Zeitschrift: Acta Tropica
Herausgeber: Schweizerisches Tropeninstitut (Basel)
Band: 37 (1980)
Heft: 1

Artikel: Tanzania Filariasis Project : studies on microfilaraemia and selected clinical manifestations of Bancroftian filariasis

Autor: Abaru, D.E. / McMahon, J.E. / Hamilton, P.J.S.

DOI: https://doi.org/10.5169/seals-312640

Acta Tropica 37, 63–71 (1980)

[1] East African Institute for Malaria and Other Vector-Borne Diseases, Amani, Tanzania
[2] MRC/WHO/Tanzania Helminthiasis Research Unit, Tanga, Tanzania
[3] Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine, U.K.
[4] Caribbean Epidemiology Centre, Port of Spain, Trinidad

Tanzania Filariasis Project

Studies on microfilaraemia and selected clinical manifestations of Bancroftian filariasis

D. E. Abaru[1], J. E. McMahon[2], T. F. de C. Marshall[3], P. J. S. Hamilton[4], J. P. Vaughan[3], P. Wegesa[1]

Summary

In a total of 1977 males aged 5 years and over examined in 21 cluster samples on the coast of Tanzania, the overall rate for microfilariae of *Wuchereria bancrofti* was 32%. Hydrocoele and elephantiasis rates were 39% and 3%, respectively. The rates and severity of these 2 clinical manifestations increased in the older age groups. Both the microfilarial density and prevalence increased rapidly in the early age groups, followed by a levelling off and then a slight fall in old age. There was no association between microfilarial densities or rates and the overall prevalence of hydrocoele, but a negative association was demonstrated between microfilaraemia and hydrocoeles and elephantiasis. A comparison between the length of residence in an endemic area and the microfilarial and clinical sign rates showed evidence for the long incubation period for *W. bancrofti* and for the slow development of hydrocoeles and elephantiasis.

Key words: Tanzania; Bancroftian filariasis; microfilaria; survey; hydrocoele.

Introduction

In June 1973 a Filariasis Project commenced in Pangani District in the Tanga region of Tanzania (Wegesa et al., 1979). Because results from the early survey on males aged 10 years or more indicated that hydrocoele, funiculitis

Correspondence: Dr. J. P. Vaughan, Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London WC1E 7HT, U.K.

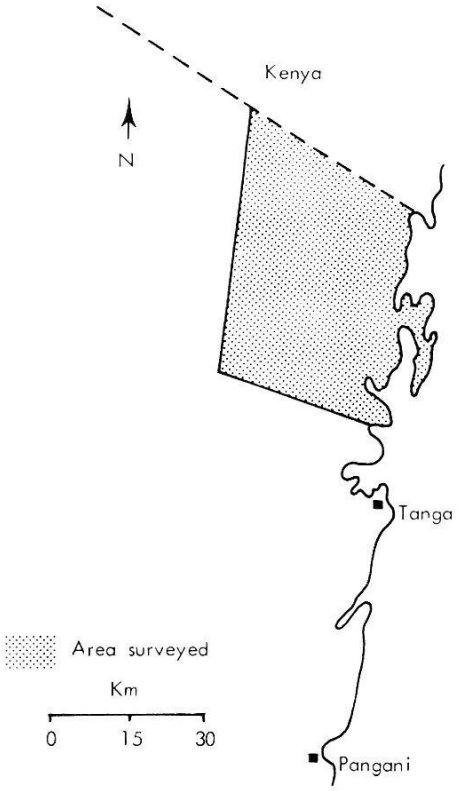

Fig. 1. The area surveyed. North of Tanga.

and elephantiasis were the most important clinical findings in Bancroftian filariasis a further survey was planned along the coast north of Tanga (Fig. 1), aimed at obtaining information on:

1. the prevalence and density of microfilariae of *W. bancrofti* in different ecological areas;
2. the prevalence and severity of hydrocoele, funiculitis and elephantiasis;
3. whether there was a correlation between microfilaraemia and the above named clinical signs;
4. the relation between duration of residence in an area and 1. and 2. above.

