A PICTORIAL FIELD GUIDE FOR THE RAPID IDENTIFICATION OF SANDFLIES (DIPTERA: PSYCHODIDAE), COMMONLY ENCOUNTERED IN PARÁ STATE, BRAZIL.

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SUMMARY

A pictorial field guide to the 30 species of sandfly most commonly encountered in Pará State is presented, based on the easily recognised external characters of the length of the 5th palpal segment, thoracic infuscation, abdominal colour and head and body size. In most cases this allows identification to the species. In others, especially with females, it gives an indication of the species, which may then be confirmed with data from more detailed taxanomix studies. This type of field guide helps in teaching, rapid sorting of flies prior to dissection and in acquainting visitors with the variety of species present in a given area.

A rapid technique for the taxonomic sorting of unmounted, freshly killed female sandflies is required, prior to the dissection of large numbers of a particular species. Such a method is useful in areas where numerous species occur in studies on natural flagellate infections, age determination and for ecological studies. With the above points in mind a pictorial field guide has been designed that enables the identification of unmounted, unmacerated specimens of the 30 more commonly encountered species of phlebotomine sandflies (***) in Pará State, North Brazil. It is based on the easily recognised external characters of the length of the 5th palpal segment, thoracic infuscation, addominal colour and proboscis and body size.

*Taxonomy of male phlebotomine sandflies is based on the structure of the genitalia and, as most of this is external, a wholly external character key is readily made. Female taxonomy, however, is based on the internal characters of the cibarium, pharynx and spermathecae. In order to produce an external character key we therefore return to an unsophisticated "phlebotometry" (see Martins **et al.**, 1978 p. 3 for review), using relative*

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(***) Authorities for all phlebotomines mentioned in the text are given by Martins **et al.** (1978).

lengths of the proboscis, palpal segments and body, along with the degree of infuscation. This idea is not new; indeed many sandfly specialists presently use external characters to separate certain species (H. Fraiha, R. P. Lane, P. D. Ready, D. G. Young and R. D. Ward personal communications 1983 & 1984).

A key used to separate five anthropophillic sandflies by Biagi (1966), in Mexico, was based mainly on palpal segment length and infuscation. Floch and Abonnenc (1952) stressed the use of relative lengths of palpal segments in their keys to the sandflies of French Guiana, and four members of the ***shannoni*** *group have been similarly separated according to the degree of infuscation by Morales* ***et al.*** *(1982). The use of thoracic infuscation as a reliable character seems to be gaining favour, having been used by Young & Fairchild (1974) and Ready & Fraiha (1981). Indeed Chaniotis 1974) showed the usefulness of thoracic infuscation to seperate 7 anthropophillic species, during studies on vesicular stomatitis in Panama. Identification using external characters is essential for work on viral isolations from sandflies, where bulk samples of whole sandflies are used.*

Perhaps the major advantage of a simple visual guide is for teaching purposes. Technical staff in this Institute are able to identify most of the species they encounter without having to use the standard, more unwieldly (and in many cases unavailable) internal character keys, and the guides presented below have allowed rapid species sorting prior to the dissection of sandflies in our leismaniasis study areas (Ryan ***et al.****, 1985).*

DISCUSSION

This field guide to the sandflies of Pará has been found to work during the period between June 1983 and December 1984, in our study sites of Marajó (Lainson **et al.**, 1983) Belém (Lainson & Shaw, 1968), Carajás (Ward **et al.**, 1973), Santarém (Lainson **et al.**, 1984 & 1985), Tucuruí, Porto Trombetas, Ruropólis, Presidente Médici and Paragominas. The phlebotomine fauna must first be studied in a given area; and a field guide for the common species may be produced which speeds the work rate and allows identification of the sandflies without mounting or maceration. Smaller samples may be examined in greater detail to check the validity of the identification made with the field guide.

We stress that this is not an alternative to the accepted characters in use at present in the few available keys, but rather an aid to field work in a given region. Where for example, one already knows **Ps. davisi** to be present in a given work area the pictorial guide immediately reminds the field worker of its appearance. Again a relatively untrained dissector may give his opinion that a sandfly is **Ps. davisi**, and this can then be confirmed by the person of the dissecting team who is examining the spermathecae and guts.

