard Wray, Curator of the Taiping Museum, Perak State, Malaysia (Straits Settlements, sic). The specimens remaining from this collection include 2 ♀ of *An. tessellatus* Theobald 1901 (one being the type), 1 ♀ *kochi* Donitz (the type of *ocellatus* Theobald 1901, a synonym of *kochi*), 1 ♂ *vagus* Donitz, and the specimens he described together with others from India (Madras, Captain Cornwall; Sambalpur, Central Provinces, D. O'C. Murphy, 99) as *An. sinensis annularis* and *sinensis annularis* var. A. The remaining specimens of his *sinensis annularis* s.l. were partly in the main collection and partly in a drawer of duplicates above a pencilled label that appears to be in Theobald's writing; this reads "*sinensis* Wied. v. *annularis*." In this drawer there were nine of Wray's specimens and in the main collection there were four (including the former 'type' of *indiensis*), plus one of D. O'C. Murphy's, making a total of 14.

As noted by Harrison, Scanlon and Reid (1973) there are no specimens from Captain Cornwall who, according to Giles (1902), only lent his specimens to Theobald. This seems to be confirmed by Theobald's statement (1901a:134), in his description of *An. fuliginosus* Giles 1900, that "the specimen from which this description is taken *belongs* (my italics) to Captain Cornwall and was obtained in Madras."

As Theobald does not say how many specimens he had, we do not know what proportion remains. Presumably 14 is only a fraction of what he had as he refers (1901a:144) to "the large series sent by Mr. Wray from Taiping" (=Taiping) and describes the male (no males remain). Also it was official policy at that time for the Museum to keep such specimens of mosquitoes as were wanted and set aside the remainder as duplicates for distribution (Mattingly, 1969:171). Further, counting all species of *Anopheles* from Wray, the total of specimens now in the collection is only 18 out of the original 66. In 1953, Reid recorded 7 ♀ of *nitidus* (his *indiensis*) collected by Wray, in addition to the supposed type of *indiensis*; there are now only six including this supposed type.

Theobald's description consists essentially of two parts. The first is the formal description which relates to specimens with narrow apical hindtarsal pale bands as in *sinensis*. The second part (1901a:144), headed "*Variability of the subspecies*," is based on those of Wray's specimens having hindtarsal pale bands which "involve both sides of the joints" which he calls variety A. With regard to the first part, the remaining specimens with narrow apical hindtarsal bands are all females and consist of three *An. crawfordi* (noted by Reid, 1953), one *sinensis* Wiedemann (Reid, 1953) and one *separatus* (Leicester). The latter is a member of the *An. umbrosus* group and bears a marked superficial resemblance to some members of the *hyrcanus* group.

With regard to the second part of Theobald's description, the remaining specimens with pale hindtarsal bands extending on both sides of the joints consist of six *nitidus* (including the former supposed type of *indiensis*) and

three *peditaeniatus* (Leicester). Two of the latter are from Wray's series (one noted by Reid, 1953) and one from D. O'C. Murphy, India (Reid, 1953).

Thus, examination of the specimens remaining from the series on which Theobald based his description of *sinensis annularis* s.l. shows that his taxon was a mixture of at least five currently recognized species, four belonging to the *hyrcanus* group. This amply confirms Harrison, Scanlon and Reid (1973) in their conclusion that Theobald's taxon was a mixture of at least two species in the *hyrcanus* group.

