

Marine (1899) Department.

G.O., No. 208 Mar

DATED 6th March 99

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[Despatch Abstract.]
Spread of the insect known as the "Chop" or
the "Jigger"

Indorsement in the Public Dept
transferring letter from the Govt of India stating
that the attention of that Govt has been drawn
to the _____ on Africa to the possibility that
the pest may invade India, forwarding a memorandum
about the insect prepared by Mr. Cotes, Commissioner
Caled to the Dist. Secy. & the Collectors of Mauritius
Dist. Secy and the papers ordered also to be published in the
Intelligence & Mauritius & Seychelles.

280
24

92

Indorsed 7/3

G.O., No. 208, 6th March 1899.

MARCH.

Spread of the Insect known as the "Chigo" or the "Jigger"

Endorsement in the Public Department transferring letter from the Government of India stating that the attention of that Government has been drawn to the — over Africa and to the possibility that the pest may invade India, and forwarding a memorandum about the insect prepared by Mr. Cotes, communicated to the Presidency Port Officer and the Collectors of Maritime Districts; and the papers ordered also to be published in the Fort St. George and Maritime District Gazettes.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

READ—the following papers:—

From A. H. L. FRASER, Esq., c.s.i., Officiating Secretary to the Government of India (Home Department—Medical), to the Chief Secretary to the Government of Madras, dated Calcutta, the 9th February 1899, No. 195,

I am directed to state that the attention of the Government of India has been drawn to the spread of the insect known as the "Chigo" or "Jigger" over Africa and to the possibility that the pest may invade India. I am to forward, for the information of the Governor in Council, a memorandum about the insect prepared by Mr. E. C. Cotes, Fellow of the Entomological Society of London.

2. The Government of India think that it would be advisable that the matter should be brought to the notice of Port Health Officers in order that they may be on the look out and may make enquiries from ship masters and doctors, in the case of vessels coming from countries which are infested by the insect. I am also to suggest that the following precautions should be adopted, as far as the Government of Madras may consider practicable, in respect of any ship in which the existence of the jigger may be brought to light. Every one on board to be carefully examined before being allowed to land, and any person suffering from the pest to be detained until cured. The ship to be washed down with kerosine oil, and the ballast, if the ship is in ballast, to be discharged into the sea.

ENCLOSURE.

THE JIGGER OR CHIGO.

This insect, *Sarcopsylla penetrans*, Linn., belongs to a group of degraded wingless Diptera, known by entomologists as Aphaniptera, Siphonaptera or Pulicidae. It is closely related to the common flea, from which, however, it differs in habits. Its nearest relation in Asia is *Sarcopsylla gallinacea*, Westwood, which was described by Professor Westwood (*Entomologists' Monthly Magazine*, Volume XI, 1874-75, p. 246) from specimens found fastened to the eyelids and on the neck of domestic fowls at Colombo. The same species has since been identified on competent authority in specimens from Turkestan and from the United States of America (Gainesville, Fla.)—vide A. S. Packard in U. S. Dept. Entomology Bulletin, Volume VII, 1894-95, p. 23. It is probable, therefore, that *Sarcopsylla gallinacea* occurs all over the world. Its relative, *Sarcopsylla penetrans*, on the other hand, appears to have been confined to South America and the West Indies up to the middle of the nineteenth century, when it is alleged to have been introduced on to the West Coast of Africa in sand ballast landed at Ambriz by a ship from Brazil. A good deal has been written about the jigger, the following being references to the more recent publications in which it is discussed. Packard, Proc. Ent. Soc., Washington, Volume III. Jullien, *La Chique sur la Côte occidentale d'Afrique*, Bull. Soc. Zool. Fr. XIV, pp. 93-95 (containing notes on its habits).

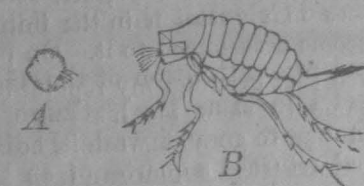
Blanchard, Bull. Soc. Zool. Fr. 1889, pp. 95-99.
Raspail, *Note rectificative sur l'histoire de la Chique*, Bull. Soc. Zool. Fr. XIV, pp. 366-369.
Gronet, Let. Nat. VII, pp. 6 and 13 (being a contribution to the Natural History of).
Packard, *Guide to the study of Insects* (New York, 1880, p. 390) quoted below.
Comstock, *Manual for the study of Insects*. Ithaca, New York, 1895, p. 493 (quoted below).
Johnston, *British Central Africa*, London, 1897, p. 368 (quoted below).
Deele, *Three years in Savage Africa*, London, 1898, pp. 374 and 567 (quoted below).

Linnaeus (Syst. Nat. 13th Edit., Ins. tom I, Pt. V, p. 2923) describes the jigger, which he calls "*Pulex penetrans*," as being "rostrum corporis longitudine," whereas the flea (his *Pulex irritans*) is "rostrum corpore brevior." Of the jigger he says: "Habitat in America, pedes hominum intrans, ova deponens, ulcera maligna saepe mortem causans, caute extrahendus, fusco rupeus, abdomine subtus feminae ovis innumeris gravidae orbiculato, ad magnitudinis centuplam totius corporis intumescens."

Writing in the year 1781, Fabricius (Species Insectorum, Par. II, p. 383) refers to the previous descriptions of *Pulex penetrans* by Linnaeus and others as follows:—

"P. Proboscide corporis longitudine Syst. Ent. 733, 2. Linn. Syst. Nat. 2. 1021. 2, pulex cutem penetrans, Catesb. Carol. 3, 10, tab. 10, Fig. 3, Acarus fuscus subcute nidulans, proboscide acutiori, Brown. Iam 418." He adds, almost in the words used by Linnaeus: "Habitat in America, pedes hominum intrans, ova deponens, ulcera maligna saepe mortem causans, caute extrahendus. Abdomen feminae ovis innumeris gravidum, orbiculatum, uti in termitis fatali ad magnitudinem centuplam totius corporis intumescit."

A.—Gravid female natural size.
B.—Active stage, much enlarged.



Sarcopsylla penetrans, Linn., after Packard.

Packard, in his *Guide to the study of Insects* (New York, 1880, p. 390), speaks of the species as "one of the most serious insect torments of the tropics of America." He adds—

"The female, during the dry season, bores into the feet of the natives (though it also lives in dogs and mice, which accounts for its presence in houses), the operation requiring but a quarter of an hour, usually penetrating under the nails, and lives there until her body becomes distended with eggs, the abdomen swelling out to the size of a pea. The presence of this insect often causes distressing sores. The chigo lays about sixty eggs, according to Karsten, depositing them in a sort of sac on each side of the external opening of the oviduct. The larvae do not live in the body of the parent, or of its host, but like those of *pulex* live free on the ground. The best preventives against its attacks are cleanliness and the constant wearing of shoes or slippers when in the house, and of boots when out of doors."

