Some Observations on

Filariaeis & Elephantiaeis

in the South Pacific.

by James Roberts Boyd  M.D. 1914.

M.B. Edin. (Edin.)

July 1911.
Prefatory Remarks.

In January of this year, after seven months' residence at the Colonial Hospital, Suva, I was appointed to the district of Kadavu, an island lying about 60 miles south of Nadi town, the main island of the Fiji group.

Funding in my everyday hospital practice so many cases of filariasis or elephantiasis, I was induced to undertake this small work on the subject during my spare hours.

An additional inducement was the fact that no one had previously made any study of the disease on Kadavu, and as various observers, working in different parts of the South Pacific have shown what varied features the infection may present, I have endeavoured in this work to determine the more important characteristics of the disease as it occurs on this island.

In order to indicate clearly the position of Kadavu, I have attached to these papers a map tracing and also give a very short account of the island on page 4.
renders itself into a mass of statistical tables, I have placed these by themselves at the end; and as an introduction to my tables, I have given a short account of the methods or techniques employed throughout my observations. A very brief reference is made to the chief mosquito intermediaries.

As regards literature, I have been limited for reference to the very few writings on the subject, which I have collected during a year’s residence in Fiji. A short bibliography is attached.
Kadavu is a well-wooded island, about 35 miles long by 1 to 5 miles broad, or it lies, practically speaking, on hat. 19° 8 by long 178° E.

It has an abundant & excellent water supply & a rainfall of about 90 inches for annum. The average rainfall per month during my residence on the island has been 7.01 inches.

The temperature ranges from about 65-66° as a minimum in the winter to 88-89° as a maximum in the summer.

The total population of the island is slightly over 6000. (Table I)

For a tropical country the health of the people is good. Dysentery (bacillary) occurs in epidemic form now and then, especially during the hot months—January, February, March.

Framboesia, as in other parts of Fiji, is very common; in fact almost every child is affected at one time or another.

Luesens tuberculosis is rarely seen but the pulmonary form of tuberculous glands are by no means rare.

The only diseases, which, as far as
our knowledge goes, are dependent upon
mosquito intermediaries are filariasis
Malaria. The latter is not a common
disease on the island.

East Indian cookies have recently
been imported, but malaria, as an
indigenous disease, is quite unknown.
Filaria - Historical Survey

It was the discoveries of Demarquay, Wucherer, Lewis Bancroft (1860-1870), which first demonstrated to the medical world the existence of the human infection now known as Filaria, and since that time new knowledge has been very greatly extended by the work of such men as Manson, Burkow, more recently by Dow. Fullerton.

The larval form of the parasite was first discovered by Demarquay in 1863 in the chymous fluid of a hydrocele. In 1867 Bancroft, working as far south as Brisbane in Australia, discovered the adult form - the Filaria Bancrofti.

Since that time the parasite has been found in almost every tropical and subtropical country where it has been known to occur in patients living as far north as Southern Europe. It is known to exist in South China where about 10% of the population are infected. It is a very frequent parasite in Madras and in other parts of India. In Demerara, the West Indies and West Africa, its great frequency has been testified to
by Daniels, Rev. R. Sutton.

Very early after the advent of the white man to the islands of the South Pacific, the very numerous cases of elephantiasis attracted the attention of medical men, but it was not till the causal relationship of *Filaria bancrofti* with the condition was suggested that much earnest work was devoted to the subject of filariasis in these parts.

Many islands have now been investigated and many important variations recorded, variations in some cases so distinct as to give to the workers the impression that they were dealing with some new form.

In several islands, however, and notably in the Solomons, New Hebrides and New Caledonia, the disease and its special features have still to be studied.

Thomson, in 1895, started his work in Tonga, and, as a result, found that 36.5% of the population harboured the filaria. His later investigations in the Friendly Islands fix the infection rate there at 32.7%.

In Samoa it is estimated that 60% of the inhabitants are filaria carriers. 

Julturton has recently shown that a very high percentage of the natives of
the Bismarck Archipelago, German New Guinea, harbour the parasite.

Gloede, as a result of his work in Fiji, calculated that 25% of the population were infected. Leucht 4 Bennun 5 fixes the rate at a very similar figure. Wilson 6, in 1909, working on the island of Boulan, estimated that 43.3% males or 34.9% females were infected.

A year later Bahl 7, working under the auspices of the London School of Tropical Medicine, made a prolonged study of the disease in Viti Levu, Bau and the Lau Islands. (See Map)

Many islands of the Fijian group have had little attention paid to them and no details of the infection have ever been procured from Kadavu. It was with the object of obtaining results that this work was undertaken.

In my work 1000 natives were examined, this number was composed of 550 males, 450 females of all ages. (Table II)

Percentage Infected

A total of 313 were found to harbour the parasite, giving a
percentage of 31.3, as compared with
Kahn's estimate of 27.17% for 1320 cases. (Table III)

Male Infected

In the 550 males examined, I found the parasite in 197 cases, making a percentage of 35.8.

Female Infected

In the 450 female cases, 116 gave a positive result, making a percentage of 25.7.

There is, therefore, no very great difference between my figures and those of Kahn. (Table III)

Filarial Disease Rate much higher.

These figures, given above, must not, however, be taken as representative of the total number infected with filarial disease. In common with the experience of other observers in other parts, I have several times been surprised at not finding the parasite in persons who manifestly were suffering from the effects of this infection, and, when such cases are taken into consideration, the total filarial infection rate approximates 50%. (Tables IV and V)
Infection Rate at different age limits -

Table II shows the percentage infected at different age limits - comparing our figures with Rabo's, perhaps the most striking feature is the much higher infection rate in Kadam during the first 10 years of life. (Table VI)

So unusual is it to find a high infection rate amongst children of this age that various suggestions have been put forward to explain the peculiarity. Some hold that there is a natural immunity; others assert that it is due to a long incubation period. Recently Marotte-Horovan, while investigating filariasis amongst Senegalese troops in Algeria, examined 122 of the barrack children and only found the parasite once. For reasons which they do not mention, they hold that the rarity of infection cannot be attributed to either of the two reasons given above, but to some as yet undiscovered cause. My statistics, although in no way revealing this unknown cause, make it clear that in Kadam at any rate, there can be no question of natural immunity; nor, from the ages of the infected children, can a long incubation period have any
retarding influence upon the appearance of the larval forms in the peripheral circulation.

The youngest male examined was 10 months old, the youngest age at which the parasites was found was 4 years. There were 3 at this age whose blood gave a positive result; they had 4, 48 and 15 microfilariae respectively per slide. The next youngest was 1½ years with 14 microfilariae.