With regard to the second conclusion by Harrison, Scanlon and Reid (1973); that the supposed type of *indiensis* probably came from Wray's series of *sinensis annularis* var. A, this is confirmed beyond any reasonable doubt by microscopic examination of the specimen and its mount. The specimen is closely similar to the other specimens of *nitidus* from Wray's series both in size and characters. But more convincing is that the small pin and white card disc, on which the specimen is double-mounted, exactly match those of two of Wray's specimens all of which bear printed labels "22.11. & 21.12.99 Straits Settlements Taiping. L. Wray Junr,.". These two specimens have been remounted, presumably in the B.M., on larger discs because their original card discs had worked loose and were evidently swinging round on the main pins. These original discs, bearing on the underside the data "Perak Wray" (probably in Wray's writing), show worn pin holes and are mounted beneath the printed data labels. They are made of pasteboard, that is, thin brown cardboard with white paper pasted on both sides, whilst the new larger discs are of white card throughout. The heads of the pins of these remounted specimens, including the supposed type of *indiensis*, have been cut off in order to withdraw them through the old cards and thrust them through the new, but all are the same kind of pin and agree in this respect with the pins that retain their heads because the specimens have not been remounted. It looks as if at sometime someone must have discarded the original card disc with its legend "Perak Wray," and possibly also the printed label, from the supposed type of *indiensis*. Perhaps Theobald himself did so when he labelled the specimen with the M.S. name "*Anopheles annularis* var *alboamulus* (Type) Theobald" (Harrison, Scanlon and Reid, 1973), but this seems improbable. It is unlikely that we shall ever know now who did this and whether the same person then placed the specimen above a label reading *indiensis* Theobald.

*Wright's specimens.* It is convenient to give here the results of identifying another series of old specimens collected in Perak at about the same time as Wray's series. Theobald (1903:346, collection no. 120) records a collection of 650 mosquitoes made during the first five months of 1900 by Dr. M. J. Wright and presented by him on 25 July 1901.

Dr. Martensz James Wright was State Surgeon, Perak, in 1900 and, like Wray, he doubtless made his collection of mosquitoes in response to the circular letter of December 1898 from the Secretary of State for the Colonies, Joseph Chamberlain, asking that collections of mosquitoes be made and sent to the British Museum (Natural History), Cromwell Road, London (Mattingly, 1969:171). The Federated Malay States Civil Service Lists (e.g., F.M.S., 1908:199) show

that Dr. Wright was on long leave from 21 August 1900 to 8 October 1901, so he evidently made his collection prior to going on leave and presumably gave it to Theobald during a visit to London from his home in Aberdeen (Theobald, 1903: 346).

The anophelines remaining in the British Museum from Dr. Wright's collection include the type ♀ of *An. albotaeniatus* (Theobald, 1903) and two other ♀ which I have labelled syntypes, several specimens of the *barbirostris* group (1 ♀ *barbirostris*, 3 ♀, 3 ♂ *campestris*), 2 ♀, 2 ♂, *kochi*, 1 ♂ *karwari*, and 16 specimens of the *hyrcanus* group. The latter were included in Theobald's *vanus* of 1903 (not *vanus* Walker, 1859) which, as explained earlier, was the name used by Theobald after he had discovered his error of 1901 in treating *annularis* Van der Wulp as closely related to *sinensis* Wiedemann.

Like the *hyrcanus* group specimens of Wray's series, Wright's specimens were partly in the main collection and partly in the duplicate drawer. Six of those in the duplicate drawer lacked any labels, but microscopic examination of the circular card mounts and pins shows them to be identical with those bearing printed labels reading "120. Perak Straits Settlements, Dr. M. J. Wright." All the small pins bearing Wright's specimens and the diameter of all the cards, and the quality of some of them, are exactly the same as those of Wray's original mounts. Possibly Wray supplied Wright with pins and card discs. I have labelled the six specimens "? Dr. M. J. Wright, Malaya, 1900" in black ink and placed them with the others from the duplicate drawer in the main collection under their correct species.

Including those already in the collection, Wright's 16 *hyrcanus* group specimens were identified as follows: *An. crawfordi* 3 ♀, *nitidus* 8 ♀, 3 ♂, *peditaeniatus* 1 ♀, *nigerrimus* 1 ♂; none had been noted by me earlier (Reid, 1953). Thus, the species representation is similar to that of the Wray series, except that there is no specimen of *sinensis* but one of *nigerrimus* instead.

