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6. The Epidemiology and Etiology of Sleeping Sickness in Equatorial East Africa, with Clinical Observations. By CUTHBERT CHRISTY, B.M., C.M. (Edin.).

7. Report on a Collection of Mosquitoes and other Flies from Equatorial East Africa and the Nile Provinces of Uganda. By FRED. V. THEOBALD, M.A., etc.

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7.

REPORT ON A COLLECTION OF MOSQUITOES AND OTHER FLIES FROM EQUATORIAL EAST AFRICA AND THE NILE PROVINCES OF UGANDA.

(Made between June, 1902, and April, 1903.)

By FRED. V. THEOBALD, M.A., Etc.

(With Map.)

The large number of Culicidæ and a few other flies collected by Dr. C. Christy during his marches while investigating the recent outbreak of Sleeping Sickness on the Victoria Nyanza are of particular interest in showing the distribution of certain species. The collection contained one new species belonging to the Culicidæ, and shows us the chief annoying forms that occur in the region traversed, the specimens having been mainly taken in tents, etc., at the different camps and not searched for otherwise. It is in these species that we should endeavour to trace out the life-history, for many of them are common in the few towns and native huts all over Central Africa. The *Tæniorhynchus fuscopennatus* seems to be very abundant judging from the bottles full brought back by Dr. Christy from so many localities. Other collectors have also sent it in numbers from Uganda.

The collection for descriptive purposes is valueless; as time was important the specimens were simply put in numbers in glass tubes and in consequence were all more or less damaged, but merely for the purpose of distribution this method of collecting is ample.

The number of species of Culicidæ identifiable was sixteen, comprising the following:—

Pyretophorus costalis. Loew.
Myzomia funesta. Giles.
Myzorhynchus paludis. Theobald.
Myzorhynchus mauritianus. Grandpre.
Cellia pharoensis. Theobald.
Cellia squamosa. Theobald.
Christya implexa. Nov. sp.
Stegomyia sugens. Wiedemann.
Culex luteolateralis. Theobald.
Culex metallicus. Theobald.
Culex viridis. Theobald.
Culex fatigans. Wiedemann.
Culex sp. ? (too damaged to describe).
Tæniorhynchus fuscopennatus. Theobald.
Tæniorhynchus annettii. Theobald.
Mansonia uniformis. Theobald.

Besides the Culicidæ there were species of *Psychodidæ*, a few *Tipulidæ*, a *Ceratopogon*, and a *Simulium*, amongst the Nematocerous flies; amongst the Brachycerous a single Tabanus, *T. dorsoritta* (Walker).

FAMILY CULICIDÆ.

Genus Christya. *Nov. Gen.*

Allied to *Myzorhynchus* (Blanchard) but easily told by the long lateral tufts of abdominal scales.

Head clothed with long upright forked scales and some short scales rather broadened in front; palpi densely scaled; thorax with hair-like curved scales and narrow-curved lateral ones; prothoracic lobes with narrow-curved scales; abdomen with hairs and dense lateral tufts of long hair-like scales, the tufts apical and also other long lateral hairs; wings with dense short lanceolate lateral vein-scales; fork-cells rather short. The ♀ only known.

This genus comes in the *Anophelina* and can at once be distinguished by the marked lateral abdominal tufts of long hair-like scales. It was first taken by Dr. Christy, after whom the genus is named.

Christya implexa. N. sp.

Thorax rich umber brown with golden hair-like scales and a few narrow-curved ones laterally, a narrow cinerous line on each side; pleuræ deep brown with three diverging grey lines and some small white scales; head with black and golden upright forked scales and some short golden ones in front between the eyes; palpi densely scaled with brown and white bands. Abdomen black with pale brown hairs and with long dense lateral tufts of black and golden hairs. Legs deep brown, the femora and tibiæ with white spots and to some extent the hind metatarsi; the fore and mid tarsi with the two first joints with basal white bands and to some extent the other two; in the hind legs, the apex of the metatarsi white, the apical two-thirds of the first tarsal and all the rest, except the apex of the leg, black: wings with dense blackish brown scales, the costa with two very large yellow areas, one basal and two small ones nearer the apex, the smallest the second from the apex; veins mostly dark scaled, a few yellow areas.