[Comstock in his *Manual for the study of Insects* (Ithaca, New York, 1895) says, p. 493, under Siphonaptera—"The chigo or jigger, *Sarcopsylla penetrans*, is a small flea found in the West Indies and South America, which often causes serious trouble to men by burrowing beneath the skin of the foot. It is the fertile female that does this, and soon after entering its host the body of the flea becomes distended with eggs and acquires the size of a pea."]

An important contribution to the history of the insect in Africa is made by Sir Harry Johnston, in his *British Central Africa* (Methuen, London, 1897), p. 368, where he writes—

"The burrowing flea (*Sarcopsyllus penetrans*) is quite a new arrival in this country. It is a native of South America and the West Indies, where it is usually known as the "Chigo" or "Jigger," and as such is supposed to be the origin of the sailor's oath—"Well, I'm jiggered!" In the earlier "fifties" a ship from Brazil landed sand ballast at Ambriz on the west coast of Africa, and thus introduced the jigger into the soil. The animal slowly spread through the sandier regions of Angola and along the West African Coast towards the Congo and Sierra Leone. At first it made its way up the Congo slowly, but Stanley's expedition and the spread of civilization over the Congo Free State carried this jigger far and wide. When I visited the Congo, the burrowing flea had scarcely got further up the river than Bolobo. Soon afterwards it reached the Stanley Falls, and thence made its way to Tanganyika in the Arab caravans. From Tanganyika it gradually spread southwards to Lake Nyasa, and was first heard of at Karonga about 1891. It reached South Nyasa the following year, and in 1894 became a great pest at Zomba and throughout the Shiré Highlands, finally reaching Chinde on the sea coast in 1895. Fortunately it is an insect which apparently only thrives on sandy soils, and therefore in moist parts of British Central Africa it is already commencing to disappear. At first it caused

terrible sufferings amongst our naked-footed soldiers, policemen and postmen, many of whom became lame by its bites. It caused the administration to go to great expense in providing boots for all these people. Gradually, however, the natives are getting used to its attacks, as they are in West Africa and in the West Indies, and by care and constant attention to the feet are able to keep it at bay. The jigger is a very minute flea, only just visible. The female creeps under the skin, preferring, if possible, those parts where there is a slight pressure, such as between the toes or fingers. The foot, however, is that portion of the human frame which it most usually attacks. Having burrowed under the surface of the skin the insect proceeds to lay a large number of eggs, which, together with itself, are enveloped in a white sac. After laying the eggs the mother dies, the young ones hatch out and proceed to devour all the surrounding tissues, burrowing in all directions until at last the neglected toe or other portion of the foot becomes honeycombed. In extreme cases mortification may set in, and the whole foot be lost even if the mischief spread no farther. But such a case as this could only occur when the insect first makes its appearance in a new country, and its advances are quite uninterrupted and neglected. If the jigger be removed within a few days after entry, the removal is very easy and relatively painless, and the evil consequences are nil. Still Europeans who are obliged to live in jigger-haunted localities should be careful to have their feet examined once a day by a native servant.

The natives are very sharp eyed, and on a white skin it is easy to see the jigger burrowing like a little blue point under the surface. A little carbolic oil dropped into the hole from which the burrowing flea has been extracted will allay the irritation, which is caused by some liquid the animal exudes, and will effectively kill any eggs that may have escaped from the sac.

Fortunately the skin surrounding the sac is tough, and a skilful operator easily removes it unbroken. The jigger attacks not only human beings, but monkeys, dogs, fowls and turkeys.

In his *Three years in Savage Africa*, London, 1898, Mr. Lionel Deele gives interesting particulars of the damage that the insect may occasion in the initial stage, which Sir H. Johnston describes, before the people have become accustomed to it. On page 374 Mr. Deele writes—

"At Sindai, where we arrived that evening, my reputation as a Mfumu had preceded me, and I was met by a man who came to show me his foot. The little toe was enormously swollen and full of matter. I told him to go and wash it, because it would have to be opened. The imbecile misunderstood me and returned a quarter of an hour later, very tranquil, having cut off his toe. I dressed it, and in a few moments a dozen others had collected, with their feet in an awful condition from the jiggers. Half of them had removed the parts attacked, cutting themselves to the bone. Others had removed the big toe-nail. All these sores were most dreadful, and all I could do was to dress them with corrosive sublimate and iodoform.

It was there that I was first able to judge of the terrible havoc caused by funza—jiggers. In this village there was not a man, woman or child who was not covered with ulcers.

Again, in pages 567 to 571 of the same volume, Mr. Deele writes—

"But there is another plague, quite as serious, that threatens South Africa—a plague that nothing will stop and that will seriously affect the labour market. I am speaking of the jiggers. This is an insect of the flea family, indigenous to South America. It was brought to West Africa by a slave ship. The jigger, or *Pulex penetrans*, is a small flea that burrows in the flesh, chiefly of the feet, choosing in preference the neighbourhood of the toe-nails. The female penetrates under the skin with its head only sticking out; this head is so small that it can only be detected with a magnifying-glass, and cannot be seen in the skin of a black man. At first it causes no pain, but after a couple of days it gives the same sensation as a small thorn. After five to six days the body of the insect reaches the size of a pea, and is full of eggs; the pain is then very great, and when the insect has been extracted its place is marked by a deep ulcer, that usually gets badly inflamed and often brings on blood poisoning. The natives dig it out with a pointed piece of wood, tearing the skin all round to make a hole large enough to allow the body of the insect to come out without breaking the pocket of eggs. They imagine that if they break the pocket, the eggs will generate under their skin. They are right in a sense; as they possess no antiseptics; and I have myself seen a fellow out of whom two hundred jiggers were extracted! But even when a hole has been made large enough to allow the insect to be removed, it is most painful to get it out, as it is fastened to the ulcer it has produced. The best way is to open the place where the insect is with a lancet, and then to syringe the wound well with a sublimate lotion. The body of the insect having been removed with a forceps the wound must again be well syringed and carbolic oil applied to it. In order to avoid these pests getting to a large size, white men ought to have their feet carefully examined twice daily. When a jigger is discovered, it can be easily removed during the first two days with the point of a needle. In many cases, however, they cannot be discovered until they have reached a certain size, and then extraction often amounts to a regular operation. Often they penetrate under the edge of the nails, and I have seen some of them right under the middle of the nail; this necessitated a most painful operation. Boots are of little avail, and only prevent you from getting large numbers of them. They jump like a flea, and get at your foot by the top of the boot. Besides, when they have invaded a country, they are found on the ground outside and inside every house. Although I had my feet examined twice daily, I have had as many as three extracted at one time,

after they had reached a good size, as they had escaped the notice of my servants during three or four days. I had from two to four of them taken out almost daily. When Colonel Colville started for the Unyoro expedition, out of eight white men four of us were unable to wear a boot or walk, on account of ulcers brought on by the jiggers. Colonel Colville had seven of them extracted the day he left Kampala; and Dr. Moffat had to ride a donkey, his feet being tied up in bandages.