The youngest female examined was 9 months old, the youngest age at which the parasites was found was 3 years. This child had only 2 mf per slide but had most marked bilateral enlargement of the groin glands, the mass on one side being almost pedunculated.

In Bahri’s work the youngest age at which the parasite was found, was in males at 8 or in females at 5 years.

Female infective rate at this age period
higher than in males.

Why the infective rate amongst female children, is so low. Bahri’s series in any one, should be so much higher than the male rate, it is hard to say. The
mosquito intermediary is chiefly a bush fly. Both children have equal chances of infection, so far as the fly is concerned, as they play together in the same parts - usually just on the outskirts of the bush. (Table II)

At later ages, my infective ratio was very closely correlated with those of Bush.

The male population is more affected than the female; this is due very probably to two causes:
1. The male dress exposes more of the body, bush workers wearing only a skirt.
2. The man spends much more time in the bush than the woman.

Diseased States due to T. Bancrofti

Many different pathological states are produced by this parasite and, in concluding whether or not any given person is the subject of filarial disease, I have taken as positive signs the following conditions:
1. Enlarged Epitrochlear glands of a certain size.
2. Filarial Abscess, known to myself or noted in previous records in the Hospital case.

* A light calico kilt.
3. Enlarged Groin Glands
4. Lymph Serositis; enlarged tisue; cyclic conditions of the cord; hydrocele, for which no other cause could be found.
5. Lymphangitis, either personally observed or noted in previous records of the Hospital case book.
6. Elephantiasis

A strange feature is the peculiar localization throughout the filariated world of these affections, some, or any one, being rare in some parts whilst common in others.

In Kadam, for example, I have not seen a case of elephantiasis nor is one to be found in the Hospital records. 

Finucane and Kehr draw attention to the rarity of this condition in other parts of Fiji. Brochard has pointed out how rare it is amongst Wallis Islanders, and in Samoa Lee and Papez have experienced a similar rarity. In Egyptian filariasis, on the other hand, it is very common whilst elephantiasis is rare (Scheube).

Kehr also refers to the absence of lymph serositis amongst those he examined.
Enlarged Epitrochlears

Under this heading I have only included cases where epitrochlear glands or glands are larger than \( \frac{3}{4} \) inch in length when held between the thumb and forefinger. My reason for doing so is because I have found from previous unpublished observations on "the enlargement of glands in Java" that in children from 18 months up to 17 years, the epitrochlears are enlarged in 77.27\% of cases and are frequently fully \( \frac{3}{4} \) inch in length. Moreover, it appears that glands so enlarged soon go back to their original size and tend to further enlarge on the occurrence of tertiary manifestations later in life.

This, I have no doubt, has a great deal to do with the prevalence of enlarged epitrochlears in filariasis or the frequency of abscess at this part. No doubt, also, it has a considerable bearing upon the greater frequency of elephantiasis of the arms amongst natives of the South Pacific compared with those in other parts.
Filarial Abscess

This is the filarial lesion most frequently met with in India. It affects the usual sites.

1. Epitrochlear region of arm
2. Axilla or groin
3. Trapezius, latissimus & frequently the limb muscles.

These abscesses frequently arise or at all events attract the patient's attention with great suddenness & may be associated with considerable pain & rise of temperature. Most commonly they lead to no untoward result but in one case which I recently had in Hospital - a man who had 5 years previously, been operated on for elephantiasis scroli - the abscess was situated deeply in the lower abdominal wall & proved fatal.

Development of Abscess & Disappearance of Microfilariae.

In one of my female cases, a blood film taken between 10 & 11 am, showed 51 mf. Next day she complained of pain in the leg, an abscess rapidly formed in the calf & from then onwards, the most careful examination of fresh stained preparations could reveal no microfilariae in the blood.
I have since noticed this same sudden disappearance in several more recent cases and it has been frequently pointed out by others.

It seems quite probable that a spurious: female worm may die after expulsion of her larvae and give rise to the abscess but some other cause must be sought for to explain the sudden disappearance of the larvae from the peripheral blood.

It cannot be the toxins of ordinary pyogenic organisms, which are known to infect these abscesses, because a similar disappearance does not occur in other septic cases.

With this in view I have carefully examined cases of

1. Acute Whitlow
2. Cellulitis of Arm
4. A fatal case of fungoidal septicemia, who died 24 hours after admission.

In this fatal case blood films were made on admission, 4 hours before death, 0.25 hours before death, and 0.25 hours before death, respectively.

Fugitive swellings which do not terminate in
obscess, are not at all uncommon in
Kadavu. On casual examination, look
almost like the swellings produced by
the Dacnaresus (Tilapia) gratiaensiis,
when nearing the surface. They
appear quite suddenly or travel about
2 inches per day. By degrees they
disappear altogether or leave a slight
bulging at the original starting point.
The condition, however, is not
absolutely typical of what is usually
described as a salaban Swelling
(Thompson). The trunks being frequently
multiple, always tender when touched,
& associated, as a rule, with a rise
of 1 or 2 degrees in temperature.
Young has reported fugitive swellings
apparently of a similar nature
occurring in a native of Jamaica,
Bahr refers to them as occurring
in other parts of Fiji.

Enlarged Groin Glands

Enlargement of the inguinal &
temporal glands, one set or both, is
extremely common & they frequently
reach a very large size. The line
varies slightly, however, is not common
the glands being tough indurated
& yielding, as a rule, not even a minute
drop of fluid in function.

The glandular mass has, in
most of my cases, had a fairly broad
base so I have not seen in Madras
any true example of pedunculated
 groin glands. The case which most
nearly approached the pedunculated
form was that of the little girl, aged
3 years, already referred to.

Beyond discomfit due to size, these
glands give rise to little trouble,
except in those cases where
elephantiasis ultimately occurs.

Patients presenting such glands do
not by any means invariably show
microfilariae in blood examination.
Thus, out of a series of 47 cases with
enlarged groin glands, only
succeeded in finding the microfilaria
in 17.

lymph Serotum

Out of the 550 males examined,
I found 6 cases of lymph serotum.

I am aware that in most parts
of Fiji this condition is rare. Each
case was accordingly most carefully
gone into before I included it under
this category. In each instance the
serotum presented the typical features
of the condition - some enlargement, 
silky to the touch with little 
foaming varices which, when pricked, 
discharged a yellowish fluid. In some 
of the cases, scales were present 
removal of these brought out the 
same kind of fluid, the varices 
having apparently ruptured 
spontaneously and the scale formed 
by coagulation of the exuding fluid.

Enlarged Testis, Ateps of the body: Hydroceles 
of otherwise unexplainable origin*

These are very common on the island 
as many as 13.9% of the male population 
in 25 years suffering from enlarged 
testicles or hydroceles, frequently bilateral.