Methods and materials

Sampling and area surveyed (July–August 1974)

The area surveyed extended from north of Tanga town to the Kenyan border (Fig. 1). The area was divided in 5 ecological zones from which 21 villages were randomly selected so that those selected in each zone were in proportion to the total population of the zone. These were: 1. three fishing villages directly on the coast, 2. five villages up to two miles inland in the flat narrow coastal plain, 3. seven compact villages between 2 and 20 miles inland lying in the higher coastal plateau area, 4. four scattered inland villages nearer to the foothills of the Usambara mountains and 5. two sisal estate compounds.

The survey methodology was as described by Wegesa et al. (1979) except that the minimal age of subjects in the random cluster samples was reduced from 10 to 5 years.

Subsequent visits to the villages surveyed were made to examine the non-attenders from the original sample selected. There was no apparent clinical or parasitological bias in non-attenders of the first examination who were examined at follow-up when compared to the original first attenders.

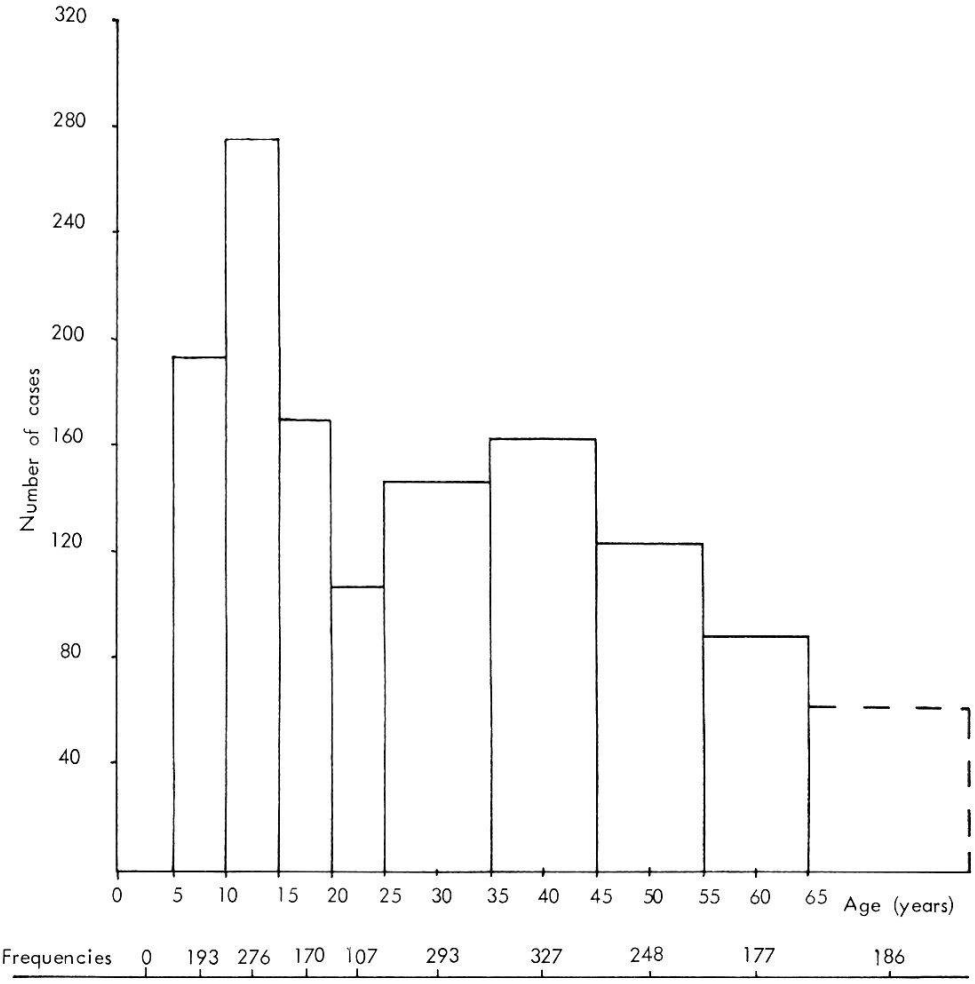

Fig. 2. Age distribution of all subjects examined.

Final attendances for examination, including follow-ups after non-attenders were contacted, varied from 72–97% with an overall attendance of 85% (1977 persons) in the total of 21 clusters surveyed. This represented about 10% of the total population.

The age distribution of all subjects examined is shown in Fig. 2.

