TABANIDAE OF A "MIOMBO" WOODLAND IN THE REPUBLIC OF ZAMBIA

S. N. Okiwelu, Pest Research Unit, National Council for Scientific Research,
P.O. Box 49, Chilanga, Zambia

ABSTRACT. Three Malaise traps baited with CO_2, flowing at the rate of 2mls. per min. were used for the collection of tabanids for 1 year in a "miombo" woodland in Zambia. A total of 3,587 tabanids comprising 5 species of *Tabanus* and 7 species of *Haematopota* were collected. Other insects trapped included *Glossina morsitans morsitans,* other muscoid flies, asilids, tachinids, lepidopterans, orthopterans and hemipterans.

INTRODUCTION. The importance of tabanids has been documented by a number of authors (Zumpt 1949, Lewis 1953). Tabanid bites of domestic animals cause irritation, loss of condition and reduction in milk yield, and they are a great nuisance to man (Balfour 1906, Philip 1931, Oldroyd 1964). Poulton (1934) had concluded on experimental evidence that *Trypanosoma congolense* may be transmitted to healthy cattle from infected ones by *Stomoxys* and tabanids. Many writers have discussed the potential of tabanids in the transmission of cattle trypanosomiasis in Africa: Soltys (1954), Lucas (1955) in parts of East Africa, Buxton (1955) in the Sudan and Ford (1964) in Southern Rhodesia. Weitz (1964) expressed the view that mechanical transmission is more common in spreading the infection within a herd of cattle rather than among herds. The growing importance of mechanical transmission prompted the Expert Committee on Trypanosomiasis of the World Health Organization in 1962 to recommend the need for work on this subject. The staff of the department of Veterinary and Tsetse Control Services, Republic of Zambia, have expressed increasing concern on this threat (personal communication). An investigation was therefore initiated in November, 1973, to identify the tabanid species and study their diurnal and seasonal activity cycles. Collections were made up to October, 1974. Activity cycles of the more common species will be discussed in another paper. Experiments were conducted in our field station. The tabanid species collected are discussed below.

EXPERIMENTAL AREA. The experimental area is in the Chakwenga Game Reserve which lies on the plateau between the Zambezi and Lusemfwa valleys, at an elevation of approximately 1100 m above sea level; it is located 29° 15′ E and 15° 13′ S. Climatically, the seasons are broadly divided into 3 overlapping ones: November–April, warm and wet, seasonal averages: 20° C and 85% RH; May–August, cool and dry, 13° C and 70% RH; and September to October, hot and dry, 25° C and 60% RH.

It is a miombo woodland with a lightly closed canopy, dominated by *Julbernardia globiflora* and *Brachystegia speciformis.*

Miombo woodland is a two-storeyed woodland with an open or lightly closed canopy of semievergreen trees 15–21 m. high, characterized by species of *Brachystegia, Isoberlinia, Julbernardia* and *Marquesia macroura* with *Pericopsis angolensis, Anisophyllea pomifera* (locally), *Erythrophleum africanum* and *Parinari curatellifolia* as frequent associates. There may or may not be a vaguely defined lower storey. The underwood consists of either a dense grass/suffrutex layer 0.6–1.3 m high or a dense evergreen thicket 1.3–3.6 m high. Occasionally there is an ill-defined shrub layer over the grass/suffrutex layer. Suffrutices are a very marked feature of miombo woodland, especially species of the genera: *Abrus, Combretum, Indigofera,* etc. Woody climbers are absent except in the evergreen thickets; herbaceous twiners and ground trailers occur occasionally. Epiphytes are rare. The grass carpet may be moderately dense, dense or very dense, depending on the season. A seasonal rhythm is apparent in the appearance of different genera of grasses.