The fluid from several cases of 
hydrocele was examined for microfilariae 
but in no case was I successful in 
finding the parasite.

So these pathological lesions has been 
*Syphilis, as a cause of enlargement can be 
at once ruled out of account, as it is now
existent in Kadam. The tertiary gummatous 
lesions of Granulosis have not been found to affect 
the testicles. Tuberculosis can in rare cases be 
include d also can malignant disease, except 
in some rare cases of rapid development.
attributed the low birth rate which prevails generally throughout the Fiji group, and while these organic changes must have some effect upon the sexual potentialities of the Kadam wall, I think we must not lose sight of the great loss incurred by artificial methods of abortion. Again, the native marriage at a comparatively early age may serve as a cause of the age incidence of hydrocele or enlarged testes at about 35 to 40 years, so that a considerable time for prenuptial syphilis intervenes between say 25 and that age.

Lymphangitis & Elephantiasis

I have left these for Latin reference meantime will consider some of the more general features of this helminthiasis.

The larval or Embryonic Forms found in the circulating blood

heifer, after a close examination of specimens of the Fijian parent. filariae sent home by Hake & companions of these with Bobbolds original type collected by Bancroft in Australia with Indian & British Louisiana types, has come to the conclusion
that all these specimens belong to one
the same species, namely, *Filaria*
Bancrofti of Bobbott, 1877.

Judging from the microscopic
characteristics of the larval form as it
occurs in the skin, this appears to be no
morphological differences whatever between
it and *Filaria* bancrofti.

Examined in fresh blood or stained
preparations, the worm is seen to be
enclosed in a sheath considerably
longer than itself, hanging free at
one or both ends. The striations in
the muscular cutaneous layer is well
exhibited in most specimens and the
cellular composition of the body, as
evidenced by the deeply staining
nuclei, is easily demonstrated with
diamonoylaidin or methylene blue. The
anterior V-shaped or the still more
anterior crisscross in the central
column of nuclei are easily seen
in stained specimens, as is also
the posterior or tail end.

I have not succeeded in
staining the elongated viscera, which
has been said to characterize the
anterior part of the middle third,
the "central cell mass" of Manson or
"Innen-Körper" of Fülleborn.
Periodicity

Bahr has shown that, in the districts examined by him, there is no periodicity, the microfilariae appearing in the peripheral blood by day just as freely as by night. The same thing has been proved by Shofer to occur in Tunga and by Leber & Freund in Itamai.

Ashburn-Erakay have shown that filariasis in the Philippines is characterised by a similar new, periodic habit of the larva and from this other characteristics which they describe, they are inclined to regard it as a new species. Broochard, working in the Wallis Islands has come to a similar conclusion.

In the Bismarck Archipelago, German New Guinea, however, Fullerton has shown that the embryonic form possesses a well-marked periodicity.

From Table VII it will be seen that in Iadam, there can be no question of periodicity, the larvae being found just as readily in day as in night blood.

The difference between day and night blood, as regards the number of microfilariae present, was the first piece of work undertaken, and this was
done in order to determine whether or not it would be safe to rely altogether upon daily examinations in making my diagnosis. A reference to Table VII will show that in no case were microfilariae found by night when they were not also present by day.

In those parts in which the microfilariae do observe a periodic habit, the matter is usually explained by saying that it is an adaptation to the habits of the existing intermediate host, the vectors. For example, appearing in the peripheral blood by night if the mosquito be a night feeder. Babu has even applied this theory to Fiji; says the non-periodic habit of the microfilariae is due to the fact that Stegomyia Pseudocuticulalis is a day feeder only. If that were so, then why should not the microfilaria become diurnal in its habits to form the general orientation by night?

Again, in dogs infected with *Filaria bruciae*, the microfilariae is present in the blood both by day and night, but the carrier is a night feeder.

This theory, based upon adaptation to the habits of the liberating host,
was first pronounced by Manson in explaining the nocturnal periodicity of microfilariae bancrofti, but that this view is not generally accepted is shown by the fact that filariologists of great experience have on several occasions put forward other reasons to explain the peculiarity. Rodenwaldt's opinion is that it depends upon blood pressure. Gullborn experimented to see if the rate of blood flow had any effect, while Whyte was of the opinion that the oxygen supply was the main factor of influence.

Such speculations as these which attribute the periodicity to the influence of light or darkness to the dilatation of the peripheral capillaries have been investigated refuted by Mackenzie, Manson, Whitley.

So far, therefore, it may be said that no satisfactory solution of the problem has been found - no explanation given which will at once apply to all cases.

My own feelings are that the peculiarity may probably be explained by the varying chemical composition of the blood. The microfilariae undoubtedly grow and develop after expulsion from the parent worms the processes of
absorbed in the growing larvae must be influenced by a stationary position. Moreover, there are times when the blood of the host will contain greater quantities of the necessary building materials so this time one would expect to occur some hours after a meal or during the process of intestinal digestion or absorption.

Much will, therefore, depend upon the habits of the race. In the Solomon, for example, I understand from men many years resident on the islands, that the natives have only one large meal per day and that towards sunset. Bahr states that in Solomon Islanders, freshly arrived in Fiji, the microfilaria was nocturnal in its habits.

Fijians, on the other hand, not only eat by day but are notorious feasters by night. I can at least testify to this in Kadavu.

This would also explain Mackenzie's findings in the case of the nocturnal microfilaria bancrofti, whose periodicity attains when the infected persons sleep by day and kept awake by night. They must, of course, have reversed their feeding times.

With Fijians it would be an almost
impossible task to study this question unless in some well-regulated
institution such as an asylum or gaol.

Shortly put, therefore, Democritus

that the nutrition & growth of the larva

are aided by a stationary attitude
during the processes of absorption.

2. That in the large thoracic vessels & the

lungs, the blood is, at certain times

which depend upon racial habits,

richer in nutritive elements - for

anatomical & physiological reasons.

3. That the larvae will, by chemical

influences, be attracted to those parts

at that time which offer the most

abundant nutrify.

Distribution in Peripheral Blood.

Experiments were made in order to
determine the equality or otherwise of
distribution of the larvae in the
peripheral blood. Three slides were
taken from each patient at the same
time & the results are shown in
Table VIII. The quantity of blood was
in each case the same, the white
fibriette being used as described. The

+In Hospital the friends of patients constantly bring

them food, or it is next to impossible to prevent it.
difference is not very great, but considering the accurate measurement of the blood, is sufficient to show that the distribution in the peripheral blood is not an equal one.

Blood Changes - Eosinophilia

Ordinary routine work in Hospital has convinced me that in filarial patients there is no appreciable alteration either in the total red or the total white count, nor in the haemoglobin index as calculated by Hallgren's method. The same cannot, however, be said about differential counts. A marked eosinophilia has always been present in my cases but a high eosinophil count is also present in other patients who present no obvious clinical signs of filariasis or in whose blood one is unable to find the microfilariae.