Parasitological and clinical

Parasitological investigations and examinations for funiculitis, hydrocoele and elephantiasis were conducted as described by Wegesa et al. (1979) except that in the present work cystic swellings above the testes were also recorded and elephantiasis was graded as follows:

Scrotal elephantisis: Grade I Lymphoedema, Grade II Muddy scrotum, Grade III Thickened skin with loss of elasticity, Grade IV Evident elephantiasis with gross deformation.

Limb elephantiasis: Grade I Loss of contour, Grade II Thickened skin, Grade III Evident elephantiasis.

Results

The results in the 5 ecological zones are shown in Table 1. No significant differences in the microfilaria (mf), hydrocoele or elephantiasis rates were

Table 1. Microfilarial rates, median microfilarial density, hydrocoele and elephantiasis rates in different ecological zones

Ecological zone of villages	Number of villages	Mf rate	Median mf density	Hydrocoele rate	Elephantiasis rate
Coastal villages	3	34%	10	44%	3%
Villages up to 2 miles inland	5	28%	11	34%	3%
Compact inland villages	7	27%	7	45%	2%
Scattered inland villages	4	24%	6	39%	5%
Sisal estates	2	40%	15	40%	0.6%

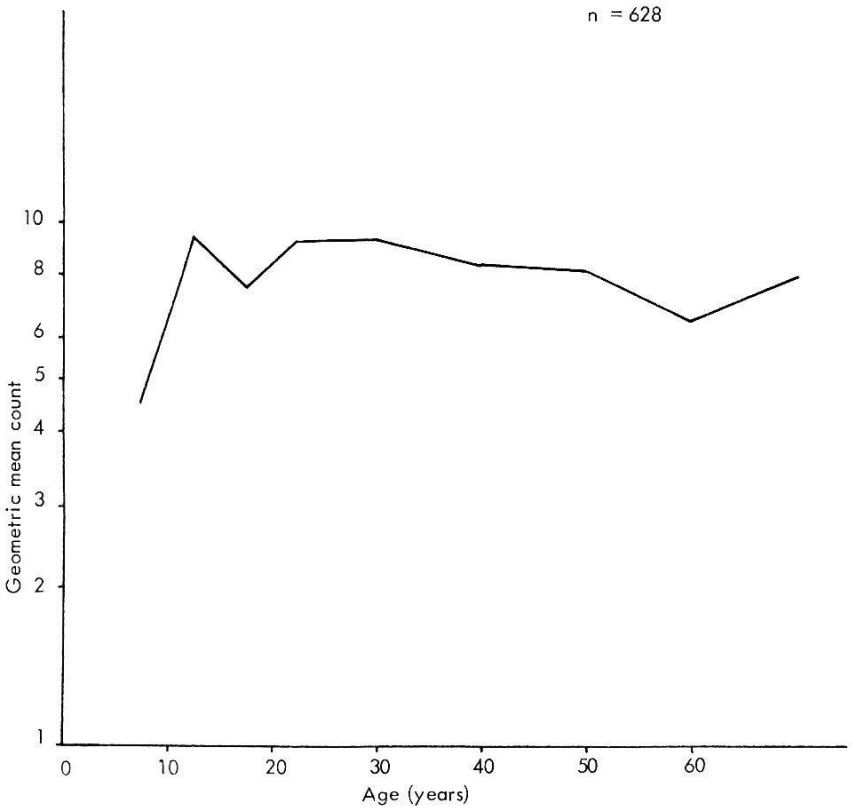

Fig. 3. Geometric mean microfilaria counts among positives, by age.

found between the different zones and the data were therefore aggregated and are presented for all zones.

Prevalence and density of microfilariae

The mf rate for the 21 villages ranged between 18% and 49%.

In all villages the age prevalence shows the pattern described by Wegesa et al. (1979) of a steep rise followed by a levelling out and usually a slight fall after 50 years.