♀ Head black with long black upright forked scales behind, golden ones in front, and short golden ones between the eyes; palpi densely scaled with black and bands of white scales: some yellow ones at the base (damaged); proboscis black; antennæ banded black and testaceous, the basal joint testaceous, the second with dense black scales. Thorax rich dark chestnut brown with curved hair-like golden scales, small flat pale creamy ones laterally and in front, a pale grey narrow

line on each side of the mesonotum due partly to the pale flat scales, partly to the grey sheen on the integument; prothoracic lobes deep testaceous with small flat creamy scales; scutellum deep brown with curved hair-like golden scales; metanotum deep brown; pleuræ deep brown with some flat white scales and with frosty grey lines, three prominent ones radiating from a central point.

Abdomen steely black with short pale brown hairs over the dorsum and with long black and golden lateral hairs, the black in prominent apical tufts; on the venter are several prominent silvery white spots forming a lateral line.

Fore legs deep brown, the femora and tibiæ with white spots, a few only on the femora and one prominent pale band, the tibiæ with six white spots, the metatarsi and first three tarsals with narrow white basal bands; mid legs as in the fore, but the femora with numerous white spots; hind legs with the femoral and tibial spots more numerous; the metatarsus much longer than the tibia, black with a narrow white apical band, the apical two-thirds of the first tarsal white, remainder white except the apical part of the foot.

Wings with dense blunt lanceolate scales, mostly brown, but some forming yellow spots; the costal border with a large yellow apical spot which spreads on to the first long vein, the next costal spot about the same size spreading on to the first long vein, but with a small median dark spot on the latter, the next costal spot minute, not spreading on to the first long vein, apical spot larger and spreading evenly on to the first long vein; veins all dark scaled otherwise, except at the base of the fork-cells and at the posterior cross-vein and a small area at the base of the third vein; fork-cells short, the first submarginal longer and narrower than the second posterior, its base nearer the base of the wing, its stem about as long as the cell, stem of the second posterior longer than the cell; fringe black, a yellow spot at the junction of the upper branch of the fifth and the lower branch of the second posterior cell; (apex ?).

Length: 6 mm.

Time of capture: August (Dr. Christy), June (Dr. Hodges).

Habitat: Togo (Busoga), Pokino (Toro), Mumia's boma (Kavirondo), Bulema (Ankole) (Dr. Christy), and Jinja (Busoga) (Dr. Hodges).

Observations.—Described from a damaged ♀ taken by Dr. Christy in August, 1902, and the description completed from a specimen taken by Dr. Hodges in June, 1903.

It cannot be confused with any other Anopheline on account of its marked abdominal character, the long lateral tufts of hair-like scales.

Pyretophorus costalis. Loew.

(Mono. 'Culicidæ,' vol. 1, p. 157, and vol. 3, p. 74.)

This common African Anopheline was taken at Kamuli, the capital of the Gabula country (Busoga), in a tent on August 22; also at Sambwa, in the Bukedi country, "where mosquitoes are terrible"; also at Bikira (Buddu). The specimens are quite typical.

It has also been sent from Lagos (Nigeria), Entebbe (Uganda), Maniumba (Busoga), Togo, Cameroon, Gambia, Freetown, Bonny, Salisbury, Senegal.

Myzomyia funesta. Giles.

(Mono. 'Culicidæ,' vol. 1, p. 178, and vol. 3, p. 34.)

Typical *funesta* were taken at Kamuli (Busoga), in tent with *costalis* in August; at Ngo, Gabula's country (Busoga), on the border of Lake Kioga, in August. "At Ngo, near the lake, mosquitoes were more troublesome than elsewhere in Busoga"; at Sambwa (Bukedi) with *costalis*; at Ngola Fort (Bukedi), in tent (*vide M. uniformis*); Lusinga Island (Kavirondo); and at Wadelai (Nile Provinces).

This has also been sent from Senegal, Lagos, Gambia, Natal, British Central Africa, Sierra Leone, Mashonaland, Zomba, Lake Chilwa, B.C.A., Tanganika Plateau, on Zambesi and Congo watersheds, and up the Zambesi as far as the Lupata Gorge.