In addition, for teaching purposes, this guide provides a useful starting point, or introducting to the sandflies of Pará. The small and medium 5th palpal segment groups function well, fortunately, as most of the anthropophillic flies belong to these groups. Even so difficulties may arise in separating **Ps. amazonensis** from **Ps. claustrei** and the

Trichophoromyia subgenus generally. Within the series **squamiventris** it is at present impossible to separate female **Ps. squamiventris squamiventris**, **Ps. s. maripaensis**, **Ps. complexus**; **Ps. chagasi** and as yet undescribed members o the series found in Pará State: the males of these species, however, are all characteristic (Ready **et al.**, 1982). Only **Ps. wellcomei** and **Ps. complexus** are figured in this guide as they are both present at our study site in the Serra dos Carajás, where recent studies (Ryan **et al.**, 1985) have confirmed without doubt that the former is the proven vector of **Le. b. brasiliensis**. We use **Lu. guyanensis** assuming that **Lu. geniculata** is the junior synonym. We use here **Lu. trinidadensis** although this may eventually prove to be **Lu. villelai**, should the latter be resurrected (H. Fraiha personal communication, 1985).

The long 5th palpal segment group contains many of the species that are encountered only as males and/or that are captured rarely. Anthropophilic species include **Lu. gomezi**, **Lu. carvalhoi** and **Lu. longipalpis**, and these are all characteristic. It is dificult to distinguish between females of species in the subgenus Pressiata, as well as between **Lu. dasypodogeton** and **Lu. longispina** females. Another recent complication is the discovery of a **Lu. longipalpis** complex (Ward et al., 1985), where note must be made of the presence of one two abdominal, white spots on males.

All the characters used are constant, but caution should be exercised when dealing with Lu. longipalpis, as this species exhibits a wide morphological range. A small, white form encountered in Camará, Marajó Island and Santarém, Pará, is fortunately uncommon in our samples (1 = 1000).

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RESUMO

É apresentado um "levantamento ilustrado" dos 30 flebotomíneos mais comumente encontrados no Estado do Pará, Brasil, usando-se características externas, com as medidas do quinto segmento das palpos, cor do tórax e do abdomen, e medidas da cabeça e do corpo. Com isto é possível, na maioria dos casos, levar à identificação até a espécie. Existem algumas espécies, entretanto, que são mais difíceis de serem identificadas, particularmente as fêmeas, havendo nestes casos, necessidade de um exame taxonômico mais detalhado, para que se possa concluir a identificação. Esta orientação ilustrada é particularmente útil a técnicos de laboratório, estudantes e entomólogos visitantes.