*Synonymy.* Reverting to Theobald's description of *An. sinensis* subspecies *annularis* (1901a), the first part fits *An. crawfordi* very well, both in some of the characters by which Theobald says his subspecies *annularis* chiefly differs from *sinensis* and also in other respects. The points in his description which seem the most significant for treating it as applying chiefly to *crawfordi* are as follows. "Apical fringe spot yellow, but the black spot between it and the apical costal spot larger"; in *crawfordi* one of the diagnostic characters is the rather short apical fringe spot which commences at the end of vein 2.1 [R<sub>2</sub>], instead of at or above vein 1 [R<sub>1</sub>] as in *sinensis* (Reid, 1968). "There is no pale patch on the fringe where the lower branch of the fifth vein joins the border"; *crawfordi* lacks a pale fringe spot at 5.2 [Cu<sub>2</sub>] which is frequently present in *sinensis* (in about 3/4 of Malaysian females). "Thorax brown, dusted frosty gray, with a narrow median line and broader lateral ones of a dull violet hue, and also two large oval, dark, lateral, eye-like spots"; the mesonotum of *crawfordi* is like this and has well marked eye spots as in *nitidus*. Theobald emphasizes that the cross veins are further apart than in *sinensis*, especially that the supernumerary (cv 2-3) [base R<sub>4+5</sub>] is distant from the mid one (cv 3-4) [r-m] "by about two-thirds of its own length";

characters of the cross veins are regarded now as usually unreliable and Theobald himself (1903a:89) says "The latter a doubtful character." However, comparison of a number of *crawfordi*, including the three in Wray's series, with a number of *sinensis*, including the one in Wray's series, shows that in most specimens cv 2-3 [base R<sub>4+5</sub>] in *sinensis* is much closer to cv 3-4 [r-m] than it is in *crawfordi*.

So we may say, on the basis of the specific determinations above, that Theobald's *sinensis annularis* is in large part a synonym of *crawfordi* Reid, though also of *sinensis* Wiedemann; whilst his *annularis* var. A is in large part a synonym of *nitidus* Harrison, Scanlon and Reid, though also of *peditaeniatus* (Leicester). His later description (Theobald, 1903), under the name *vanus*, does not distinguish between specimens with the pale hindtarsal bands narrow or broad. So *vanus* of Theobald 1903 can be regarded as a synonym in part of all the five species in Wray's series (p. 5), plus *nigerrimus* Giles represented by the single male in Dr. Wright's series.

*Slide mounts.* There are some legs of *sinensis annularis* mounted in balsam on slides and bearing labels in Theobald's writing, but none can be identified to the species level. Some of them may have come from the existing pinned specimens and would not therefore represent parts of additional specimens. In any case, none are labelled Wray or Perak, though there are two labelled Penang.

#### ACKNOWLEDGEMENTS

I would like to express my thanks to the Authorities of the British Museum (Natural History) for giving me working space and use of the Museum's great facilities, and to the librarian, Foreign and Commonwealth Office, for kind help with Malayan Government records of service.

#### REFERENCES

- Federated Malay States. 1908. The Federated Malay States Civil Service Lists, 1908. Government Printer, Kuala Lumpur.
- Giles, G. M. 1902. A handbook of the gnats or mosquitoes. John Bale, Sons & Danielsson, Ltd. London. 2nd Ed. 530 pp.
- Harrison, B. A., J. E. Scanlon and J. A. Reid. 1973. A new synonym and new species name in the Southeast Asian *Anopheles hyrcanus* complex. Mosq. Syst. 5:263-268.
- Mattingly, P. F. 1969. The biology of mosquito-borne disease. George Allen and Unwin Ltd. London. 184 pp.
- Reid, J. A. 1953. The *Anopheles hyrcanus* group in South-East Asia (Diptera: Culicidae). Bull. Ent. Res. 44:5-76.

- Reid, J. A. 1968. Anopheline mosquitoes of Malaya and Borneo. Stud. Inst. Med. Res. Malaysia 31:1-520.
- Theobald, F. V. 1901a. Monograph of the Culicidae. Brit. Mus. (Nat. Hist.), London. Vol. I, 424 pp.
- Theobald, F. V. 1901b. Monograph of the Culicidae. Brit. Mus. (Nat. Hist.), London. Vol. II, 391 pp.
- Theobald, F. V. 1903. Monograph of the Culicidae. Brit. Mus. (Nat. Hist.), London. Vol. III, 359 pp.