It is obvious from the writings of others that this filariasis does not in all parts of the world lead to an increase in the eosinophil count. Marriott & Morrison when investigating this peculiarity in a battalion of Senegalese troops in Algiers found that
out of a total of 88 persons infected with *Filaria bancrofti*, not one presented any increase in eosinophils. This has pointed out that the same absence of increase exists amongst the filariated natives of Uganda, who in addition were found to harbor many intestinal parasites.

In investigating this matter in order to eliminate the possibility of any previous knowledge, I chose during the course of one day the first 20 persons who came along, irrespective of age; they were sent into Hospital 8 kept there till next day, only being permitted to leave when a motion was presented for our examination.

The following was my method of procedure. Between 10 o'clock am and blood films were taken from each patient, 1 for a differential count and 1 for the demonstration of microfilariae. In 12 of the cases films for the differential count were also made between 10 o'clock am in order to investigate the question of periodicity in eosinophilia.

The ages of these 20 patients ranged from 12 months to 60 years, 9 being below 17 years of age.
The average eosinophilia for the total number examined was 9.63%. For the age 20 to 60 it was 11.14%. (Table IX.)

6 out of the 20 were found to harbour microfilaria. Their average eosinophil rate was 10.75%.

The highest rate obtained was an eosinophilia of 17.5% — this in a man in whom repeated attempts to find the microfilaria always resulted in failure. (Table IX)

The stool examination resulted in the ova of Trichocephalus Nishan being found in 6 cases. That of Ascaris lumbricoides in 2. No ankylostome ova were found.

This puts the intestinal parasitic infection rate at 40%.

2 of these cases will also harboured filaria bancrofti. Their average eosinophil percentage was only 8.3%.

From these results it may, I think, be conjectured that

1. A high eosinophil count is characteristic of the native of the island.
2. That this is not influenced in any constant way either by the presence

* Ankylostomiasis, though it does occur, is by no means common on the island.
of microfilariae in the blood or of ova in the stools.

It is quite reasonable, I think, to argue that this eosinophilia, which has also been noted in other parts of Sigi (Kahr, Wilson), has become intensified upon them by a long ancestral reaction to the filarial parasite. Intestinal parasites may, of course, be an additional causative factor, but Wilson has found in his investigations as high an eosinophilia as 14-18% in Indians in whom there was no evidence whatever of infection with metazoal parasites.

Periodicity in Eosinophilia

A reference to Table II will show that there was no periodicity in my cases. Nor, from the few cases examined, could I satisfy myself that, with an increase of microfilariae, there was any corresponding increase in eosinophils. This does not support either Sellandi's or Duncan Whyte's figures, but concurs with Galindo's15 with what has been found by Kahr in other parts of Sigi.
lymphangitis + elephantiasis

Lymphangitis is common on the island & undoubtedly plays a large part in the production of elephantoid lesions. It is to be noted, however, that attacks of lymphangitis though associated during the acute stage & for some days after with considerable swelling & tough oedema, do not of necessity lead to elephantiasis.

This feature was emphasised by the case of an old chief, who has been under my care off & on during the last few months. His age must be close on 70, & for 12 years he has suffered from recurring attacks of lymphangitis scroti. Recently these attacks have been more frequent. I have, during the course of this work, watched him through 4 attacks.

At such a time the whole of the scrotum becomes most extensively swollen & oedematous & remains in this state for 2 or 3 days. It then gradually recovers. In the intervals, the scrotal ulcereations appear & feel quite normal & except for a general increase in size due to bilateral testicular enlargement, it would

*Most of his statements are, I think, reliable. He is one of the better educated class of Zijans.
be hard to believe that lymphangitis
had ever been present.

Elephantiasis

Though the exact etiology of
elephantiasis has not yet been definitely
proved, everything points to the
filaria bancrofti as being the
determining cause of the condition.
The distinctive fibrosis of lymph
 glands occurs caused by the presence
of these worms has been ably
demonstrated by this 18 Kahl 7 it has
been pointed out 18 how very frequently
the intraabdominal glands are the
seat of this distinctive process. This
in itself might well be sufficient to
cause lymphatic stasis consequent
elephantiasis in the lower extremities
and would account for the greater frequency
of elephantoid enlargement in these
parts as compared with the upper limbs.

The patchy distribution of
filariasis and elephantiasis as described
by this in the West Indies and Whyte 20
in South China reminds us, however,
that there may be some other or
co-existing factor at work which leads
as Whyte says, to keep an open mind
as to the discovery of some other cause
of elephantiasis should be raised.
In British new Guinea, Jones has shown that, though 7% of the general population are infected with *filaria bancrofti*, the elephantiasis cases are practically all derived from one small district; this, to his mind, suggests the possibility of a symbiosis.

A somewhat similar state of affairs exists on this island. (Table XI) In Lombrk district 4.8% of the total adult population are affected with elephantiasis, whereas in Traceva district, with a considerably greater population, only 0.7% of the adult population are affected. It will be seen, however, (Table XI) that the microfilaria rate in Lombrk is considerably higher than in Traceva. This supports the epidemiological argument that the higher the microfilaria rate in any part the higher the elephantiasis rate.

Whatever the ultimate cause of the condition may be shown to be, there can be no doubt that the pathological basis of the disease is lymph stasis, that the larval filarial worm is able to cause an obstructive sufficient to effect this stasis. The recurring inflammatory attacks, which help to increase the
Lymphatic blockages, are probably initiated by toxins derived from the destruction of pent-up larvae which have failed to reach the general circulation.

My observations in Kadavu are based upon a thorough examination of every adult male and female made during a tour of inspection of the whole island.

I found a total of 96 elephanziaasis cases, 68 being males and 28 females. (Tables XI & XII). This gives a total elephantiasis rate (adult) for the island of 2.5%, considerably lower than the rate quoted by Bahr for other parts of Fiji - 3.06%.

My microfilariae rate is slightly higher than this zone would, therefore, have expected considerably more elephantiasis in Kadavu.

The average age of elephantiasis cases I found to be 55. The youngest was a man of 28 with elephantiasis of the leg.

As in most other countries examined, males are more commonly affected than females - 5 men to every 2 women. Here again the elephantiasis rate, for females, is lower than would have been expected if one is to judge from the microfilariae...
Microfilariae in Elephantiasis

From 29 of these 96 cases blood films were taken for microfilariae, of which 24 were males and 5 the male rate amongst them was 41.6. In the 5 female cases, no embryos could be found. (Table XIII)

The total male rate for elephantiasis is, therefore, 34.5%, compared with Bahri's 38.2%.