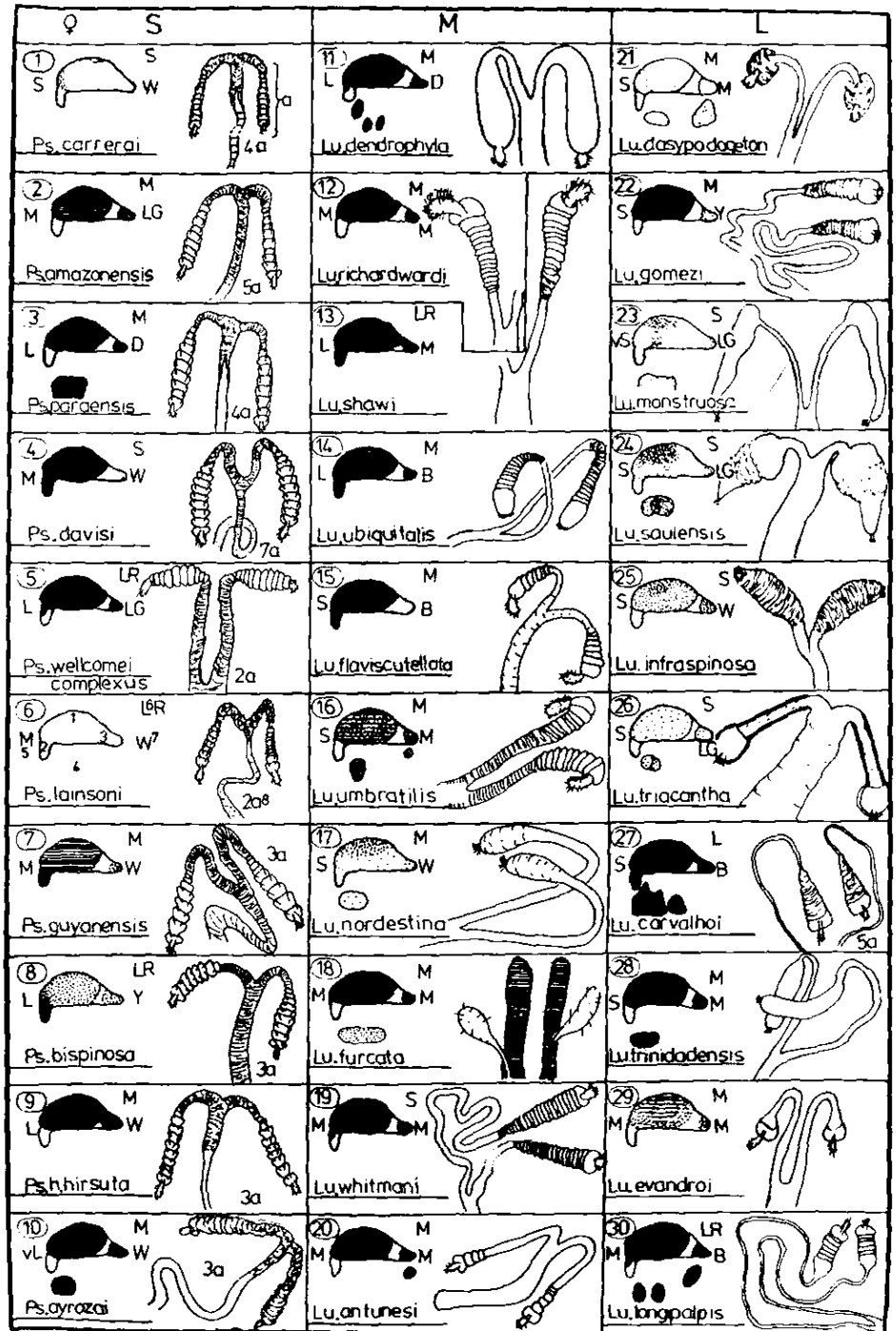

Fig. 1A. Field guide to the 30 most commonly encountered species of sandflies in Pará State, north Brazil.

A. Females.

I: The key - initially divides into 3 columns according to the relative length of the 5th palpal segment, where the ratio to the 5th:4th:3rd segments is as follows:

S (short) 5th=0.5x3rd=4th= genus **Psychodopygus**.

cont. - **Fig. 1A.**

M (medium) 5th=3rd=2x4th & < (3rd+4th)= subgenera **Viannamyia, Trichophoromyia, Nyssomyia, Psathyromyia** and groups **brasiliensis, lanei** and **driesbachi.**

L (long) 5th=2x3rd=3x4th & > (3rd+4th)=all other subgenera and groups.

II. Using number 6, Ps. **lainsoni** as an example: theleft figure indicates the degree of infuscation, represented by shading (increasing from white ; light ; medium & ; to dark), of 1: scutum; 2: pronotum; 3: scutellum; 4: sternopleuron.

The letters in the figures refer to:

5: Size of proboscis (from the clypeus to the tip)in proportion to:

the size of the antenna (shown as being equal in length to antennal segments I to n) and:

the size of the head (from read capsule o clypeus) thus:

vL (very long): n=6: > head,

L (long): n=5: =head,

M (medium): n=4: =head,

S (short): n < 4: < =head,

vS (very short): n < 4: 0.6 x head.

6: Overall size of the thorax and abdomen,excluding the head and male genitalia. This category is subjective in that the observer will consider **Ps. wellcomei** as a large fly, because of its long legs. However, as a guide we give the equivalent size in millimetres:

LR (large) = > 2.2mm & > 1.8mm,

M (medium) = 2-2.2mm & 1.6-1.8 mm,

S (small) = < 2mm & < 1.6mm for females and males respectively.

7: Colour of the abdomen where W = white, LG = light, M = medium and D = dark infuscation, Y = yellow, B = black.