"But it is among the natives that they cause the most damage. Among the Soudanese troops in Uganda I have myself made the following observations. At Fort Raymond the garrison consisted of 160 askaris (soldiers) and 70 porters; out of this number of men 72 askaris and 30 porters were absolutely unfit for service through ulcers brought on by jiggers, and 30 more men were lame. At Fort Grant the proportion of invalids through jiggers was over 50 per cent. I was in charge of the Medical Department—having volunteered to help Major Owen during the war—and never in my life have I seen such awful ulcers. Some of the men had the bone of their big toe protruding fleshless for more than an inch, others had quite a square inch of the bone of the heel exposed. I remember, among others, a corporal whose foot was covered with an ulcer about five inches long by three inches broad. In some villages of Uduhu (south of Lake Victoria Nyanza) I found the people starving, as they were so rotten with ulcers from jiggers, that they had been unable to work in their fields, and could not even go to cut the few bananas that had been growing. In many villages of Uganda things were almost as bad. When I crossed Africa, I found the first trace of jiggers at Mabwe, half-way between Lake Nyasa and Lake Tanganyika. From there I found them all over the shores of Lake Tanganyika, in Uhha, in Unyamwezi, in Usikuma, all over the shores of Lake Victoria Nyanza, throughout Uganda and Usoga. The southern part of the Masai country alone was free from them.

"Sir Harry Johnston informed me last summer that the jiggers have come down to Blantyre, having, therefore, travelled about 500 miles southward in two years' time. I calculate, accordingly, that they will reach Mashonaland in about two years' time, and with the railway communication they will be all over the Cape Colony in a year more. In fact, I feel absolutely certain that they will invade the Colony before the year 1900.* Those only who have seen what damage the jiggers cause can realize what the

* They had already made their appearance in Beria in 1896.

prospect means for South Africa. The matter is most serious, and steps should be taken to try to ward off the danger.

"To give an idea of the prolific way in which they generate, I must explain that the moment the jigger is taken out of the flesh, she begins to lay her eggs; and I have counted, with a magnifying glass, 150 eggs that came out of one jigger in less than 30 seconds, and she went on laying them for more than five minutes. Even if a jigger lays only 500 eggs—and this is far below the number—it must be remembered that these become insects in a few days, and it may be under- stood how the whole of Africa north of the Zambezi is now infested with them. Sandy soil is the most suitable to their development, and in all the sandy regions where I found them the place swarmed with them. The natives are chiefly responsible for their increase, as, instead of destroying them as they extract them from their skin, they merely throw them on the ground, where they soon generate.

"Animals are also attacked by them—dogs, monkeys, fowls, and others. I saw in Muanza, south of Lake Victoria Nyanza, a tame eagle that had lost one of his legs through jiggers. In order to give an idea of the way in which these insects attack men, I may quote the example of a dwarf (one of those discovered by Mr. Stanley) who was in the service of Major Owen. The little fellow was very dirty, and while Major Owen went to Unyoro, he was left for a month at Fort Raymond. When we returned there, we found that he could not walk, and, having examined him, I discovered that he was full of jiggers. I got a Soudanese to take them out, and the first day he got two hundred and eighty out of the boy's body. His feet, his toes, knees, hands, fingers, elbows, shoulders and back were full of them, and when he was brought to me after the operation, he was a mass of blood, and it took me over an hour to bandage him.

"As I have explained, the natives dig the jiggers out with a pointed bit of wood, breaking the skin all round the body of the insect. The result is that the skin gets hardened and mortified, and when fresh jiggers get in the same spot, they cannot be discovered till they have grown quite large, and often they are so deep in the flesh, having crept in by one of the crevices left in the mortified skin, that a hole half an inch deep has to be made before they can be got at. The result is usually a deep ulcer, dirt gets in, and the native medicines they apply to it, consisting of all sorts of filth, bring on gangrene, causing death or at least the loss of a limb. In many instances I have had to perform amputations of toes in order to save a man from the effects of gangrene, and in all such cases I found iodoform the most effective antiseptic to prevent ulceration after the jigger had been extracted.

"In fact, the natives soon learned its use; and when I arrived in Karagwe, a native Chief, having heard that a white man had landed, came from a long distance to ask me for yellow medicine. A brother of his, he said, had some of the yellow *dawa* (medicine) given to him by a German officer, and if I would give him some, he would give me anything I liked. I gave him

a little iodoform, and in the evening his *katikiro* (prime minister) came also to beg for some of it. I had obtained canes from the Chief to take me to Uganda, and being short of iodoform I did not care to spare any more; so I made a mixture of iodoform and sulphate of zinc.

"The *katikiro*, however, soon returned, and complained that his medicine was not as yellow as the one I had given to the Chief. I replied that he could not expect the same medicine as a big Chief, and he quite understood the distinction.

To conclude, I think that I have done my duty in pointing out the serious and new danger that threatens South Africa.

"I feel sorry to appear as a prophet of evil, but, perhaps my warning may enable the Government to take steps to check the impending danger. I cannot think of any measure that may stop the invasion, but I should advise the responsible authorities to have the subject thoroughly studied, so that, when this new plague makes its appearance, it may not take the people unawares, and that proper remedies may be known beforehand, and precautions recommended to avoid the spreading of the pest. From Central America and the West Indies, whence the jigger comes, considerable information can be obtained on the subject, and measures should be taken to obtain it without delay. My experience makes me look upon the jigger as the greatest curse that has ever afflicted Africa, and I hope that my warning will be taken up and turned to practical account."

It is to the above passages in Mr. Deale's book that reference is made in an article headed *A real danger to India*, which appears in the *Allahabad Pioneer*, dated 30th December 1898.

It will be seen from the above that the jigger can be a very serious pest when it first invades a country, though once the people get used to it, it becomes rather a nuisance than a grave infliction. This is borne out not only by the experiences in British Central Africa described by Sir H. Johnston, but by what is said about the insect by those who have been in South America, where it is a constant source of possible annoyance to any one who incautiously goes about without shoes and who fails to take the precaution, which every one in Demerara is said to get used to, of examining his feet afterwards.

For those who wear shoes, however, and examine their feet often, the evil apparently becomes comparable to that caused by the mosquito in connection with which it would not be difficult to rake up harrowing tales of people who have got blood poisoning and even died from being bitten!

At the same time, the jigger evil is certainly one that is worth taking trouble to avoid importing into India.

In this connection it may not be out of place to observe that there has been for many years a large coolie and rice traffic between Calcutta and both South America and the West Indies, without the insect's succeeding in establishing itself on this side. It does not, of course, follow that it has never been brought to India, for it is a common remark amongst entomologists that what may amount to a serious pest in one place and time may in another locality or at another time find conditions so inimical that, though present, it may fail to multiply sufficiently to become noticeable. Two other points will also be observed in connection with the jigger: one is that damp coasts like those of Bombay and Calcutta are said to be unfavourable to its development; the other is that, although in slave dealing times there must have been considerable traffic between the west coast of Africa and the West Indies, where the jigger exists, it is believed to have been in ballast and not on the persons of coolies that the pest was eventually imported. This is easily explained by the life history of the insect, which passes one stage of its existence in a free state on the ground. The inference is obvious in regard to preventive measures, which would, of course, have to be used against South America and the West Indies as well as against Africa. In this connection it may be observed that what is known about the susceptibility of allied insects to the effect of different insecticides points strongly, it might be said conclusively, to the supposition that kerosine oil used broadcast would be the most effectual disinfectant on boardship against the jigger.