It has been argued that the frequent absence of microfilariae from the blood is a point in favor of some cause other than a filarial one for the production of elephantiasis. But it must be remembered that microfilariae are also very frequently absent in other manifestations of filariasis. I have already made mention of this feature in Bahri's especially refers to its occurrence in many cases of enlarged lymphatic glands. In my 1000 cases I came across very numerous examples of enlarged groin or other lymphatic glands due to no other discernible cause, or in many of these no microfilariae could be found even in repeated blood examination. I am, however, unable to quote with any accuracy from those...
results, as the greater proportion of the population had so recently been vaccinated* that I was unable to take into consideration those cases who presented enlargement of the axillary glands.

Parts affected with Elephanthiasis

Along with my tables will be found a list showing the frequency of affection in different anatomical regions. (XIV)

In Madras, as in other parts of India, the changes produced in the lymphatics of the arm, particularly in life by the cirsrhadari of Yaws.

The Health of different Districts

The two districts of Gamki & Navitaki are, from a health point of view, undoubtedly the worst on the

*This was in account of the outbreak of smallpox in Sydney 1854 & North Island N.Z.
island. Many of the towns are situated on low-lying ill-drained ground surrounded behind and on both sides with swamps. All access to or from the town to the native plantations is through or alongside these swamps and they form excellent breeding grounds for mosquitoes.

The water supply is laid on to practically every town on the island by pipes, salternic arrangements are the same in all. It is not surprising, therefore, that such diseases as dysentery or enteric cholera show an almost equal distribution.

As regards filariasis, the findings are just what one would expect. The highest infection rates also the highest elephantiasis rates are to be found in these same two districts. In fact the quality of town sites in the different districts can be fairly accurately gauged from my filariasis census.

To improve matters in these districts the only alternatives are either to shift the entire town to a new and better site or to drain still-in-all-swamps - a matter of considerable expense.
Europeans on the island

Apart from the 1000 natives examined, I examined 4 male and 2 female Europeans out of a total European population of 6 males and 4 females. In all of these any possibility of infection in other parts was excluded.

None presented any clinical signs; the microfilaria was found (in considerable numbers) in one case only, a male several years resident in the island.

A R. B. priest, who has lived for over 40 years on the island, has one of the most marked examples of elephantiasis of the leg that I have seen, but unfortunately I was not permitted to examine his blood.

chinemu

5 males were examined, resident from 1 to 10 years on the island, 5
the microfilaria was found in only 1.

*Two R. B. priests & two R. B. sisters, for some Catholic reason, would not allow me to examine their blood.
II That 81.3% of the total population harbour Microfilariae bancrofti in their blood.
III That 47.8% of the total population suffer from filariasis.
IV That males are much more commonly infected than females.
V That this difference is due to the dress of the male and to the nature of his work.
VI That young children are much more commonly infected in Kadavu than is the case in those other parts of Fiji which have been investigated.
VII That female children have a higher infective rate than male children.
VIII That abscesses is the commonest manifestation of filariasis in Kadavu.
IX That fugitive swellings, in some respects similar to balaban swellings, are not uncommon.
X That the sudden disappearance of microfilariae from the peripheral blood following when the development of an abscess is not due to the toxins of ordinary pyogenic organisms than yet to be explained.
XI That chyluria does not occur on the island.
XII That lymph scrotum does occur.
XII That 13.9% of the male population over 25 years suffer from enlarged testes or hydroceles. That this must have some bearing upon the infertility of the race.

XIII That the microfilariae observe no periodic habit.

XIV That filarial periodicity depends upon racial habits.

XV That the microfilariae are not equally distributed throughout the peripheral circulation.

XVI That a high eosinophil count is characteristic of the natives of the island.

XVII That this feature is probably due to a long ancestral reaction to the filaria bancrofti.

XVIII That there is no periodicity in this eosinophilia.

XIX That 2.6% of the adult population suffer from elephantiasis.

XX That males suffer from elephantiasis more commonly than females.

XXI That the upper limbs, as in other parts of the South Pacific, are more commonly affected with elephantiasis than in other parts of the filarial world.

XXII That in 34.5% of elephantiasis patients the mφ. can be demonstrated in the blood.
Statistical Tables

with an

Introduction
Methods & Technique employed

All persons who came to Hospital whether as in-patients or out-patients were thoroughly examined with a view to finding what signs, if any, they presented of filarial infection & a carefully measured blood film was then made.

No notice was taken of any previous subjective symptoms, unless these were confirmed by entries in the Hospital records.

While this method provided me with a certain number of slides I found it more satisfactory to visit in addition as many towns as possible. The head man, or Buli, of the district being forewarned of my visit, I had little difficulty in securing a sufficiency of material.

On other occasions I went to a well-frequented bush track with two Fijians to carry the necessary requisites, waited for two hours or examined, in the way described above, everyone who passed.

While quite unable to give each town this amount of individual attention, I found, from a complete tour of inspection, the exact population of each town was able
to accurately estimate the total number of elephantiasis cases on the island.

In night work it was, of course, only possible to make use of Hospital
patients.

Blood films were made only between
the hours of 10 a.m. or 10 a.m.
A while blood pipette was filled up
to the mark 1 0 the blood was then
transferred to a clean slide. It was
allow ml in 3 or 4 drops towards the
centre of the slide other mixed with
a needle so as to form a fairly thick
film.

Day blood was stained & examined
the same day or next blood the
following morning. The slides
were first dehaemoglobinised by being
placed face downwards on a watch
glass full of distilled water. They were
then transferred to another watch glass
containing methylene blue.

For more clearly differentiating the
parasite, Haematoxylin with heat
was used. The film was then "bled"
well in distilled water.

With the exception of Methylene Blue
I found "K & W" labloid stains the
handiest to work with, though used
them stronger than their instructions
direct.
In making blood counts 300 or 400 cells were counted & Jenner's stain was always used.

**Mosquitoes**

Two of the blood sucking insects of Fiji have as yet been accurately determined.

Entomologists working on these islands have great difficulties to overcome. Anti or other destructivesenha will destroy in a few hours material which has taken days to collect & specimens become oxygen with worms in while of all species.

For these reasons owing to the want of specimens it is almost impossible to say that I have arrived at any great conclusions, though my observations tend to show that the chief mosquitoes of the island are

1. Stegomyia Pseudozentellarius
2. *Anopheles* Fatigans
3. Stegomyia Sentillarius

* S. Pseudozentellarius or *S. Sentillarius* are the great day feeding flies.
* S. Fatigans is a night mosquito.