METHOD. Many traps have been used for collecting tabanids (DeFoliart and Morris 1967, Hanec and Bracken 1974, Thompson, 1969, Thorsteinson et al. 1965, Wilson et al. 1966, Roberts 1970). The Malaise trap described by Malaise (1937), Townes (1962) and modified by Gressitt and Gressitt (1962) is recognized as a useful tool for collecting haematophagous Diptera (Breeland et al. 1965, Smith et al. 1965, Easton et al. 1968, Blume et al. 1972, Roberts 1970, 1971a, 1972). The Malaise trap similar to that of Blume et el. (1972) was used for the collections. Three such traps were used. These were placed at the apices of an equilateral triangle of sides 100 metres in the central section of the experimental area. The trap canopy was covered with white plastic film, while the baffle was made of black plastic. The collection cage was made out of a container approximately 16.5 liters in volume.

Various authors have used different baits for attracting tabanids. Haddow (1945) Haddow et al. (1947), Haddow and Dick (1948) used anaesthesized monkeys; Lumsden (1952) worked with human bait; Thorsteinson (1958) baited with heat; Wilson (1968), Olkowski and Anderson (1967), Roberts (1970) and DeFoliart and Morris (1967) all used CO_2 as bait. CO_2 has been found very successful in tabanid surveys in terms of numbers of specimens and species. CO_2 was therefore used as bait in these studies. CO_2 was emitted into the clear canopy at the rate of 2 liters per min from a 66 kg. CO_2 cylinder through a regulator and flowmeter, products of British Oxygen Limited. This emission rate had been found suitable (Roberts 1971b). Collections were made at 0600, 0900, 1200, 1500, and 1800 hours daily.

RESULTS. A total of 3587 tabanids were collected. There were 2 genera, *Tabanus* and *Haematopota*. Numbers were as follows: *Tabanus taeniola* P. de B. (450), *Tabanus ustus* Walker (289) *Tabanus conjormis* Ricardo (218), *Tabanus sandersoni* Austen (127), *Tabanus variabilis* Loew (69), *Haematopota pallidimarginata* Austen (1301), *Haematopota perturbans* Edwards (526), *Haematopota decora* Walker (251), *Haematopota stimulans* Austen (115), *Haematopota hirsutitarsis* Austen (87), *Haematopota distincta* Ricardo (85) and *Haematopota albihirta* Karsch (69).

Muscoid flies collected totalled 6,961 specimens. These were dominated by the following species: *Musca lusoria* Wiedemann, *Musca ventrosa* Wiedemann, *Musca* sp. (sg. *Eumusca*) and *Haematobosca* sp. Ninety-three *Glossina morsitans morsitans* Westwood were also trapped; the experiment was located in a *Glossina*-infected Game Reserve. Asilids and tachinids were occasionally seen. Lepidopterans, orthopterans and hemipterans were also collected.

ACKNOWLEDGMENTS. I am grateful to Dr. R. H. Roberts, U.S.D.A., Stoneville, Mississippi, U.S.A. and Mr. A. C. Pont, British Museum of Natural History, London, England for identifications of taba-

nids and muscoid flies, respectively, and to the Secretary General, National Council for Scientific Research, for permission to publish.

Literature Cited

Balfour, A. 1906. Biting and noxious insects other than mosquitoes. 2nd Rep. Wellcome Trop. Res. Lab. pp. 29–50.

Blume, R. R., Miller, J. A., Eschle, J. L., Matter, J. J. and Pickens, M. O. 1972. Trapping tabanids with modified Malaise traps baited with CO_2. Mosq. News 32:90–95.

Breeland, S. G. and Pickard, E. 1965. The Malaise trap-an efficient and unbiased mosquito collecting device. Mosq. News 24:19–21.

Buxton, P. A. 1955. *The Natural History of Tsetse Flies.* Lewis, London. 816 pp.

DeFoliart, G. R. and Morris, C. D. 1967. A dry ice-baited trap for the collection and field storage of haematophagous Diptera. J. Med. Entomol. 4:360–362.

Easton, E. R., Price, M. A. and Graham, O. H. 1968. The collection of biting flies in West Texas with Malaise and animal baited traps. Mosq. News 28:467–469.

Ford, J. 1964. The geographical distribution of trypanosome infections in African cattle populations. Bull. Epizoot. Dis. Afr. 12:307.

Gressitt, J. L. and Gressitt, M. K. 1962. An improved Malaise trap. Pacific Insects 4(1): 87–90.

Haddow, A. J. 1945. Further observation on the biting habits of Tabanidae in Uganda. Bull. Entomol. Res. 35:659–674.