Further suggestions of utility might possibly be obtained through the Governments of such Colonies as Demerara and Jamaica; an important point to ascertain being the length of time the larval form is capable of living in a free state in ballast or dust on board ship. It would, of course, be to some extent upon this that would depend the length of time an infected vessel required to be quarantined, though supposing the observation recorded by Dr. Packard to be confirmed, *viz.*, that the insect is parasitic upon mice as well as men, it is likely that rats also would be liable to act as hosts, in which case mere quarantining would be insufficient. It may be added that the burning of sulphur on board ship is quite useless against such insects as the jigger, though it is possible that it might have some effect in killing rats that might otherwise convey the infection. Upon the whole, the danger seems so remote, and the difficulty of really effectual preventive measures so great, that all that can be at all confidently recommended is to make masters and ships' doctors responsible for reporting cases of the pest on board; the vessel to be thereafter swabbed down with kerosine oil under the supervision of the Port Health Officer, and restrictions imposed upon the dumping on shore of sand ballast from infected localities.

Endorsement in the Public Department, dated 23rd February 1899, No. 559.

ORDER—No. 208, Marine, dated 6th March 1899.

Communicated to the Presidency Port Officer and the Collectors of Maritime Districts who will instruct the Port Health officers to adopt the precautions suggested by the Government of India.

The papers will be published in the Fort St. George and Maritime District Gazettes.

(True Extract.)

Under Secretary to Government.

To the Presidency Port Officer.
" Collector of Maritime Districts.
" the Port Health Officer, Madras.
" the Revenue Department.
" the Public Department.
" the Political Department.
" the Local and Municipal Department.
" the Superintendent, Government Press.

Exd. T. K. Narayana Aiyangar.

Home
Public (1897) Department.

287
CURRENT No. 26



From
The Govt. of India
Home Dept (Medical)

Order Endorsement
No. 559
423-299

Transferred to the
Marine Department.
Advn. Hk.
at: Under Secretary

No. 195

Dated 9.2.89
Received } 15.2.89.
Registered }
Enclosures 1
Spare copies

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17.2.89

~~Revenue~~
~~By~~

To
The Marine Department.

SUBJECT.

Forwarding a memo-
randum prepared by Mr.
E.C. Cole regarding the
spread of the insect known
as "Chigo" or "Jogger" &
stating that certain precautions
should be taken against the
pest, which is said to be
in Africa.

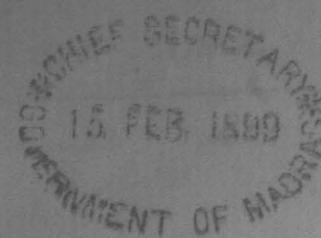
BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

CURRENT NO. 526



No. 195.

FROM

A. H. L. FRASER, Esq., C.S.I.,
Offg. Secretary to the Government of India,

TO

The Chief Secy. to the Govt. of Madras.

Home Department.
Medical.

Calcutta, the 9th February 1899.

SIR,

I AM directed to state that the attention of the Government of India has been drawn to the spread of the insect known as the "Chigo" or "Jigger" over Africa and to the possibility that the pest may invade India. I am to forward, for the information of the Governor in Council, a memorandum about the insect prepared by Mr. E. C. Cotes, Fellow of the Entomological Society of London.

2. The Government of India think that it would be advisable that the matter should be brought to the notice of Port Health Officers in order that they may be on the look out and may make enquiries from ship masters and doctors, in the case of vessels coming from countries which are infested by the insect. I am also to suggest that the following precautions should be adopted, as far as the Government of Madras may consider practicable, in respect of any ship in which the existence of the jigger may be brought to light. Every one on board to be carefully examined before being allowed to land, and any person suffering from the pest to be detained until cured. The ship to be washed down with kerosine oil, and the ballast, if the ship is in ballast, to be discharged into the sea.

I have the honour to be,

SIR,

Your most obedient Servant,

A. H. L. Fraser.

Offg. Secretary to the Government of India.

THE JIGGER OR CHIGO.

This insect, *Sarcopsylla penetrans*, Linn., belongs to a group of degraded wingless Diptera, known by entomologists as Aphaniptera, Siphonaptera or Pulicidae. It is closely related to the common flea, from which, however, it differs in habits. Its nearest relation in Asia is *Sarcopsylla gallinacea*, Westwood, which was described by Professor Westwood (*Entomologists' Monthly Magazine*, Volume XI, 1874-75, p. 246) from specimens found fastened to the eyelids and on the neck of domestic fowls at Colombo. The same species has since been identified on competent authority in specimens from Turkestan and from the United States of America (Gainesville Fla.)—*vide* A. S. Packard in U. S. Dept. Entomology Bulletin, Volume VII, 1894-95, p. 23. It is probable, therefore, that *Sarcopsylla gallinacea* occurs all over the world. Its relative, *Sarcopsylla penetrans*, on the other hand, appears to have been confined to South America and the West Indies up to the middle of the nineteenth century, when it is alleged to have been introduced on to the West Coast of Africa in sand ballast landed at Ambriz by a ship from Brazil. A good deal has been written about the jigger, the following being references to the more recent publications in which it is discussed. Packard, Proc. Ent. Soc., Washington, Volume III. Jullien, *La Chique sur la Côte occidentale d'Afrique*, Bull. Soc. Zool. Fr. XIV, pp. 93-95 (containing notes on its habits).

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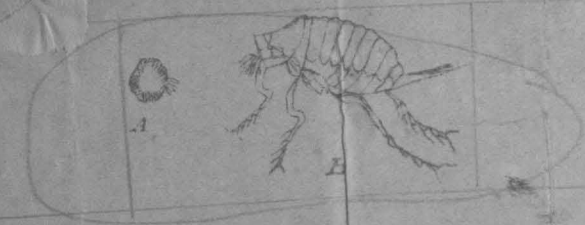
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A.—Gravid female natural size.
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cut in head
B.H.