Myzorhynchus paludis. Theobald.

(Mono. 'Culicidæ,' vol. 1, p. 128, and vol. 3, p. 86.)

A single ♀ at Sambwa (Bukedi) with *costalis*, and another from Kisimbika (Uganda). The wings are very dark.

The same species is recorded from Kalmiga, Sierra Leone, Bahr el Ghazal.

Myzorhynchus mauritianus. Grandpre.

(Mono. 'Culicidæ,' vol. 1, p. 129.)

A single ♀ at Bujaju (Buddu), and another between Mbarara and Kichwamba (Ankole).

Also recorded from Natal, Pretoria, Bahr el Ghazal, Wadi Nutrun (L. Egypt), and Mauritius.

Cellia pharoensis. Theobald.

(Mono. 'Culicidæ,' vol. 1, p. 169, and vol. 3, p. 109.)

Specimens collected at Wadelai (Nile Provinces), and at Sireaos on the banks of the Nile, four marches north of Wadelai. Of the latter

locality, Dr. Christy says: "The tent roof was black with this species in the morning, but none were to be seen in the evening. I noticed this same peculiarity in the case of *Cellia squamosa*. Both species adopt the 'Anopheline' attitude when at rest."

Also recorded from Gambia, Mashonaland, Rosaires, on the Blue Nile, and Cairo.

Cellia squamosa. Theobald.

(Mono. 'Culicidæ,' vol. 1, p. 167, and vol. 3, p. 109.)

Specimens taken at Kajira, Masawa country (West Elgon); a single ♀ also at Lusinga Island (Kavirondo).

The same species has been recorded from Pretoria, Mashonaland, British Central Africa, Uganda.

Stegomyia sugens. Wiedemann.

(Mono. 'Culicidæ,' vol. 1, p. 300.)

A few ♀'s from Entebbe (Uganda). Most of the Central African specimens are very small.

Same species also from Freetown, Nubia, Mashonaland, Gambia, and Corsica, and recently from India (Christopher).

Culex luteolateralis. Theobald.

(Mono. 'Culicidæ,' vol. 1, p. 71.)

This abundant West Coast and Central African species was taken at the following localities:—Sirwanga (Busoga), in August, "specimens caught in grass at back of tent; swarms of them here, but not in tent." Lusinga Island (Kavirondo); Entebbe, "caught in Commissioner's house, and in my tent." Koko, and other places on the Buddu road, Bujaju, Masaka, Kiabogo, Bikira (Buddu); Mbarara and Kichwamba (Ankole), and at Wadelai (Nile Provinces).

Also recorded from Durban, Salisbury, Straits Settlements (rare).

Culex viridis. Theobald.

(Mono. 'Culicidæ,' vol. 3, p. 212.)

Kampala (Uganda) in August, "bred from larvæ in old chattie containing almost black infusion of leaves and grass; the eggs are laid in rafts." Dr. Christy found five times as many males as females bred out from these larvæ; also taken at Kukungulo's boma near western slopes of Mount Elgon; between Mbarara and Kichwamba (Ankole); and at Mongala, the most southerly station in the Sudan.

Others have recorded it from Buse (Uganda), and Gambia.

Culex metallicus. Theobald.

(Mono. 'Culicidæ,' vol. 2, p. 63.)

Only two localities in which *metallicus* occurred, namely, Nisomba in the Gabula country (Busoga) in August, and at Wadelai on the Nile in February. "Caught in tent, found in evening, scarcely one to be found in the morning."

Also recorded from Bonny, and Senegal.

This Culex seems to be very local, as but few are sent in collections from Africa.

Culex fatigans. Wiedemann.

(Mono. 'Culicidæ,' vol. 2, p. 151, and vol. 3, p. 225.)

Specimens found at Sirwanga (Busoga) in August, and at Sanji (Buddu).

This species is almost cosmopolitan.

Culex, sp. ?

Some damaged specimens from the Yala River (Kavirondo) where mosquitoes were rare, and from Kukungulo's boma near the western slopes of Mount Elgon, also from Lusinga Island (Kavirondo) and Bujaju (Buddu) are apparently a new species, but as they are all rubbed and damaged, they cannot be described.