Geometric mean counts among positives are shown by age in Fig. 3. There is a steep rise and then a very slight fall. Within all age groups among positive

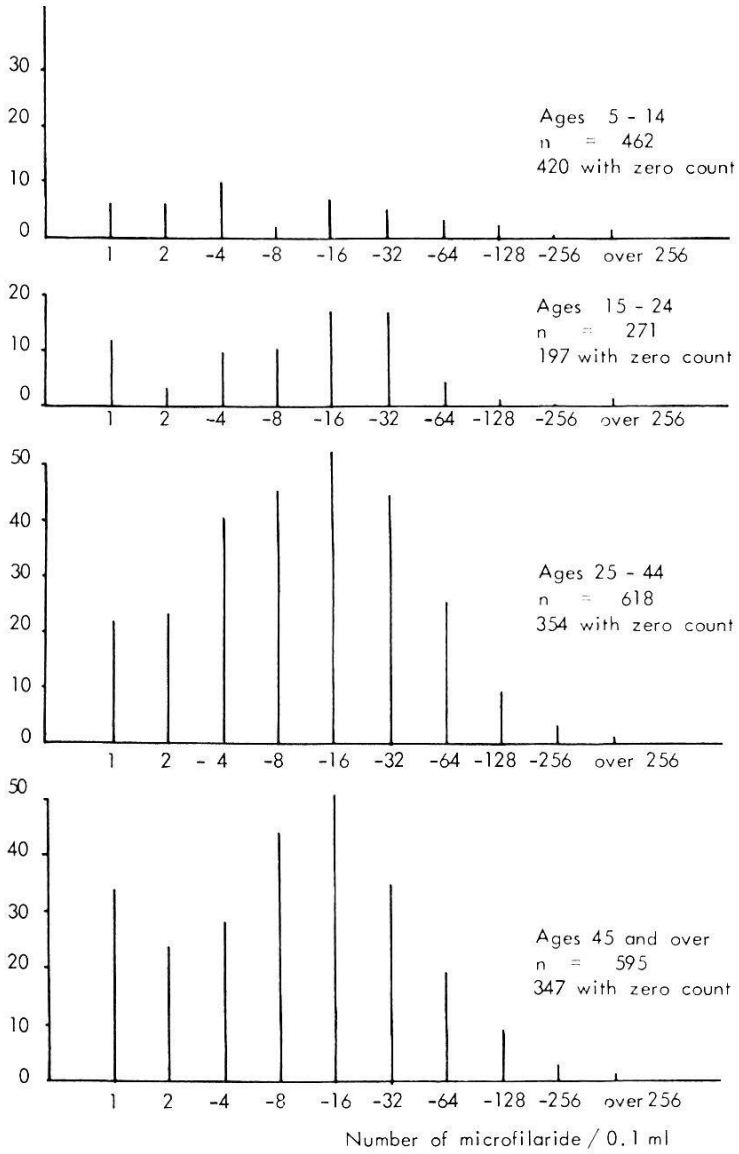

Fig. 4. Distributions of microfilaria counts, by age.

cases the low counts have the highest frequency although there is an increased relative frequency of high counts in the older age groups. The distributions of counts by age are shown in Fig. 4. In this figure, the counts are on a logarithmic scale and the class intervals of counts are of increasing width.

Clinical manifestations

Funiculitis. Fig. 5 shows a sharp rise with age, after puberty, in prevalence of both the history of typical spermatic cord pain and in the clinical finding of thickening of the cord. These findings drop significantly after the age of 50 years.

Hydrocoele. The percentage of males with either unilateral or bilateral hydrocoeles increases with age (Table 2). The overall prevalence of hydrocoeles in males aged 55 years and above is 56%.