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An important contribution to the history of the insect in Africa is made by Sir Harry Johnston, in his *British Central Africa* (Methuen, London, 1897), p. 368, where he writes:—

The burrowing flea (*Sarcopsylla penetrans*) is quite a new arrival in this country. It is a native of South America and the West Indies, where it is usually known as the "Chigo" or "Jigger," and as such is supposed to be the origin of the sailor's oath—"Well, I'm jiggered!" In the earlier "fifties" a ship from Brazil landed sand ballast at Ambriz on the west coast of Africa, and thus introduced the jigger into the soil. The animal slowly spread through the sandier regions of Angola and along the West African Coast towards the Congo and Sierra Leone. At first it made its way up the Congo slowly, but Stanley's expedition and the spread of civilization over the Congo Free State carried this jigger far and wide. When I visited the Congo, the burrowing flea had scarcely got further up the river than Bolobo. Soon afterwards it reached the Stanley Falls, and thence made its way to Tanganyika in the Arab caravans. From Tanganyika it gradually spread southwards to Lake Nyasa, and was first heard of at Karonga about 1891. It reached South Nyasa the following year, and in 1894 became a great pest at Zomba and throughout the Shire Highlands, finally reaching Chinde on the sea coast in 1895. Fortunately it is an insect which apparently only thrives on sandy soils, and therefore in moist parts of British Central Africa it is already commencing to disappear. At first it caused terrible sufferings amongst our naked-footed soldiers, policemen and postmen, many of whom became lame by its bites. It caused the administration to go to great expense in providing boots for all these people. Gradually, however, the natives are getting used to its attacks, as they are in West Africa and in the West Indies, and by care and constant attention to the feet are able to keep it at bay. The jigger is a very minute flea, only just visible. The female creeps under the skin, preferring, if possible, those parts where there is a slight pressure, such as between the toes or fingers. The foot, however, is that portion of the human frame which it most usually attacks. Having burrowed under the surface of the skin the insect proceeds to lay a large number of eggs, which, together with itself, are enveloped in a white sac. After laying the eggs the mother dies, the young ones hatch out and proceed to devour all the surrounding tissues, burrowing in all directions until at last the neglected toe or other portion of the foot becomes honeycombed. In extreme cases mortification may set in, and the whole foot be lost even if the mischief spread no farther. But such a case as this could only occur when the insect first makes its appearance in a new country, and its advances are quite uninterrupted and neglected. If the jigger be removed within a few days after entry, the removal is very easy and relatively painless, and the evil consequences are nil. Still Europeans who are obliged to live in jigger-baunted localities should be careful to have their feet examined once a day by a native servant.

The natives are very sharp eyed, and on a white skin it is easy to see the jigger burrowing like a little blue point under the surface. A little carbolic oil dropped into the hole from which the burrowing flea has been extracted will allay the irritation, which is caused by some liquid the animal exudes, and will effectively kill any eggs that may have escaped from the sac.

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stage, which Sir H. Johnston describes, before the people have become accustomed to it. On page 374 Mr. Deele writes:—

At Sindai, where we arrived that evening, my reputation as a Mfumu had preceded me, and I was met by a man who came to show me his foot. The little toe was enormously swollen and full of matter. I told him to go and wash it, because it would have to be opened. The imbecile misunderstood me and returned a quarter of an hour later, very tranquil, having cut off his toe. I dressed it, and in a few moments a dozen others had collected, with their feet in an awful condition from the jiggers. Half of them had removed the parts attacked, cutting themselves to the bone. Others had removed the big toe-nail. All these sores were most dreadful, and all I could do was to dress them with corrosive sublimate and iodoform.

It was there that I was first able to judge of the terrible havoc caused by funza-jiggers. In this village there was not a man, woman or child who was not covered with ulcers.

Again, in pages 567 to 571 of the same volume, Mr. Deele writes:—

But there is another plague, quite as serious, that threatens South Africa—a plague that nothing will stop and that will seriously affect the labour market. I am speaking of the jiggers. This is an insect of the flea family, indigenous to South America. It was brought to West Africa by a slave ship. The jigger, or *Pulex penetrans*, is a small flea that burrows in the flesh, chiefly of the feet, choosing in preference the neighbourhood of the toe-nails. The female penetrates under the skin with its head only sticking out; this head is so small that it can only be detected with a magnifying-glass, and cannot be seen in the skin of a black man. At first it causes no pain, but after a couple of days it gives the same sensation as a small thorn. After five to six days the body of the insect reaches the size of a pea, and is full of eggs; the pain is then very great, and when the insect has been extracted its place is marked by a deep ulcer, that usually gets badly inflamed and often brings on blood poisoning. The natives dig it out with a pointed piece of wood, tearing the skin all round to make a hole large enough to allow the body of the insect to come out without breaking the pocket of eggs. They imagine that if they break the pocket, the eggs will generate under their skin. They are right in a sense, as they possess no antiseptics; and I have myself seen a fellow out of whom two hundred jiggers were extracted! But even when a hole has been made large enough to allow the insect to be removed, it is most painful to get it out, as it is fastened to the ulcer it has produced. The best way is to open the place where the insect is with a lancet, and then to syringe the wound well with a sublimate lotion. The body of the insect having been removed with a forceps the wound must again be well syringed and carbolic oil applied to it. In order to avoid these pests getting to a large size, white men ought to have their feet carefully examined twice daily. When a jigger is discovered, it can be easily removed during the first two days with the point of a needle. In many cases, however, they cannot be discovered until they have reached a certain size, and then extraction often amounts to a regular operation. Often they penetrate under the edge of the nails, and I have seen some of them right under the middle of the nail; this necessitated a most painful operation. Boots are of little avail, and only prevent you from getting large numbers of them. They jump like a flea, and get at your foot by the top of the boot. Besides, when they have invaded a country, they are found on the ground outside and inside every house. Although I had my feet examined twice daily, I have had as many as three extracted at one time, after they had reached a good size, as they had escaped the notice of my servants during three or four days. I had from two to four of them taken out almost daily. When Colonel Colville started for the Unyoro expedition, out of eight white men four of us were unable to wear a boot or walk, on account of ulcers brought on by the jiggers. Colonel Colville had seven of them extracted the day he left Kampala; and Dr. Moffat had to ride a donkey, his feet being tied up in bandages.

But it is among the natives that they cause the most damage. Among the Soudanese troops in Uganda I have myself made the following observations. At Fort Raymond the garrison consisted of 160 askaris (soldiers) and 70 porters; out of this number of men 72 askaris and 30 porters were absolutely unfit for service through ulcers brought on by jiggers, and 30 more men were lame. At Fort Grant the proportion of invalids through jiggers was over 50 per cent. I was in charge of the Medical Department—having volunteered to help Major Owen during the war—and never in my life have I seen such awful ulcers. Some of the men had the bone of their big toe protruding fleshless for more than an inch, others had quite a square inch of the bone of the heel exposed. I remember, among others, a corporal whose foot was covered with an ulcer about five inches long by three inches broad. In some villages of Uduhu (south of Lake Victoria Nyanza) I found the people starving, as they were so rotten with ulcers from jiggers that they had been unable to work in their fields, and could not even go to cut the few bananas that had been growing. In many villages of Uganda things were almost as bad. When I crossed Africa, I found the first trace of jiggers at Mabwe, half-way between Lake Nyasa and Lake Tanganika. From there I found them all over the shores of Lake Tanganika, in Uhha, in Unyamwezi, in Usikuma, all over the shores of Lake Victoria Nyanza, throughout Uganda and Usoga. The southern part of the Masai country alone was free from them.