8: When mounted or dissected the spermathecae (figured for each species) allow confirmation. Where (a) is the length of the spermathecal body, such that the common spermathecal duct is twice the length of (a) ie. 2a.

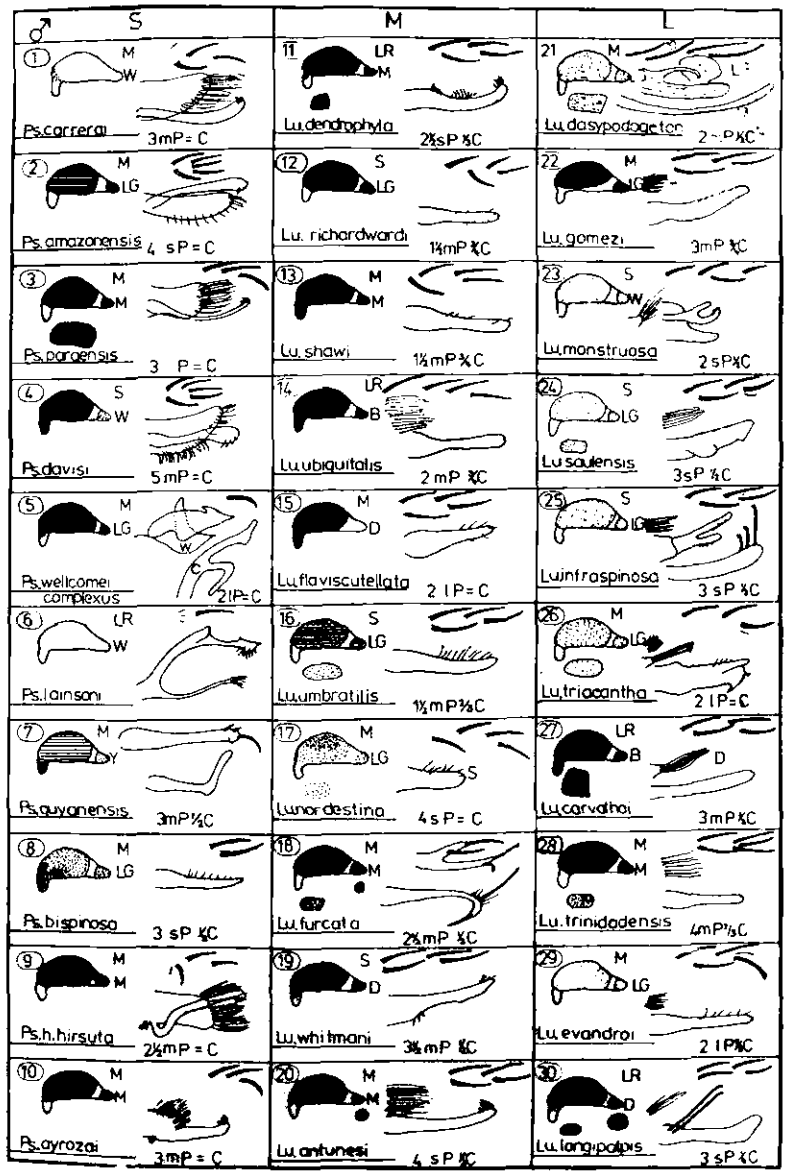

Fig. 1B. As for females with the additional parameters of: (as in examples 21 **Lu. dasypodogeton** and 22 **Lu. gomezi**).

B. Males.

9: The overall size of the genitalia, this is only used when obviously LR (large) or S (small).
10: The arrangement and number of spines on the style.
11: The presence or absence of a basal tuft.
12: The structure of the paramere and, in some cases, the
13: structure of the lateral lobe.
14: The formula 2sP1/2C is such that the genital filaments are 2x the length of the (s) small sized (P) pump which in turn is 1/2 the length of the (C) coxite. It may be determined after mounting or dissection.

References

Biagi, A. M. de B. de - 1966. Clave para identification rapida de las hembras de **Phlebotomus** anthropofilos del area endemica de Leishmaniasis cutanea en Mexico. **Rev. Invest. Salud Publ. (Mex.)**, 26: 367-372.

Chaniotis, B. N. - 1974. Use of external characters for rapid identification phlebotomine sandflies in vector studies. **J. Med. Ent.**, 11: 501.