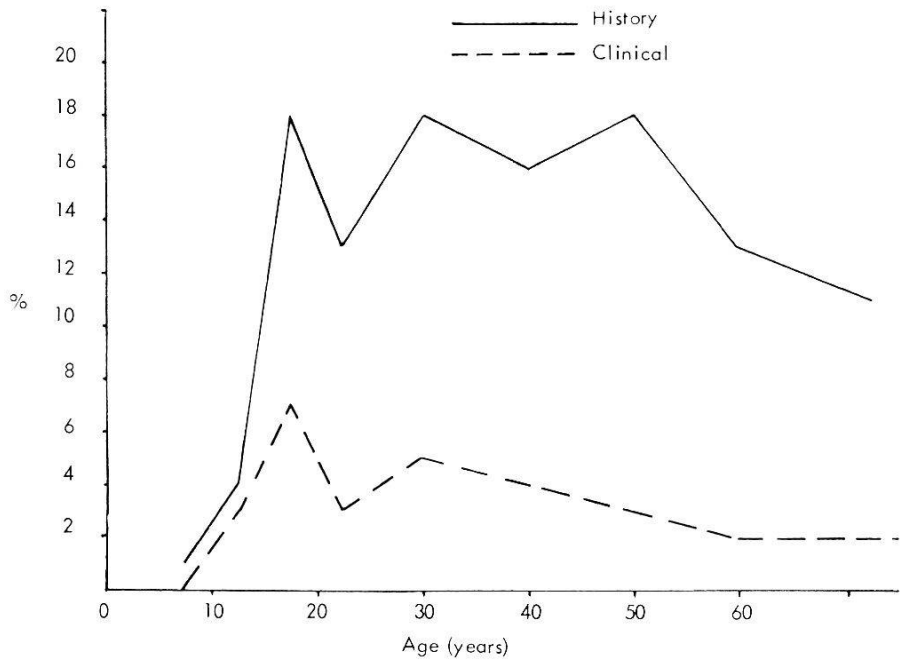

Fig. 5. Prevalence of funiculitis, by age.

Table 2. Hydrocoele rates by age, with prevalences of microfilariae

Age (years)	Number seen*	Numbers with one side	Hydrocoele both sides	Prevalence of microfilariae in those with		
				no hydrocoele	one side	both sides
5–9	192	0	0	9%		
10–14	276	9 (3%)	1 (0.4%)	9%	11%	0%
15–19	170	23 (14%)	12 (7%)	28%	18%	25%
20–24	106	13 (12%)	8 (8%)	33%	15%	11%
25–34	292	52 (18%)	71 (24%)	46%	48%	30%
35–44	322	78 (24%)	92 (29%)	52%	35%	35%
45–54	246	71 (29%)	87 (35%)	46%	44%	40%
55–64	172	53 (31%)	70 (41%)	44%	51%	32%
65+	177	44 (25%)	83 (47%)	33%	39%	40%
Total	1,953	343 (18%)	425 (22%)	29%	39%	35%

* Includes those with age and details of presence or absence of hydrocoele on both sides only.

There was an increased proportion of larger hydrocoeles in the older age groups.

Elephantiasis. Of the 1963 persons examined on whom full information was obtained, a total of 31 (1.6%) had elephantiasis of the leg (9 left leg, 10 right leg and 12 bilateral). 24 (1.2%) persons had elephantiasis of the scrotum. The increased prevalence by age of both leg and scrotal elephantiasis is shown in Table 3.

Table 3. Subjects with elephantiasis of leg and/or scrotum by age

Age (years)	No. examined*	Leg	Scrotum
5–19	639	Nil	Nil
20–24	107	2 (1.9%)	Nil
25–34	293	2 (0.7%)	4 (1.4%)
35–44	326	4 (1.2%)	4 (1.2%)
45–54	245	4 (1.6%)	5 (2.0%)
55–64	174	7 (4.0%)	2 (1.1%)
65+	179	12 (6.7%)	9 (5.0%)
Total	1,963	31 (1.6%)	24 (1.2%)

* Includes only those with age and details of elephantiasis recorded.

The gradings of the legs were: 16 cases with Grade I, 17 Grade II, and 20 Grade III. Of the cases of scrotal elephantiasis none were Grade I, 9 Grade II, 8 Grade III, and 8 Grade IV.

No cases of elephantiasis were seen under 20 years.

No cases of arm elephantiasis were seen (arm elephantiasis was seen in later surveys).

Correlations

There was no association found between the clinical findings of funiculitis and microfilaraemia.

Table 2 shows the prevalence of mfs by age in subjects with and subjects without hydrocoeles. Above the age of 25 there is relatively little change with age. There is a negative association between hydrocoele and microfilaraemia in all age-groups except the highest (65 years and over). In this highest age-group the apparent positive association is not statistically significant.

There was also a negative association found between severity of hydrocoele and microfilaraemia in that those with severe hydrocoeles had lower mf rates than those with less severe ones, in separate age-groups.

There was a negative association between microfilaraemia and leg elephantiasis in that only 4 of the 31 cases (13%) were positive. Six of the 25 cases (24%) of scrotal elephantiasis had microfilaraemia.

Effect of length of residence in an endemic area

The mf and hydrocoele rates among 182 persons of all ages who had previously resided in non-endemic areas and then lived for varying periods in these villages are shown in Table 4. These results show a definite correlation between length of residence and mf and hydrocoele rates. No elephantiasis occurred in these subjects.