Sir Harry Johnston informed me last summer that the jiggers have come down to Blantyre, having, therefore, travelled about 500 miles southward in two years' time. I calculate,

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accordingly, that they will reach Mashonaland in about two years' time, and with the railway communication they will be all over the Cape Colony in a year more. In fact, I feel absolutely certain that they will invade the Colony before the year 1900.* Those only who have seen what damage the jiggers cause can realize what the prospect means for South Africa. The matter is most serious, and steps should be taken to try to ward off the danger.

* They had already made their appearance in Paris in 1896.

To give an idea of the prolific way in which they generate, I must explain that the moment the jigger is taken out of the flesh, she begins to lay her eggs; and I have counted, with a magnifying glass, 150 eggs that came out of one jigger in less than 30 seconds, and she went on laying them for more than five minutes. Even if a jigger lays only 500 eggs—and this is far below the number—it must be remembered that these become insects in a few days, and it may be understood how the whole of Africa north of the Zambezi is now infested with them. Sandy soil is the most suitable to their development, and in all the sandy regions where I found them the place swarmed with them. The natives are chiefly responsible for their increase, as, instead of destroying them as they extract them from their skin, they merely throw them on the ground, where they soon generate.

Animals are also attacked by them—dogs, monkeys, fowls, and others. I saw in Muanza, south of Lake Victoria Nyanza, a tame eagle that had lost one of his legs through jiggers. In order to give an idea of the way in which these insects attack men, I may quote the example of a dwarf (one of those discovered by Mr. Stanley) who was in the service of Major Owen. The little fellow was very dirty, and while Major Owen went to Unyoro, he was left for a month at Fort Raymond. When we returned there, we found that he could not walk, and, having examined him, I discovered that he was full of jiggers. I got a Soudanese to take them out, and the first day he got two hundred and eighty out of the boy's body. His feet, his toes, knees, hands, fingers, elbows, shoulders, and back were full of them, and when he was brought to me after the operation, he was a mass of blood, and it took me over an hour to bandage him.

As I have explained, the natives dig the jiggers out with a pointed bit of wood, breaking the skin all round the body of the insect. The result is that the skin gets hardened and mortified, and when fresh jiggers get in the same spot, they cannot be discovered till they have grown quite large, and often they are so deep in the flesh, having crept in by one of the crevices left in the mortified skin, that a hole half an inch deep has to be made before they can be got at. The result is usually a deep ulcer, dirt gets in, and the native medicines they apply to it, consisting of all sorts of filth, bring on gangrene, causing death or at least the loss of a limb. In many instances I have had to perform amputations of toes in order to save a man from the effects of gangrene, and in all such cases I found iodoform the most effective antiseptic to prevent ulceration after the jigger had been extracted.

In fact, the natives soon learned its use; and when I arrived in Karagwe, a native Chief, having heard that a white man had landed, came from a long distance to ask me for yellow medicine. A brother of his, he said, had some of the yellow *dawa* (medicine) given to him by a German officer, and if I would give him some, he would give me anything I liked. I gave him a little iodoform, and in the evening his *katikiro* (Prime Minister) came also to beg for some of it. I had obtained canoes from the Chief to take me to Uganda, and being short of iodoform I did not care to spare any more; so I made a mixture of iodoform and sulphate of zinc.

The *katikiro*, however, soon returned, and complained that his medicine was not as yellow as the one I had given to the Chief. I replied that he could not expect the same medicine as a big Chief, and he quite understood the distinction.

To conclude, I think that I have done my duty in pointing out the serious and new danger that threatens South Africa.

I feel sorry to appear as a prophet of evil, but perhaps my warning may enable the Government to take steps to check the impending danger. I cannot think of any measure that may stop the invasion, but I should advise the responsible authorities to have the subject thoroughly studied, so that, when this new plague makes its appearance, it may not take the people unawares, and that proper remedies may be known beforehand, and precautions recommended to avoid the spreading of the pest. From Central America and the West Indies, whence the jigger comes, considerable information can be obtained on the subject, and measures should be taken to obtain it without delay. My experience makes me look upon the jigger as the greatest curse that has ever afflicted Africa, and I hope that my warning will be taken up and turned to practical account.

It is to the above passages in Mr. Deele's book that reference is made in an article headed *A real danger to India*, which appears in the *Allahabad Pioneer*, dated 30th December 1898.

It will be seen from the above that the jigger can be a very serious pest when it first invades a country, though once the people get used to it, it becomes rather a nuisance than a grave infliction. This is borne out not only by the experiences in British Central Africa described by Sir H. Johnston, but by what is said about the insect by those who have been in South America,

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where it is a constant source of possible annoyance to any one who incautiously goes about without shoes and who fails to take the precaution, which every one in Demerara is said to get used to, of examining his feet afterwards.

For those who wear shoes, however, and examine their feet often, the evil apparently becomes comparable to that caused by the mosquito in connection with which it would not be difficult to rake up harrowing tales of people who have got blood poisoning and even died from being bitten!

At the same time, the jigger evil is certainly one that is worth taking trouble to avoid importing into India.

In this connection it may not be out of place to observe that there has been for many years a large coolie and rice traffic between Calcutta and both South America and the West Indies, without the insect's succeeding in establishing itself on this side. It does not, of course, follow that it has never been brought to India, for it is a common remark amongst entomologists that what may amount to a serious pest in one place and time may in another locality or at another time find conditions so inimical that, though present, it may fail to multiply sufficiently to become noticeable. Two other points will also be observed in connection with the jigger: one is that damp coasts like those of Bombay and Calcutta are said to be unfavourable to its development; the other is that, although in slave dealing times there must have been considerable traffic between the west coast of Africa and the West Indies, where the jigger exists, it is believed to have been in ballast and not on the persons of coolies that the pest was eventually imported. This is easily explained by the life history of the insect, which passes one stage of its existence in a free state on the ground. The inference is obvious in regard to preventive measures, which would, of course, have to be used against South America and the West Indies as well as against Africa. In this connection it may be observed that what is known about the susceptibility of allied insects to the effect of different insecticides points strongly, it might be said conclusively, to the supposition that kerosine oil used broadcast would be the most effectual disinfectant on boardship against the jigger.

Further suggestions of utility might possibly be obtained through the Governments of such Colonies as Demerara and Jamaica; an important point to ascertain being the length of time the larval form is capable of living in a free state in ballast or dust on board ship. It would, of course, be to some extent upon this that would depend the length of time an infected vessel required to be quarantined, though supposing the observation recorded by Dr. Packard to be confirmed, *viz.*, that the insect is parasitic upon mice as well as men, it is likely that rats also would be liable to act as hosts, in which case mere quarantining would be insufficient. It may be added that the burning of sulphur on board ship is quite useless against such insects as the jigger, though it is possible that it might have some effect in killing rats that might otherwise convey the infection. Upon the whole, the danger seems so remote, and the difficulty of really effectual preventive measures so great, that all that can be at all confidently recommended is to make masters and ships' doctors responsible for reporting cases of the pest on board; the vessel to be thereafter swabbed down with kerosine oil under the supervision of the Port Health Officer, and restrictions imposed upon the dumping on shore of sand ballast from infected localities.