In order to determine the type with which I was dealing, the
mosquitoes, after being caught in gauge nets, were transferred to test tubes 
just before examination were killed 
by beating the tube against the 
forearm. A pocket-lens examination 
was then made and afterwards, 
the legs' swipes being detached, each 
part was separately examined 
with the lens power of the microscope. 
Their features were then compared 
with those descriptions in Alaska's 
"Entomology for Medical Officers."
Table 1

To show population of the island as a whole and of each district. The table is compiled from my own notes made during a tour of inspection. "Children" are those under 16.

<table>
<thead>
<tr>
<th>District</th>
<th>Total Population</th>
<th>Adults M</th>
<th>Adults F</th>
<th>Children M</th>
<th>Children F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naritaki</td>
<td>732</td>
<td>232</td>
<td>220</td>
<td>151</td>
<td>129</td>
</tr>
<tr>
<td>W'ibekelom</td>
<td>798</td>
<td>258</td>
<td>238</td>
<td>171</td>
<td>131</td>
</tr>
<tr>
<td>Sanima</td>
<td>467</td>
<td>155</td>
<td>140</td>
<td>85</td>
<td>87</td>
</tr>
<tr>
<td>Yale</td>
<td>433</td>
<td>138</td>
<td>126</td>
<td>96</td>
<td>73</td>
</tr>
<tr>
<td>Uaccova</td>
<td>994</td>
<td>348</td>
<td>310</td>
<td>179</td>
<td>157</td>
</tr>
<tr>
<td>Yamki</td>
<td>795</td>
<td>253</td>
<td>247</td>
<td>143</td>
<td>152</td>
</tr>
<tr>
<td>Yave</td>
<td>342</td>
<td>116</td>
<td>111</td>
<td>62</td>
<td>53</td>
</tr>
<tr>
<td>Uno</td>
<td>538</td>
<td>161</td>
<td>164</td>
<td>118</td>
<td>95</td>
</tr>
<tr>
<td>W'leka</td>
<td>1096</td>
<td>346</td>
<td>323</td>
<td>232</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>6195</td>
<td>2007</td>
<td>1879</td>
<td>1237</td>
<td>1072</td>
</tr>
</tbody>
</table>
### Table II

To show percentage infection rate in my 1000 cases.

<table>
<thead>
<tr>
<th>Age</th>
<th>No. exam</th>
<th>No. infected</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>51</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>5 - 10</td>
<td>83</td>
<td>11</td>
<td>13.2</td>
</tr>
<tr>
<td>10 - 15</td>
<td>74</td>
<td>9</td>
<td>12.1</td>
</tr>
<tr>
<td>15 - 20</td>
<td>107</td>
<td>16</td>
<td>14.9</td>
</tr>
<tr>
<td>20 - 25</td>
<td>64</td>
<td>24</td>
<td>37.5</td>
</tr>
<tr>
<td>25 - 30</td>
<td>186</td>
<td>67</td>
<td>35.6</td>
</tr>
<tr>
<td>30 - 40</td>
<td>201</td>
<td>75</td>
<td>37.3</td>
</tr>
<tr>
<td>40 - 50</td>
<td>133</td>
<td>54</td>
<td>40.6</td>
</tr>
<tr>
<td>50 - 60</td>
<td>78</td>
<td>37</td>
<td>47.4</td>
</tr>
<tr>
<td>60 - 70+</td>
<td>23</td>
<td>10</td>
<td>43.4</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>313</td>
<td>31.3</td>
</tr>
</tbody>
</table>

The same in males, 550 cases.

<table>
<thead>
<tr>
<th>Age</th>
<th>No. exam</th>
<th>No. infected</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>30</td>
<td>5</td>
<td>16.6</td>
</tr>
<tr>
<td>5 - 10</td>
<td>50</td>
<td>4</td>
<td>8.0</td>
</tr>
<tr>
<td>10 - 15</td>
<td>37</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>15 - 20</td>
<td>51</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>20 - 25</td>
<td>30</td>
<td>12</td>
<td>40.0</td>
</tr>
<tr>
<td>25 - 30</td>
<td>94</td>
<td>37</td>
<td>39.3</td>
</tr>
<tr>
<td>30 - 40</td>
<td>101</td>
<td>47</td>
<td>46.5</td>
</tr>
<tr>
<td>40 - 50</td>
<td>78</td>
<td>40</td>
<td>51.2</td>
</tr>
<tr>
<td>50 - 60</td>
<td>60</td>
<td>33</td>
<td>53.0</td>
</tr>
<tr>
<td>60 - 70+</td>
<td>19</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td>Total</td>
<td>550</td>
<td>197</td>
<td>35.8</td>
</tr>
</tbody>
</table>
Table II (contd.)

To show percentage infection rate in females

<table>
<thead>
<tr>
<th>Age</th>
<th>No. examined</th>
<th>No. infected</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>21</td>
<td>5</td>
<td>23.8</td>
</tr>
<tr>
<td>5 - 10</td>
<td>33</td>
<td>7</td>
<td>21.2</td>
</tr>
<tr>
<td>10 - 15</td>
<td>37</td>
<td>8</td>
<td>21.6</td>
</tr>
<tr>
<td>15 - 20</td>
<td>56</td>
<td>6</td>
<td>10.7</td>
</tr>
<tr>
<td>20 - 25</td>
<td>34</td>
<td>12</td>
<td>35.3</td>
</tr>
<tr>
<td>25 - 30</td>
<td>92</td>
<td>30</td>
<td>32.6</td>
</tr>
<tr>
<td>30 - 40</td>
<td>100</td>
<td>28</td>
<td>28.0</td>
</tr>
<tr>
<td>40 - 50</td>
<td>55</td>
<td>14</td>
<td>25.4</td>
</tr>
<tr>
<td>50 - 60</td>
<td>18</td>
<td>4</td>
<td>22.2</td>
</tr>
<tr>
<td>60 - 70</td>
<td>4</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>450</td>
<td>116</td>
<td></td>
<td>25.7</td>
</tr>
</tbody>
</table>
Table III

To show, comparatively, the percentage of males & females of all ages with microfilariae in the blood as estimated by Kahr for Veli Heru and by myself for Kadavu.

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>iii</th>
<th>iv</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kahr</td>
<td>1320</td>
<td>30.4</td>
<td>23.8</td>
<td>27.1</td>
</tr>
<tr>
<td>Self</td>
<td>1000</td>
<td>35.8</td>
<td>25.7</td>
<td>31.3</td>
</tr>
</tbody>
</table>
Table IV

<table>
<thead>
<tr>
<th>No. examined</th>
<th>No. with</th>
<th>No. with</th>
<th>Total no.</th>
<th>Infected with</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mt.</td>
<td>no Mt.</td>
<td></td>
<td>Filariasis</td>
</tr>
<tr>
<td>1000</td>
<td>313</td>
<td>165</td>
<td>478</td>
<td>47.8%</td>
</tr>
</tbody>
</table>

The same in males:

| 650          | 197      | 116      | 312       | 56.7%         |

The same in females:

| 450          | 116      | 50       | 166       | 36.9%         |

+ A list of these conditions which I have taken as exanthem in filarial infection is given in the text.
Table V

To show that Bahr's total filariasis rate in Viti Levu is higher than mine in Kadavu that a much greater number of his cases present clinical signs without showing the microfilaria in the peripheral blood.