Table 4. Microfilaria and hydrocoele rates for persons who had lived for varying periods in an endemic area

Length of residence (years)	Number	Microfilariae		Hydrocoele	
		No. +ve	Rate	No. +ve	Rate
1	28	Nil	Nil	1	3.6%
1–4	69	4	5.8%	10	14.5%
5–9	43	5	11.6%	7	16.3%
10–15	42	9	21.4%	14	33.3%
Total	182	18	9.9%	32	17.6%

Discussion

The pattern of mf rates and clinical signs could not be related to differences in the five ecological zones as defined in this investigation. Differences between villages within the same defined zone were often greater than between villages in different zones.

Of the 21 cluster samples examined there was also no consistent relationship between mf rates and clinical signs, e.g. the village with the lowest mf rate (18%) and median mf density (3 mf) had a higher hydrocoele rate than most other villages. This complex situation could be due to the fact that the present clinical sign rate is dependent on the level of transmission of *W. bancrofti* that existed many years ago, whereas the present mf rate is dependent on much more recent transmission levels. Climatic changes or environmental modification such as the addition or removal of rice fields or other water bodies within the vicinity of a village may effect vector density at different periods leading to a low correlation between prevalence rates of clinical signs and microfilaraemia. Such a low correlation was also reported by Wijers (1977) in certain areas of the Kenya coast, although later surveys in the Tanga Region (McMahon, unpublished data) and reports by Jordan (1960) and Wijers (1977a) did show a correlation between mf rates and densities and sign rates.

Evidence for the long incubation period of *W. bancrofti* and for the slow development of hydrocoele and elephantiasis is shown by the relation between the length of residence and microfilaraemia and the appearance of these signs. Of those persons living in an endemic area for less than one year none became mf positive and only 4 of 69 (5.8%) who had lived up to 5 years had microfilaraemia.

Both the prevalence and density show a rapid rise with age then a levelling off and a slight fall as age incrases, Wijers (1977b) noted that on the coast of Kenya both mf rates and densities increased with age but levelled off about the age of 50.

The present survey confirmed the findings of Wegesa et al. (1979) that hydrocoele, funiculitis and elephantiasis are the most important clinical manifestations of filariasis. Hydrocoele and elephantiasis rates incrased with age as did the proportion of subjects with the more advanced hydrocoeles.

In subjects with funiculitis and/or smaller hydrocoele, mf prevalence and density follow the pattern seen in the total population. But the rate of microfilaraemia was much lower in subjects with the most advanced hydrocoeles and this was also demonstrated in cases of leg elephantiasis, only 4 of 31 (13%) being positive.

A negative correlation between microfilaraemia and both advanced hydrocoele and elephantiasis was also reported by Wijers (1977b).

The present work confirmed that hydrocoeles are the main public health problem resulting from Bancroftian filariasis on the coast of Tanzania. A simple and rapid method of estimating the endemicity of filariasis in an area would be to examine a sample of the adult-male population for hydrocoeles. Although this could only be an indicator of past transmission it might be an economical method of survey prior to establishing large scale control measures. On the other hand, mosquito infectivity rates are the only indicators of recent transmission.

Following the present survey it was planned to obtain more detailed information on the dynamics of transmission by parasitological and clinical studies of total village populations and longitudinal entomological investigations. These studies, and the effect of intervention methods to control transmission, are the subject of further papers.

Jordan P.: Bancroftian filariasis in Tanganyika: observations on elephantiasis, microfilarial density, genital filariasis and microfilaraemia rates. Ann. trop. Med. Parasit. *54*, 132–140 (1960).

Wegesa P., McMahon J. E., Abaru D. E., Hamilton P. J. S., Marshall T. F. de C., Vaughan J. P.: Tanzania Filariasis Project: survey methodology and clinical manifestations of Bancroftian filariasis. Acta trop. (Basel) *36*, 369–377 (1979).

Wijers D. J. B.: Bancroftian filariasis in Kenya. IV. Disease distribution and transmission dynamics. Ann. trop. Med. Parasit. *71*, 451–463 (1977a).

Wijers D. J. B.: Bancroftian filariasis in Kenya. I. Prevalence survey among adult males in the Coast Province. Ann. trop. Med. Parasit. *71*, 313–331 (1977b).