Tæniorhynchus fuscopennatus. Theobald.

(Mono. 'Culicidæ,' vol. 3, p. 265.)

One of the most abundant of Central African species. From the great number of specimens brought back by Dr. Christy, it is evidently very plentiful in most parts of Uganda. He took it in the following places:—Namaiba (Uganda), on Jinga Road, caught in tent in August; Budaka Fort, Bangwemi district (Mount Elgon), September; Busoro, in Kavirondo, south of Mount Elgon; Mumia's to Kisumu, in Kavirondo; Nakirebe and Koko, on Buddu Road; Sese Island; Bujaju; Masaka; Kiabogo, Bikira and Sanji, in Buddu; Kifumbero, in German East Africa; between Mbarara and Kichwamba, in Ankole; along the Katwe-Toro Road; Kibero, Marengi, Tagweta, Aombo and Keganwa, in Toto; and at Lwekula's, Nabukasi, Kinyenya, Kajongola, Masevi, Bigo, Entebbe, Kalasa, Kisimbiki, Nyenge and Kisingo, in Uganda.

Dr. Christy says: "The habits of this species are in many ways peculiar. In swamp regions it bites at any time during the day, more particularly in dull or wet weather. It is the only mosquito I have met with that can be said to fly to a light. Frequently, in the Bukedi

country, beyond Lake Kioga, where clouds of this species can be seen in the day-time, quite a halo of them surrounded any lamp placed in the open, the insects flying against the glass. Their bite is not painful, and produces no subsequent irritation, as far as my personal experience goes."

Tæniorhynchus annettii. Theobald.

(Mono. 'Culicidæ,' vol. 2, p. 205.)

A single ♀ from Marenge (Toro). Also recorded from Old Calabar.

Mansonia uniformis. Theobald.

(Mono. 'Culicidæ,' vol. 2, pp. 187 and 180, and vol. 3, p. 273.)

This common species was taken at the following places:—Nisomba (Busoga) in August; Ngo (Busoga), on the border of Lake Choga, also in August; Sambwa (Bukedi), "caught in tent"; Erosi (Bukedi), "in tent, mosquitoes terrible"; Ngola Fort (Bukedi), "also in tent, mosquitoes terrible"; Budaka Fort, Bugwemi district (Bukedi), in September; Nbowa Fort (Bukedi), 2 hours east of Budaka, in September; Kukungulo's boma, near western slopes of Mount Elgon; Sigula Island, near Port Victoria (Kavirondo); Nyacach and Lusinga Island (Kavirondo); Entebbe (Uganda); Sese Islands; Mbarara to Kichwamba (Ankole); Wimi River (Toro); several camps in Unyoro; and at Wadelai, on the Nile.

It has also been recorded from:—Lagos, Fort Johnson; Zomba; Gambia, at Bathurst; Chiromo; Lower Shire, B.C.A.; Old Calabar; White and Blue Niles, at Kanessa on former, Rosaires on latter; Sudan; Bahr-el-Ghazal; Lagos; Touggourt, Algeria; Natal, at Pinetown Bridge; Ceylon; Dacca; Perak; Travancore, S. India.

Family Psychodidæ.

Phlebotomus sp.

Several taken at Kampala (Uganda); Dr. Christy says it is very common in Uganda in water-closets. The larvæ were discovered in the same vessel as *C. viridis* were found breeding in. This Owl Midge occurs in most collections brought back from Western and Central Africa, and appears to be generally abundant.

Family Chironomidæ.

Ceratopogon sp.

A single small Ceratopogon was taken at Sirwanga's, Tabingwa's, and Kinampere, in Busoga. Dr. Christy says: "It is very common in many places, usually near habitations. This minute fly can pass

through the finest mosquito netting; muslin I have not tried. It bites terribly, leaving an irritating wheal, which itches for days. It makes a sharp short peevish buzz when settling, fully as loud as a mosquito. It attacks the wrists chiefly, but is able to pass beneath a sheet, and bite the ankles and feet. Many were frequently found full of blood on turning down the bed-clothes. I have met with a similar fly, with the same habits, at Ahmednuggar (Bombay Presidency), India."

