

61556



WHO/Mal/245 ✓
26 October 1959

ORIGINAL: ENGLISH

A DETAILED EXAMINATION OF A. FUNESTUS FUNESTUS FROM
SOUTHERN AND NORTHERN NIGERIA¹

(A summary with notes on its varieties and synonyms)

by

M. W. Service
Malaria Service, Ministry of Health, Federation of Nigeria

During two Malaria Control Projects, one at Ilaro, Southern Nigeria (Bruce-Chwatt et al. 1955) the other in Western Sokoto, Northern Nigeria (Bruce-Chwatt et al. 1957) there was some evidence of differences in behaviour of the respective populations of A. funestus funestus to the spraying of residual insecticides. At Ilaro, which is situated within the zone of dense secondary forest of Southern Nigeria, funestus disappeared after a few months of BHC application, while in the North the same species was not eliminated after three years of continuous spraying with residual insecticides including BHC, DDT and dieldrin. The question then arose as to whether there were in fact two different taxonomic or physiological populations of this species, one in Southern and one in Northern Nigeria.

The present paper deals with the comparative taxonomy of northern and southern funestus including colonized forms, and reviews the status of the various synonyms and varieties.

Eggs

It is unfortunate that no comparative account can be given of the northern and southern eggs, as the only specimens available were from the South. The general morphology and the measurements of width, length and size of floats agreed with previous findings, but the convexity of the lower surface was considerably less than is usually stated. Irregularities also occurred; the median upper portion of the egg, the deck, was often irregular in outline and in a few cases parts of it were completely obliterated and an interrupted deck was found (cf. A. gambiae).

¹ A full report of the findings is to be published in the Proceedings 'B' of the Royal Entomological Society, London

Larvae

Larvae from both areas were typical of normal funestus. A detailed examination was made of the chaetotaxy of both populations, and statistical analysis showed no significant differences between the two forms. It was found that in the wild material 17 per cent. had some of the accessory tergal plates of the abdomen free and detached from the main plate. These plates were either completely free or found as two projections on the posterior edge of the main plate. Segment 2 was the segment mostly concerned, but one larva had them free on segments 5, 6 and 7 and not segment 2, and one specimen had all three plates free on segments 1 to 7 inclusive. Of the insectary material, it was found that eight per cent. had the accessory plates detached on any segment from segment 2 to segment 7. It was usual for a larva having free accessory plates to have them free on several segments, and not confined to any one segment. There does not therefore appear to be such a clear distinction as was previously thought (Evans & Symes 1937) between the proportions of wild and laboratory-bred specimens having the accessory plates free.

A larva from the Southern Cameroons was found to have three anterior inner clypeal hairs; the third extra hair was as long and as well developed as the normal two.

Pupae

Specimens from both areas appeared to be taxonomically the same and did not differ appreciably from previous descriptions.

Adults

The only variations between the southern and northern adults were in the degree of pale and dark wing scaling; in all other details they were identical. In the genitalia it was seen that the harpago was pointed to such an extent that a finger-like process was formed, and that the only phallosome leaflet that appeared to be constantly simple and not serrated was the penultimate one. Neither of these points is well illustrated in the literature. The inner accessory hair was absent in all the specimens examined; its presence was however recorded by King (1932) in West African material. In all other characters the adults were similar to typical funestus.

A. funestus adults occur in pale and dark forms and among both there is considerable variation in the degree of pale and dark scaling. Below is a table summarizing the variation of wing scaling of both populations.

TABLE 1. WING CHARACTERS OF NORTHERN AND SOUTHERN FORMS OF A. FUNESTUS

Dark area at base of costa	Vein 3	Vein 6	Grouping	Locality
Uninterrupted	All dark	All dark	Leeson 1:1930	Birnin Kebbi (Northern)
Uninterrupted	All dark	Pale basal	Leeson 1:1930	Birnin Kebbi (Northern)
Uninterrupted	All dark or pale beyond middle	All dark	Leeson 1:1930	Lokoja (Northern)
Uninterrupted	All dark	All dark	Leeson 1:1930	Ilobi, Mamfe, Enugu, Yaba Insectary (Southern)
Interrupted by one pale area	All dark	All dark	De Meillon d; 1933	Ilobi (Southern)
Interrupted by one pale area	Pale beyond middle	All dark	De Meillon a; 1933	Mamfe (Southern)
Uninterrupted	Pale beyond middle	Pale basal	Leeson 1:1930	Yaba Insectary (Southern)
Uninterrupted	Pale beyond middle	All dark	Leeson 1:1930	Enugu (Southern)

All northern material from Birnin Kebbi is seen to have the basal part of the costa uninterrupted and Vein 3 totally dark scaled. Specimens from Lokoja, which is politically in the North but geographically in the centre of Nigeria, have the costa entirely dark basally, and some specimens have Vein 3 partially pale scaled. In southern material a basal interruption on the costa is often present, and Vein 3 may be partially pale scaled. Insectary material from Yaba consisted mostly of pale forms, and 32 out of 40 examined had the fringe from Vein 1 - Vein 3 entirely pale. One specimen from the north was an extremely dark form, but is regarded as an extreme variation within the species range rather than a variety to be named.

