The Potential Significance of Biting Midge (Culicoides Latreille) Population in Nigeria

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ABSTRACT

CULICOIDES species are well-known as troublesome biters and transmitters of various diseases to man and animals. Surveys in Nigeria show Culicoides species to be well-distributed throughout the vegetational zones. The possible direct and indirect effects of such a distribution on production are discussed.

GENERAL CONSIDERATIONS

Culicoides species are widespread in distribution in the World and are believed to be absent only in a few areas (Macfie, 1921; Ingram and Macfie, 1921). Surveys in Nigeria (Nicholas, Kershaw, Duke, 1953; Dipeolu 1976; Arbovirus Research Project Report 1968–1970) though sketchy, indicates the incidence of Culicoides spp. in all vegetational zones throughout the year. 39 species have been indentified in Nigeria (Dipeolu and Sellers, 1975). The species in Nigeria are probably multivoltine because of the tropical conditions as contrasted to European species which are univoltine (Onyia, 1971).

Culicoides spp. are able to feed on a wide variety of hosts which include well-known hosts such as human beings, goats, sheep, cattle, pigs, horses and other hosts such as chimpanzees (Nicholas et. al. 1953), African giant rat Cricetomys gambianus (Dipeolu, 1976) birds (Jellison and Phillip 1933), Lizards (Myers 1934), and even engorged mosquitoes (Suntion and Little 1925). The biting habits of midges had had considerable effect on human settlements and the tourist industry in the Carribean (Linley and Davis 1961) and Southern Scotland (Hill 1947). Kettle (1965) listed all the diseases known to be transmitted by Culicoides spp. which included viral, protozoan and filarial diseases. Some of these disease agents such as Mansonella ozzardi, Venezuelan equine encephalitis, Eastern-Equine encephalitis, 3-day-fever and Japanese-B encephalitis transmitted by the closely-related Lasio belia sp (Wu and Wu 1957), have not been reported in Nigeria. Others transmitted by Culicoides spp. such as onchocerciasis of cattle and horses (Buckly 1938, Steward 1933) and fowl pox (Tokunaga 1933) are rarely documented. Diseases such as Acanthocheilonema filariasis in man, Blue Tongue (BT) of sheep, African Horse Sickness (AHS) of horse, Leukocytosis of birds, Haemoproteosis of poultry and wild birds have been reported (Nicholas et. al. 1953; Bida and Eid 1974; Taylor 1975; Adene and Dipeolu 1975; Gray 1964; Cowper 1968) in Nigeria. This paper highlights the possible role of Culicoides spp. as biters and transmitters of various diseases in Nigeria in the light of present findings and pin-points further neglected areas of research.

Biting-habits:

Culicoides species are known among the Yoruba-speaking people of Nigeria as “Kotonkan” (literally meaning—very small things). The disturbance and irritation following Culicoides bite is also well known among the populace. The bite of C. austeni, a West African species, has been described by Sharp 1928 as like ‘……..the prick of a needle………..there is little pain until 24 hours later when irritation may be considerable’. Perhaps the irritation following bite is a hypersensitivity reaction similar to a reaction noted in horses (Rick 1934). At the Y.M.C.A. camp, Eruwa, in the forest zone of Western Nigeria, activities are planned to coincide

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with periods of low insect activity (Dipeolu and Ogunrinade 1976). In large areas of Nigeria where agriculture is unmechanised and based on the age-long hand hoe, the nuisance of biting insects such as Culicoides spp. could have a deleterious effect on effective working hours. Morning biting species like G. grahami (Nicholas et al. 1953) could be of greater significance to the farmer in the warm tropics where morning hours are vital. Peak of midge abundance in Nigeria are March–April and October (Dipeolu and Sellers 1976). During such peaks, local farmers have been noticed to use leaves tied to a bunch to ward off the midges. From personal observations, animals during peaks of midge activity, appear restless, rub their body against fence posts and cattle switch their tails to ward off the insects. Such restlessness may reduce animal production and scratching may lead to lacerations, secondary bacterial infection and hide damage.

**Disease transmission**

The ability of Culicoides spp. to feed on a wide variety of hosts and to complete full engorgement on more than one host (Dipeolu 1976) has implications for mechanical and biological transmission of diseases.

Five filaria species are known to be transmitted to human and animal hosts by Culicoides spp. (Kettle 1965). Of these only 2 (Acanthochilomena persians, Acanthochilomena persians) having been reported in great detail in West Africa. Acanthochilomena persians is endemic along the West African coast (Sharp 1928; Nicholas et al. 1953, Van der Berghe and Chardome 1952), is reportedly transmitted by C. grahami (Sharp 1927). This was challenged by Chardome and Peel (1949) and Harding and Peel (1949) who showed that microfilaria of A. persians was not taken up by C. grahami. It has now been established that C. austeni is the vector of A. persians and A. streptocerca develop into mature forms in C. grahami (Duke 1954). The known vectors of Acanthochilomena spp., C. austeni and C. grahami have been found in surveys in Nigeria (Arbovirus Research Project 1968; Ogunrinade, Dipeolu and Sellers 1976; Dipeolu and Sellers 1975). Protozoans such as Leucocytozoon and Haemoproteus spp. have earlier been known to be transmitted by Culicoides spp. (Akiba 1960; Fallis and Wood 1957; Fallis and Bennett 1960). Following these studies, Hepatositis kochi, a blood parasite of monkeys, whose vector long evaded workers, was shown to be transmitted by Culicoides species (Garnham, Heisch and Minter 1961).