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>No. with T. mf.</th>
<th>No. with T. mf. but without clinical signs</th>
<th>Total no. infected with filariasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahr</td>
<td>1320</td>
<td>350</td>
<td>382</td>
<td>732 = 55.5%</td>
</tr>
<tr>
<td>Self</td>
<td>1000</td>
<td>313</td>
<td>165</td>
<td>478 = 47.8%</td>
</tr>
</tbody>
</table>

Table in Males

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>No. with T. mf.</th>
<th>No. with T. mf. but without clinical signs</th>
<th>Total no. infected with filariasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahr</td>
<td>804</td>
<td>236</td>
<td>287</td>
<td>523 = 64.8%</td>
</tr>
<tr>
<td>Self</td>
<td>550</td>
<td>197</td>
<td>115</td>
<td>312 = 56.7%</td>
</tr>
</tbody>
</table>

Table in Females

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>No. with T. mf.</th>
<th>No. with T. mf. but without clinical signs</th>
<th>Total no. infected with filariasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahr</td>
<td>516</td>
<td>114</td>
<td>95</td>
<td>209 = 40.3%</td>
</tr>
<tr>
<td>Self</td>
<td>450</td>
<td>116</td>
<td>50</td>
<td>166 = 36.9%</td>
</tr>
</tbody>
</table>

The next figures show that a very large percentage of those with T. mf. have no clinical signs.

<table>
<thead>
<tr>
<th></th>
<th>Total No.</th>
<th>No. with T. mf.</th>
<th>No. with T. mf. but without clinical signs</th>
<th>Total no. infected with filariasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahr</td>
<td>1320</td>
<td>350</td>
<td>158</td>
<td>= 45.1%</td>
</tr>
<tr>
<td>Self</td>
<td>1000</td>
<td>313</td>
<td>189</td>
<td>= 60.3%</td>
</tr>
</tbody>
</table>
Table VI

A comparative table to show the much higher infection rate among children in Kadaru up to 10 years of age.

<table>
<thead>
<tr>
<th></th>
<th>No. Exam'd</th>
<th>No. Inf.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahr</td>
<td>72</td>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>Selp</td>
<td>80</td>
<td>9</td>
<td>11.2</td>
</tr>
<tr>
<td>Female Children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bahr</td>
<td>56</td>
<td>4</td>
<td>7.14</td>
</tr>
<tr>
<td>Selp</td>
<td>54</td>
<td>12</td>
<td>22.2</td>
</tr>
</tbody>
</table>

These figures also show how very much higher, in both sexes of cases, the female infection rate is.
Table VII

To show that the microfilaria of Kadaon shows no periodic habit.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>16</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>12</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>12</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>5</td>
<td>106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>17</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>33</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>41</td>
<td>229</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>10</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>13</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>3</td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>3</td>
<td>38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Out of these 23 cases, 11 had more Mf. by night; 6 had more by day; 5 were negative on both occasions & 1 had an exactly equal number.
Table VIII

To study the inequality of distribution of the Microplasma in the peripheral blood

<table>
<thead>
<tr>
<th>Age (same time)</th>
<th>60</th>
<th>72</th>
<th>11</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>30</td>
<td>37</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>9</td>
<td>6</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>
Table IX

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Eosinophils</th>
<th>No. of Inf.</th>
<th>Ulta</th>
</tr>
</thead>
<tbody>
<tr>
<td>3½</td>
<td>9.1%</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>5½</td>
<td>11.6</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>7½</td>
<td>6.1</td>
<td>E. hirsuta</td>
<td>.</td>
</tr>
<tr>
<td>9½</td>
<td>3.0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>11½</td>
<td>3.3</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>14</td>
<td>11.6</td>
<td>E. hirsuta</td>
<td>.</td>
</tr>
<tr>
<td>16</td>
<td>8.3</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>18</td>
<td>12.0</td>
<td>E. hirsuta</td>
<td>.</td>
</tr>
<tr>
<td>25</td>
<td>13.5</td>
<td>10</td>
<td>.</td>
</tr>
<tr>
<td>30</td>
<td>9.6</td>
<td>13</td>
<td>E. hirsuta</td>
</tr>
<tr>
<td>35</td>
<td>5.3</td>
<td>do</td>
<td>.</td>
</tr>
<tr>
<td>40</td>
<td>12.0</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>30</td>
<td>9.5</td>
<td>3</td>
<td>.</td>
</tr>
<tr>
<td>30</td>
<td>13.3</td>
<td>E. hirsuta</td>
<td>.</td>
</tr>
<tr>
<td>35</td>
<td>7.0</td>
<td>4</td>
<td>do</td>
</tr>
<tr>
<td>40</td>
<td>10.6</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>25</td>
<td>11.3</td>
<td>33</td>
<td>.</td>
</tr>
<tr>
<td>20</td>
<td>15.5</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>35</td>
<td>13.6</td>
<td>2</td>
<td>.</td>
</tr>
</tbody>
</table>

This gives an average eosinophilia of 9.63%, occurring in a series of cases with a microfilaria rate of 30% and an intestinal parasitic infection rate of 40%.
Table X

To determine whether or not there is any periodicity in eosinophilia.

<table>
<thead>
<tr>
<th>Age</th>
<th>Day</th>
<th>Height</th>
<th>If</th>
<th>Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>8-3%</td>
<td>7.5%</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>26</td>
<td>12-0</td>
<td>10-3</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>26</td>
<td>5-3</td>
<td>7-0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>27</td>
<td>12-0</td>
<td>10-5</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>30</td>
<td>13-3</td>
<td>9-0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>16</td>
<td>10-6</td>
<td>11-0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>28</td>
<td>11-3</td>
<td>14-0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>23</td>
<td>15-5</td>
<td>17-5</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>25</td>
<td>13-5</td>
<td>14-3</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>30</td>
<td>9-5</td>
<td>9-6</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>35</td>
<td>7-0</td>
<td>5-6</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>35</td>
<td>13-6</td>
<td>13-0</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

There is, therefore, no constant variation.
Table XI

deaths total adult population with
number affected with elephantiasis
rate the microfilaria rate\(^*\) as
calculated from any 1000 cases.