Synonyms

A. funestus has been subjected to a great deal of splitting up into new species, subspecies and varieties, and to complicate matters there are numerous described synonyms.

The type description of funestus appeared in February 1900, and the female holotype is still in the British Museum (Natural History) in reasonable condition. In November 1900 a new species was described under the name of A. kumasi, and although the description is extremely poor, there are no drawings, and all specimens are lost, it is beyond all reasonable doubt that kumasi is in reality funestus. There are two German-named species A. hebes and A. bisignata but examination of the types shows that they are in fact both funestus. A. bisignata is merely a dark form within the species range and is better treated as a variation than as a named variety of funestus as proposed by Edwards in 1932. Theobald named two varieties, var. umbrosus and var. subumbrosus, but these again are nothing more than dark and light forms of funestus, and are best considered as variations and not as varieties.

Conclusion

There are no reliable differences between the larvae, pupal pelts or adults of the two populations, the only difference being in the wing scaling of the adults. All that can be said at present is that the two populations are morphologically indistinguishable (except possibly in the wing scaling). This does not exclude the presence of cryptic species, and it would be of interest to know whether the populations between the two extremes show differences in susceptibility to residual insecticides.

Acknowledgement

The author wishes to thank Dr C. M. Norman-Williams, Chief Medical Adviser to the Federal Government of Nigeria, for his permission to publish this communication.

REFERENCES

- Bruce-Chwatt, L. J., Archibald, H. M., Elliott, R., Fitz-John, R. A. & Balogun, I. A. (1955) An experimental Malaria Control Scheme in Ilaro, semi-rural holoendemic area of Southern Nigeria; Results 1949-1953. Information Bulletin 3, 1. Published by Gaskiya Corp., Zaria, Northern Nigeria
- Bruce-Chwatt, L. J., Archibald, H. M. & Haworth, J. (1957) Malaria Control Pilot Project in Western Sokoto (Northern Nigeria) Third Annual Report, 1-55
- De Meillon, B. (1933) On Anopheles funestus and its allies in Transvaal. Ann. trop. Med. Parasit. 27, 83
- Edwards, F. W. (1932) Genera Insectorum, Diptera, Family Culicidae. Bruxelles
- Evans, A. M. & Symes, C. B. (1937) Anopheles funestus and its allies in Kenya. Ann. trop. Med. Parasit. 31, 105
- King, W. V. (1932) Three Philippine Anopheles of the funestus minimus subgroup. Philipp. J. Sci. 48, 485
- Leeson, H. S. (1930) Variations in the wing anaesthesia of Anopheles funestus Giles. Bull. ent. Res. 21, 421

Note from the Editor

The funestus group is a notoriously difficult one from the taxonomic point of view. Within many of the species and subspecies which have been established, there is a considerable range of variation, the extremes of which may appear as distinctly different forms. Only in a few cases has an attempt been made to clarify the position by simple breeding experiments designed to study the range of variation in the progeny of single classified females.

In order to explain the apparent anomalies in behaviour described in this report, it may not be necessary, however, to have recourse to taxonomic or physiological explanations. The two study areas are very different climatically and topographically, and in addition are mainly populated by people of widely different culture and custom. It appears very likely that these differences are reflected in such points as house construction, man/animal ratio, nature of breeding place, and availability of outdoor shelters. With regard to these, and other differences between the two areas, it would be interesting to tabulate them under headings such as the following:

1. Type of house - wall material - high roof or low roof. Open structures or tightly closed, etc.
2. Comparative adult funestus densities before spraying, or in unsprayed controls.
3. Extent and seasonal duration of breeding
4. Man:domestic animal ratio.
5. Availability of outdoor resting places; vegetation heavy or scanty
6. Completeness of spraying coverage in the two areas, etc. (perhaps related to nature of houses)

A comparison of the two areas on those lines might well reveal significant differences in one or more factors likely to affect the reactions, or modify the behaviour, of A. funestus. Such differences in environment, rather than in morphology or taxonomy, might provide better guidance in the interpretation of this situation.