Floch, H. & Abonnenc, E. - 1952. Diptères Phlébotomes de la Guyane et des Antilles Français. **ORSTOM**, Paris, 207 p.

Lainson, R. & Shaw, J. J. - 1968. Leishmaniasis in Brazil: 1. Observations on enzootic rodent Leishmaniasis-incrimination of **Lutzomyia flaviscutellata** (Mangabeira) as the vector in the Lower Amazon. **Trans. R. Soc. Trop. Med. & Hyg.**, 62: 385-395.

Lainson, R.; Shaw, J. J.; Ryan, L.; Ribeiro, R. S. M.; Silveira, F. T. - 1984. Presente situação da leishmaniose visceral na Amazônia, com especial referência a um novo surto da doença occorrido em Santarém, Estado do Pará, Brasil. **Boletim Epidemilogico de SESP**, No. Especial Julho 1984.

Lainson, R.; Shaw, J. J.; Ryan, L.; Ribeiro, R. S. M.; Silveira, F. T. - 1985. Leishmaniasis in Brazil. 21: Visceral Leishmaniais in the Amazon region and further observations on the role of Lutzomyia longipalpis (Lutz & Neiva, 1912) as the vector. **Trans. R. Soc. Trop. Med. & Hyg.** (in press).

Lainson, R.; Shaw, J. J.; Silveira, F. T. & Fraiha, H. - 1983. Leishmaniasis in Brazil. 19: Visceral Leishmaniasis in the Amazon Region, and the presence of **Lutzomyia longipalpis** on the Island of Marajó, Pará State. **Trans. R. Soc. Trop. Med. & Hyg.** 77:323-330.

Martins, A. V.; Williams, P.; Falcão, A. L. - 1978. American Sandflies. **Rio de Janeiro: Academia Brasileira de Ciências**, 195 p.

Morales, A.; Rodriguez, M. C. de; Ibagos, A. L. - 1982. Descripcion de la hembra de **Lutzomyia scaffi** (Damasceno & Arouck, 1956) (Diptera, Psychodidae). **Biomédica**, 2:17-21.

Ryan, L.; Lainson, R.; Shaw, J. J. - 1985. Leishmaniasis in Brazil. XXIII: Natural, flagellate infections of sandflies (Diptera: Psychodidae) in Pará State, with particular reference to the role of **Psychodopygus wellcomei** as the vector of **Leishmaniasis brasiliensis brasiliensis** in the Serra dos Carajás. **Trans.R.Soc.T.M. & H.** (in press).

Ready, P. D. & Fraiha, H. - 1981. Brazilian Phlebotomines. 6: **Lutzomyia richardwardi** sp. n., a new species of **Nyssomyia** from Amazonia with keys for this subgenus (Diptera, Psychoddiae). **Rev. Brasil. Biol.**, 41: 705-712.

Ready, P. D.; Fraiha, H.; Lane, R. P.; Arias, J. R.; Pajot, F. X. - 1982. On distinguishing the female of **Psychodopygus wellcomei**, a vector of mucocutaneos leishmaniasis, from other squamiventris series females 1. Characterization of **Ps.squamiventris squamiventris** and **Ps. s. maripaensis** stat. nov. (Diptera: Psychodidae) **Ann. Trop. Mec. & Parasit.** 76: 201-214.

Ward, R. D.; Ribeiro, A. L.; Ryan, L.; Falcão, A. L.; Rangel, E. F. - 1985. The distribution of two morphological forms of **Lutzomyia longipalpis** (Lutz & Neiva) (Diptera: Psychodidae). **Mem. Inst. Os. Cruz.** (in press).

Ward, R. D.; Shaw, J. J.; Lainson, R.; Fraiha, H. - 1973. Leishmaniasis in Brazil. 8: Observations on the Phlebotomine fauna of an area highly endemic for cutaneous Leishmaniasis, in the Serra dos Carajás, Pará State. **Trans.R.Soc.Trop.Med. & Hyg.** 67:174-183.

Young, D. G. & Fairchild, G. B. - 1974. Studies on Phlebotomine sandflies. **Annual Report 31 May 1984, Dept. Ent. Nemat., Uni. of Florida, U.S.A.** 151 p.

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