Leucocytozoon and Haemoproteus occur in various birds in Nigeria and the ability of C. fulvothorax, C. distincticeps, C. grahami, C. endelini, C. quingualis and C. micola to feed on some avian hosts (Dipeolu 1975) show a possible role of these species in transmission of the parasites.

Various viruses have been shown to be transmitted by Culicoides spp. (Kettle 1965). Blue-tongue virus have been demonstrated in the salivary glands of Culicoides spp. (Bowne and Jones 1966) and shown to be transmitted in Africa by C. micola (Du Toit 1944), C. tororoensis (Walker and Davies 1971), C. milnei (Walker and Davies 1971). Blue tongue is a highly fatal disease of sheep leading to great economic loss in meat, milk and wool. C. micola, and incriminated vector, has been found to be most abundant in different surveys in Nigeria (Arbovirus Research Project Reports 1968; Dipeolu and Sellers 1975; Ogunrinade et al. 1976). Blue Tongue virus types 6, 7, 10 and 16 have been isolated in 74841 Culicoides put in 766 pools (Arbovirus Research Project Report 1968). Further isolates were made in 1969 and 1970 at the Arbovirus Research Project, Ibadan. Confirmed cases of Blue-Tongue in sheep have been reported in Nigeria (Anon 1943; Bida and Eid 1974). In an outbreak of BT at Dandawa, Northern Nigeria in 1943, 500 out of 750 sheep died (reported in Bida and Eid 1974). More recently at Katakormi in N.W. Nigeria, strain 10BT virus caused 31–53% mortality in imported sheep (Bida and Eid 1974). Serological evidence of previous contact with BT were found by gel-diffusion tests in 49.7% cattle, 28.9% sheep, and 29.4% goats sampled (Taylor 1975). Blue-tongue is
probably endemic in Nigeria, and could be a limiting factor in breeding programmes involving importation of exotic stock. Of long term concern, is the fact that BT is impossible to eradicate once it has been established in animal population (Erasmus 1975).

African Horse Sickness (AHS) was shown to be transmitted by Culicoides spp. (Du Toit 1944). Further evidence of multiplication of type 9 AHS virus has been shown in Culicoides spp. (Mellor, Boorman, Jennings 1974). Type 9 AHS virus caused an outbreak in 1959/60 spreading through Middle East and S.W. Asia causing the death of up to 300,000 horses (Howells 1963). Sporadic outbreaks of AHS have occurred in Nigeria. Death of horses in 1951 at Maiduguri, N.E. Nigeria and in 1966 at Kaduna were traced to AHS (Arbovirus Research Project Report 1970). More recently, type 9 AHS virus has been isolated in a horse that died of the acute disease at Zaria (Kemp, Humberg and Athaji 1971), and 20 imported Shire horses died of AHS in Kano (Taylor 1973). Serological evidence of AHS antibodies have been found in about 40% of 151 horses sampled in Nigeria (Kemp 1974). These findings have serious implications for horse breeding programmes, racing, polo games and other activities involving movement of animals across national frontiers of Nigeria. The previously unreported virus in West Africa, Rift Valley Fever (RVF) virus, was isolated in Culicoides pools in Nigeria (Arbovirus Research Project Report 1970). RVF is highly fatal to sheep in East Africa. Other viral isolates from Culicoides spp. include Simbu group, Congo Shuni, Bugbe (Arbovirus Research Project Report 1968), Kotonkan virus (Tomori, Fagbemi and Kemp 1974) Sabo and Samonda virus isolated from C. imicola and Abadina virus from C. schultzei (Arbovirus Research Project Reports 1970). Other unknown fungi, ciliates and flagellates have been isolated in wild caught Culicoides spp. in West Africa (Sharp 1928). The pathogenic significance of some of these isolates are as yet unknown.

CONCLUSION

Very little work had been done on Culicoides spp. in Nigeria, consequently, little is known about their role as vectors of various human and animal diseases in this country. The viral isolates made by the Arbovirus Research Projects, Ibadan, including Blue-tongue, Congo, Shuni, Bugbe and others were not traced to specific Culicoides species since pools were used. Knowledge about specific vectors is therefore incomplete and conjectural.

Host preference studies in Culicoides spp. which are being developed through blood meal analysis, by the author will perhaps aid in determining vectors. The various outbreaks of endemic diseases among exotic stock is cause for concern in the light of current plans to import exotic stock to upgrade indigenous stock. Control of midges therefore require more emphasis to be placed on the biology, seasonal variations, and distribution of Culicoides spp. in each vegetational zone especially since present knowledge is limited and largely confined to Ibadan, in the rain forest zone.

REFERENCES


ANNON, J. (1943) Annual report of veterinary department, Nigeria p. 5.

ARBOVIRUS RESEARCH PROJECTIONS, University of Ibadan Reports 1968-70.


DU TOIT, R. M. (1944) The transmission of blue tongue and Horse sickness by Culicoides-Undersetpeepstoep. J. vet. sci. 19, 7-16.


JELLISON and PHILLIP (1933) Quoted in Hill 1947.


MEIGER, I. (1921) Quoted in Hill 1947.


TORUNAGA, 1937 Quoted in Kettle 1965.


WU and WU (1957) Isolation of virus of B. type Encephalitis from Lasiohelia taiwana shiraki in a blood sucking midge Acta. microbiol sinica 5 22–26