<table>
<thead>
<tr>
<th>District</th>
<th>Adult No.</th>
<th>Population</th>
<th>Sexes</th>
<th>mf Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karitaki</td>
<td>452</td>
<td>21</td>
<td>4.6</td>
<td>42.7%</td>
</tr>
<tr>
<td>U'lem</td>
<td>476</td>
<td>10</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Samina</td>
<td>295</td>
<td>6</td>
<td>2.0</td>
<td>26.3%</td>
</tr>
<tr>
<td>Yale</td>
<td>264</td>
<td>5</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Vacaiv</td>
<td>658</td>
<td>5</td>
<td>0.7</td>
<td>24.0%</td>
</tr>
<tr>
<td>Samatiko</td>
<td>500</td>
<td>24</td>
<td>4.8</td>
<td>36.1%</td>
</tr>
<tr>
<td>Yame</td>
<td>227</td>
<td>10</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Avo</td>
<td>335</td>
<td>9</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>U'leka</td>
<td>679</td>
<td>6</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

\(^*\) The mf rate for the various districts has only been filled in in those cases where the number examined was sufficient to give an accurate estimate. In some parts e.g. Avo, which is difficult & dangerous to reach, I was only able to examine a very few. In others the proportion of women examined is too great to give any accurate estimate.
Table XII

To show adult male population with number affected with Elephantiasis.

<table>
<thead>
<tr>
<th>District</th>
<th>Popn.</th>
<th>No. of Eleph.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karitaki</td>
<td>232</td>
<td>13</td>
<td>5.6</td>
</tr>
<tr>
<td>U'leme</td>
<td>258</td>
<td>6</td>
<td>2.3</td>
</tr>
<tr>
<td>Samina</td>
<td>155</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>Yale</td>
<td>138</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>Vaceva</td>
<td>348</td>
<td>3</td>
<td>.9</td>
</tr>
<tr>
<td>Yaunki</td>
<td>253</td>
<td>19</td>
<td>7.5</td>
</tr>
<tr>
<td>Yawe</td>
<td>116</td>
<td>6</td>
<td>5.2</td>
</tr>
<tr>
<td>Uno</td>
<td>161</td>
<td>7</td>
<td>4.3</td>
</tr>
<tr>
<td>U'leka</td>
<td>346</td>
<td>6</td>
<td>1.7</td>
</tr>
</tbody>
</table>

2007 68 3.4

The same with female population

<table>
<thead>
<tr>
<th>District</th>
<th>Popn.</th>
<th>No. of Eleph.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karitaki</td>
<td>220</td>
<td>8</td>
<td>3.6</td>
</tr>
<tr>
<td>U'leme</td>
<td>238</td>
<td>14</td>
<td>1.5</td>
</tr>
<tr>
<td>Samina</td>
<td>140</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Yale</td>
<td>126</td>
<td>1</td>
<td>.7</td>
</tr>
<tr>
<td>Vaceva</td>
<td>310</td>
<td>2</td>
<td>.6</td>
</tr>
<tr>
<td>Yaunki</td>
<td>247</td>
<td>5</td>
<td>2.0</td>
</tr>
<tr>
<td>Yawe</td>
<td>111</td>
<td>4</td>
<td>3.6</td>
</tr>
<tr>
<td>Uno</td>
<td>164</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>U'leka</td>
<td>323</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1879 28 1.5
Table XIII

To show percentage of Elephantiasis cases with microfilariae.

<table>
<thead>
<tr>
<th></th>
<th>No. +</th>
<th>No. -</th>
<th>Percentage e Mf.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10</td>
<td>14</td>
<td>41.6</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>10</td>
<td>29</td>
</tr>
</tbody>
</table>
Table XIV

To show parts affected with Elephantiasis.

<table>
<thead>
<tr>
<th>Both arms with both legs</th>
<th>1 arm 2 arms</th>
<th>1 leg</th>
<th>2 legs</th>
<th>1 leg</th>
<th>1 arm</th>
<th>Scrotum</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9</td>
<td>32</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>68</td>
</tr>
<tr>
<td>Female</td>
<td>3</td>
<td>17</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

Male - legs alone affected, 44 = 82 %
Animals do 9 = 18 %

Female - legs alone affected, 34 = 88.8 %
Animals do 3 = 11.1 %

The scrotum was affected to some extent in 18 ml of the 68 males, but in only 3 cases was it alone affected.

*lymph Scrotum is not included here.
Bibliography

1. Maneno, "Tropical Diseases" 
   Aug. Vol XVI. No 1 p. 533-47
   No 1, 1912.
    XVII No 13 p. 416.
11. Scheurle, Krankheiten der warmen Länder.
12. Young, B. W. J., B. W. J. 1897(6), p. 1037
13. keizer, in Bahre report (7), p. 38
15. Belland, B. W. J. 1902(9), p. 831
17. cabot, Johns Hopkins Bull. 1902 V. 133.
   Vol 1 No 3, p. 243-250
   1, p. 84.
20. Whyte, Duncan, B. W. J. 1913(11) p. 1301
    Discussion on B. hwww-haku
21. Fleming, Jnes, ibid p. 1301
   Lehre. Hyg. (10) Nov. 1908
Some Observations on Filariasis and Elephantiasis in the South Pacific

by James Roberts Boyd
MB. BCh. B (Edin.)
July 1911
<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE OF THESIS</th>
<th>ORIGINAL REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boyd, James R</td>
<td>Some observations of Filariasis and Elephantiasis in the South Pacific.</td>
<td>**</td>
</tr>
<tr>
<td>Bourhill, Charles J.G</td>
<td>The smoking of Dagga (Indian Hemp) among the Native Races of South Africa, and the resultant evils.</td>
<td>**</td>
</tr>
<tr>
<td>Davidson, James</td>
<td>Buccal Cancer in India.</td>
<td></td>
</tr>
<tr>
<td>Dickson, Ian D</td>
<td>A fever of uncertain origin occurring in South Africa.</td>
<td>*</td>
</tr>
<tr>
<td>Macaskill, Donald C.</td>
<td>Entamoebic Dysentery, with a Note on Pathogenic Entamoeba.</td>
<td>**</td>
</tr>
<tr>
<td>Peake, Ernest C.</td>
<td>Asiatic Schistosomiasis: the result of Infection by the Blood-worm Schistosoma Japonicum.</td>
<td>*</td>
</tr>
<tr>
<td>Prasad, Kanta (Lt.-Col.I.M.S)</td>
<td>Diabetes Mellitus in the East. Its treatment.</td>
<td>**</td>
</tr>
<tr>
<td>Whyte, G. Duncan</td>
<td>An Epidemic of Cholera treated by intravenous saline infusion.</td>
<td>**</td>
</tr>
</tbody>
</table>