Haddow, A. J. and Dick, G. W. A. 1948. Catches of biting Diptera in Uganda, with anaesthesized monkeys as bait. Ann. Trop. Med. Parasit. 424:271–277.

Haddow, A. J., Gillett, J. D. and Highton, R. B. 1947. The mosquitoes of Bwamba County, Uganda. V. The vertical distribution and biting-cycle of mosquitoes in rain-forest, with further observations on microclimate. Bull. Entomol. Res. 37:301–330.

Hanec, W. and Bracken, G. K. 1964. Seasonal and geographical distribution of Tabanidae (Diptera) in Manitoba, based on females captured in traps. Can. Entomol. 96:1362–1369.

Lewis, D. J. 1953. The Tabanidae of the Anglo-Egyptian Sudan. Bull. Entomol. Res. 44:175–216.

Lucas, J. M. S. 1955. Transmission of *Trypanosoma congolense* in cattle under field conditions in the absence of tsetse flies. Vet. Rec. 67:403–407.

Lumsden, W. H. R. 1952. The crepuscular biting activity of insects in the forest canopy in Bwamba, Uganda. A study in relation to the sylvan epidemiology of yellow fever. Bull. Ent. Res. 42:721–760.

Malaise, R. 1937. A new insect trap. Entomologisk. Tidskr. 58:148–160.

Oldroyd, H. 1964. *The Natural History of Flies.* Weidenfeld & Nicolson, London. 324 pp.

Olkowski, W. and Anderson, J. R. 1967. Relationships between host attack rates and CO_2-baited Malaise trap catches of certain tabanid species. Calif. Mosquito Control Assoc. Proc. 35:77.

Philip, C. B. 1951. The Tabanidae (horse flies) of Minnesota, with special reference to their biologies and taxonomy. Minn. Agric. Exp. Sta. Tech. Bull. 80:1–132.

Poulton, W. F. 1934. Annual Report of the Veterinary Department, Uganda 1933, Entebbe, 1934. pp. 37–38.

Roberts, R. H. 1970. Tabanidae collected in a Malaise trap baited with CO_2. Mosq. News 30:52–53.

Roberts, R. H. 1971a. The seasonal appearance of Tabanidae as determined by Malaise trap collections. Mosq. News 31:509–512.

Roberts, R H. 1971b. Effect of amount of CO_2 on collection of Tabanidae in Malaise traps. Mosq. News 31:551–558.

Roberts, R. H. 1972. Relative attractiveness of CO_2 and a steer to Tabanidae, Culicidae and *Stomoxys calcitrans* (L). Mosq. News 32: 209–211.

Smith, G. E., Breeland, S. G. and Pickard, E. 1966. The Malaise trap—a survey tool in medical entomology. Mosq. News 25:398–400.

Soltys, M. A. 1954. Proc. Fifth Meet. Int. Sci. Comm. Tryp. Res., BPITT Publ. No. 206: 137–140.

Thompson, P. H. 1969. Collecting methods for Tabanidae (Diptera). Ann. Entomol. Soc. Amer. 62:50–57.

Thorsteinson, A. J. 1958. The orientation of horse flies and deer flies (Tabanidae: Diptera) I. The attractance of heat to tabanids. Entomol. Exp. Appl. 1:191–196.

Thorsteinson, A. J., Bracken, B. G. and Hanec, W. 1965. The orientation behaviour of horse flies and deer flies (Tabanidae: Diptera). III. The use of traps in the study of orientation of tabanids in the field. Entomol. Exp. Appl. 8:189–192.

Townes, H. 1962. Design for a Malaise trap. Proc. Entomol. Soc. Wash. 64:253–262.

Weitz, B. 1964. The reaction of trypanosomes to their environment in *Symposia* of the *Society* of *General Microbiology* 14:112–121.

Wilson, B. H. 1968. Reduction of tabanid populations on cattle with sticky traps baited with dry ice. Jour. Econ. Entomol. 61:827–829.

Zumpt, F. 1949. Medical and veterinary importance of horse-flies. S. Afri. Med. Jour. 23:359–362.