4 : Marine
Read the following:—

Letter from the Government of India, Home Department,
Medical, No 195 dated 9 February 1899.

Endorsement thereon in the Public Department, No 559, of 23rd
February 1899.

Circulated to

The Hon. Mr. Curzon C.S.I.

ORDER.

208 Mar 4 6/3/99

Communicated to the
Presidency Port officers and
the Collectors of maritime Dis-
tricts who will instruct the
various Port Health officers
to adopt the precautions
suggested by the Government
of India.

The papers will be pub-
lished in the Port of George
and Maritime District Gazette.

To

The P. P. O.

" Collector of maritime Dis-

" Port Health officers, Madras

" Revenue Dept.

" Public -

" Political -

" Law -

" Sup. Gov. Press

THE JIGGER OR CHIGO.

This insect, *Sarcopsylla penetrans*, Linn., belongs to a group of degraded wingless Diptera, known by entomologists as Aphaniptera, Siphonaptera or Pulicidae. It is closely related to the common flea, from which, however, it differs in habits. Its nearest relation in Asia is *Sarcopsylla gallinacea*, Westwood, which was described by Professor Westwood (*Entomologists' Monthly Magazine*, Volume XI, 1874-75, p. 246) from specimens found fastened to the eyelids and on the neck of domestic fowls at Colombo. The same species has since been identified on competent authority in specimens from Turkestan and from the United States of America (Gainesville Fla.)—vide A. S. Packard in U. S. Dept. Entomology Bulletin, Volume VII, 1894-95, p. 23. It is probable, therefore, that *Sarcopsylla gallinacea* occurs all over the world. Its relative, *Sarcopsylla penetrans*, on the other hand, appears to have been confined to South America and the West Indies up to the middle of the nineteenth century, when it is alleged to have been introduced on to the West Coast of Africa in sand ballast landed at Ambriz by a ship from Brazil. A good deal has been written about the jigger, the following being references to the more recent publications in which it is discussed. Packard, Proc. Ent. Soc., Washington, Volume III. Jullien, *La Chique sur la Côte occidentale d'Afrique*, Bull. Soc. Zool. Fr. XIV, pp. 93-95 (containing notes on its habits).

Blanchard, Bull. Soc. Zool. Fr. 1889, pp. 95-99.

Raspail, note rectificative sur l'histoire de la Chique, Bull. Soc. Zool. Fr. XIV, pp. 366-369.

Gronet, Let. Nat. VII, pp. 6 and 13 (being a contribution to the Natural History of).

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It was there that I was first able to judge of the terrible havoc caused by funza—jiggers. In this village there was not a man, woman or child who was not covered with ulcers.

Again, in pages 567 to 571 of the same volume, Mr. Decle writes:—

But there is another plague, quite as serious, that threatens South Africa—a plague that nothing will stop and that will seriously affect the labour market. I am speaking of the jiggers. This is an insect of the flea family, indigenous to South America. It was brought to West Africa by a slave ship. The jigger, or *Pulex penetrans*, is a small flea that burrows in the flesh, chiefly of the feet, choosing in preference the neighbourhood of the toe-nails. The female penetrates under the skin with its head only sticking out; this head is so small that it can only be detected with a magnifying-glass, and cannot be seen in the skin of a black man. At first it causes no pain, but after a couple of days it gives the same sensation as a small thorn. After five to six days the body of the insect reaches the size of a pea, and is full of eggs; the pain is then very great, and when the insect has been extracted its place is marked by a deep ulcer, that usually gets badly inflamed and often brings on blood poisoning. The natives dig it out with a pointed piece of wood, tearing the skin all round to make a hole large enough to allow the body of the insect to come out without breaking the pocket of eggs. They imagine that if they break the pocket, the eggs will generate under their skin. They are right in a sense, as they possess no antiseptics; and I have myself seen a fellow out of whom two hundred jiggers were extracted! But even when a hole has been made large enough to allow the insect to be removed, it is most painful to get it out, as it is fastened to the ulcer it has produced. The best way is to open the place where the insect is with a lancet, and then to syringe the wound well with a sublimate lotion. The body of the insect having been removed with a forceps the wound must again be well syringed and carbolic oil applied to it. In order to avoid these pests getting to a large size, white men ought to have their feet carefully examined twice daily. When a jigger is discovered, it can be easily removed during the first two days with the point of a needle. In many cases, however, they cannot be discovered until they have reached a certain size, and then extraction often amounts to a regular operation. Often they penetrate under the edge of the nails, and I have seen some of them right under the middle of the nail; this necessitated a most painful operation. Boots are of little avail, and only prevent you from getting large numbers of them. They jump like a flea, and get at your foot by the top of the boot. Besides, when they have invaded a country, they are found on the ground outside and inside every house. Although I had my feet examined twice daily, I have had as many as three extracted at one time, after they had reached a good size, as they had escaped the notice of my servants during three or four days. I had from two to four of them taken out almost daily. When Colonel Colville started for the Unyoro expedition, out of eight white men four of us were unable to wear a boot or walk, on account of ulcers brought on by the jiggers. Colonel Colville had seven of them extracted the day he left Kampala; and Dr. Moffat had to ride a donkey, his feet being tied up in bandages.

But it is among the natives that they cause the most damage. Among the Soudanese troops in Uganda I have myself made the following observations. At Fort Raymond the garrison consisted of 160 askaris (soldiers) and 70 porters; out of this number of men 72 askaris and 30 porters were absolutely unfit for service through ulcers brought on by jiggers, and 30 more men were lame. At Fort Grant the proportion of invalids through jiggers was over 50 per cent. I was in charge of the Medical Department—having volunteered to help Major Owen during the war—and never in my life have I seen such awful ulcers. Some of the men had the bone of their big toe protruding fleshless for more than an inch, others had quite a square inch of the bone of the heel exposed. I remember, among others, a corporal whose foot was covered with an ulcer about five inches long by three inches broad. In some villages of Udubu (south of Lake Victoria Nyanza) I found the people starving, as they were so rotten with ulcers from jiggers that they had been unable to work in their fields, and could not even go to cut the few bananas that had been growing. In many villages of Uganda things were almost as bad. When I crossed Africa, I found the first trace of jiggers at Mabwe, half-way between Lake Nyasa and Lake Tanganika. From there I found them all over the shores of Lake Tanganika, in Uliha, in Unyamwezi, in Usikuma, all over the shores of Lake Victoria Nyanza, throughout Uganda and Usoga. The southern part of the Masai country alone was free from them.

Sir Harry Johnston informed me last summer that the jiggers have come down to Blantyre, having, therefore, travelled about 500 miles southward in two years' time. I calculate,

accordingly, that they will reach Mashonaland in about two years' time, and with the railway communication they will be all over the Cape Colony in a year more. In fact, I feel absolutely certain that they will invade the Colony before the year 1900.* Those only who have seen what damage the jiggers cause can realize what the prospect means for South Africa. The matter is most serious, and steps should be taken to try to ward off the danger.

To give an idea of the prolific way in which they generate, I must explain that the moment the jigger is taken out of the flesh, she begins to lay her eggs; and I have counted, with a magnifying glass, 150 eggs that came out of one jigger in less than 30 seconds, and she went on laying them for more than five minutes. Even if a jigger lays only 500 eggs—and this is far below the number—it must be remembered that these become insects in a few days, and it may be understood how the whole of Africa north of the Zambezi is now infested with them. Sandy soil is the most suitable to their development, and in all the sandy regions where I found them the place swarmed with them. The natives are chiefly responsible for their increase, as, instead of destroying them as they extract them from their skin, they merely throw them on the ground, where they soon generate.

Animals are also attacked by them—dogs, monkeys, fowls, and others. I saw in Muanza, south of Lake Victoria Nyanza, a tame eagle that had lost one of his legs through jiggers. In order to give an idea of the way in which these insects attack man, I may quote the example of a dwarf (one of those discovered by Mr. Stanley) who was in the service of Major Owen. The little fellow was very dirty, and while Major Owen went to Unyoro, he was left for a month at Fort Raymond. When we returned there, we found that he could not walk, and, having examined him, I discovered that he was full of jiggers. I got a Soudanese to take them out, and the first day he got two hundred and eighty out of the boy's body. His feet, his toes, knees, hands, fingers, elbows, shoulders, and back were full of them, and when he was brought to me after the operation, he was a mass of blood, and it took me over an hour to bandage him.

As I have explained, the natives dig the jiggers out with a pointed bit of wood, breaking the skin all round the body of the insect. The result is that the skin gets hardened and mortified, and when fresh jiggers get in the same spot, they cannot be discovered till they have grown quite large, and often they are so deep in the flesh, having crept in by one of the crevices left in the mortified skin, that a hole half an inch deep has to be made before they can be got at. The result is usually a deep ulcer, dirt gets in, and the native medicines they apply to it, consisting of all sorts of filth, bring on gangrene, causing death or at least the loss of a limb. In many instances I have had to perform amputations of toes in order to save a man from the effects of gangrene, and in all such cases I found iodoform the most effective antiseptic to prevent ulceration after the jigger had been extracted.

In fact, the natives soon learned its use; and when I arrived in Karagwe, a native Chief, having heard that a white man had landed, came from a long distance to ask me for yellow medicine. A brother of his, he said, had some of the yellow *dawa* (medicine) given to him by a German officer, and if I would give him some, he would give me anything I liked. I gave him a little iodoform, and in the evening his *katikiro* (Prime Minister) came also to beg for some of it. I had obtained canoes from the Chief to take me to Uganda, and being short of iodoform I did not care to spare any more; so I made a mixture of iodoform and sulphate of zinc.

The *katikiro*, however, soon returned, and complained that his medicine was not as yellow as the one I had given to the Chief. I replied that he could not expect the same medicine as a big Chief, and he quite understood the distinction.

To conclude, I think that I have done my duty in pointing out the serious and new danger that threatens South Africa.

I feel sorry to appear as a prophet of evil, but perhaps my warning may enable the Government to take steps to check the impending danger. I cannot think of any measure that may stop the invasion, but I should advise the responsible authorities to have the subject thoroughly studied, so that, when this new plague makes its appearance, it may not take the people unawares, and that proper remedies may be known beforehand, and precautions recommended to avoid the spreading of the pest. From Central America and the West Indies, whence the jigger comes, considerable information can be obtained on the subject, and measures should be taken to obtain it without delay. My experience makes me look upon the jigger as the greatest curse that has ever afflicted Africa, and I hope that my warning will be taken up and turned to practical account.

It is to the above passages in Mr. Deele's book that reference is made in an article headed *A real danger to India*, which appears in the *Allahabad Pioneer*, dated 30th December 1898.

It will be seen from the above that the jigger can be a very serious pest when it first invades a country, though once the people get used to it, it becomes rather a nuisance than a grave infliction. This is borne out not only by the experiences in British Central Africa described by Sir H. Johnston, but by what is said about the insect by those who have been in South America,

where it is a constant source of possible annoyance to any one who incautiously goes about without shoes and who fails to take the precaution, which every one in Demerara is said to get used to, of examining his feet afterwards.

For those who wear shoes, however, and examine their feet often, the evil apparently becomes comparable to that caused by the mosquito in connection with which it would not be difficult to rake up harrowing tales of people who have got blood poisoning and even died from being bitten!

At the same time, the jigger evil is certainly one that is worth taking trouble to avoid importing into India.

In this connection it may not be out of place to observe that there has been for many years a large coolie and rice traffic between Calcutta and both South America and the West Indies, without the insect's succeeding in establishing itself on this side. It does not, of course, follow that it has never been brought to India, for it is a common remark amongst entomologists that what may amount to a serious pest in one place and time may in another locality or at another time find conditions so inimical that, though present, it may fail to multiply sufficiently to become noticeable. Two other points will also be observed in connection with the jigger: one is that damp coasts like those of Bombay and Calcutta are said to be unfavourable to its development; the other is that, although in slave dealing times there must have been considerable traffic between the west coast of Africa and the West Indies, where the jigger exists, it is believed to have been in ballast and not on the persons of coolies that the pest was eventually imported. This is easily explained by the life history of the insect, which passes one stage of its existence in a free state on the ground. The inference is obvious in regard to preventive measures, which would, of course, have to be used against South America and the West Indies as well as against Africa. In this connection it may be observed that what is known about the susceptibility of allied insects to the effect of different insecticides points strongly, it might be said conclusively, to the supposition that kerosine oil used broadcast would be the most effectual disinfectant on boardship against the jigger.

Further suggestions of utility might possibly be obtained through the Governments of such Colonies as Demerara and Jamaica; an important point to ascertain being the length of time the larval form is capable of living in a free state in ballast or dust on board ship. It would of course be to some extent upon this that would depend the length of time an infected vessel required to be quarantined, though supposing the observation recorded by Dr. Packard to be confirmed, viz., that the insect is parasitic upon mice as well as men, it is likely that rats also would be liable to act as hosts, in which case mere quarantining would be insufficient. It may be added that the burning of sulphur on board ship is quite useless against such insects as the jigger, though it is possible that it might have some effect in killing rats that might otherwise convey the infection. Upon the whole, the danger seems so remote, and the difficulty of really effectual preventive measures so great, that all that can be at all confidently recommended is to make masters and ships' doctors responsible for reporting cases of the pest on board; the vessel to be thereafter swabbed down with kerosine oil under the supervision of the Port Health Officer, and restrictions imposed upon the dumping on shore of sand ballast from infected localities.

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