Family Simuliidæ.

Simulium damnosum, N. sp.

Dr. Christy remarks:—"In travelling through Busoga westward, one passes abruptly, 3 or 4 miles from Jinja, on the Nile, into a 'belt' of this terrible pest, locally known as the 'Jinja fly.' This belt extends, I believe, from the shores of the Victoria Nyanza about Lubwa's in Busoga, northwards, along the right bank of the Nile, for 12 or 15 miles or more, and is perhaps 3 or 4 miles wide. In this area the flies swarm at certain seasons in millions, and are such a plague that, according to Dr. Hodges, the Medical Officer for Busoga the natives have to leave their shambas (plantations). I do not remember to have seen the fly on the left bank of the Nile, and I cannot recollect to have met with it in any other part of the Protectorate. There is a patch of particularly dense forest within the 'Jinja fly' belt, where the flies are particularly numerous, and in passing through it I was surprised to find the fresh tracks of buffalo, now a rare animal in Uganda. The hide of a buffalo is a particularly thick one, which probably explains the reason why the animal is able to roam through belts of tsetse and other biting flies, for it has frequently been associated with the former. The bite of this small fly is a very severe one, and causes a wheal which itches intolerably, and is marked by a large drop of blood. If many flies are allowed to bite and gorge themselves the part streams with blood from the oozing of the punctures. On nearing the sphere of influence of the 'Jinja fly' each porter stops and breaks off a leafy branch to use as a fly swish, the whole of them then collect into a bunch, and travel at increased speed."

The fly is 3 mm. long, of a general black colour, head, palpi, and antennæ black except at their base, where they are bright testaceous; thorax black, the meso-thorax with bright deep golden, thick, short, curved hairs closely applied to the surface of the thorax. Meta-thorax, black, abdomen black, shiny with short black hairs, fore and mid legs black; the metatarsi of the hind legs with a broad median pale yellow band; wings bright, testaceous at the base; halteres ochraceous; the metatarsus and especially the first two tarsi much swollen in the fore legs, the two last tarsi small, very hairy, less so on the mid and hind legs; ungues all dentate.

FAMILY TABANIDÆ.

A single species of Tabanus, the *Tabanus dorsoritta* of Walker, was taken at Bikira (Buddu). This "gad-fly," known as the "Serut Fly," occurs, not only on the West Coast, but in Central Africa and down nearly to the Sudan, for specimens have been sent me by Veterinary Colonel Griffiths, D.S.O., from Fashoda, where it is very annoying to camels and mules as well as man.

Since the identification of the insects in the collection, Dr. Christy has made a study of the distribution of each species with regard to its possible connection with either Sleeping Sickness or *Filaria perstans*, and he sends me the following notes:—

"There seems to be no species of mosquito whose distribution in any way corresponds with that of Sleeping Sickness. At no place within the infective area of that disease on the Victoria Nyanza were mosquitoes of any species a pest at the time of my visits, from July to October. Most of the country bordering the north shores of the lake is not suitable for them, being high ground, and areas of swamp are few.

"With regard to *Filaria perstans* I find that only in the case of one species does the area of distribution seem to partly correspond with that of the blood worm. This species is *Tæniorhynchus fuscopennatus*.

"Beyond the Nzoia River (Kavirondo), which is the extreme easterly limit of *F. perstans*, I only obtained this species at one locality, namely near Kisumu. With this exception the agreement of the two areas is merely a geographical one (*vide* Map).

"*T. fuscopennatus* was extremely common in the province of Uganda, west of Kampala, where a high percentage of *F. perstans* existed in the blood of the general population; but on the other hand, although the species was collected in the Sese Islands, mosquitoes there were not troublesome, and the White Fathers told me that at no time in the year were they numerous; yet one of the highest recorded percentages of *F. perstans* was met with in that group of islands. In the province of Busoga also, where a high percentage of *F. perstans* was found, *T. fuscopennatus* was rare. Again, at three spots in the Protectorate the majority of the inhabitants harboured enormous numbers of a variety of *F. perstans* in their blood, yet at these places *T. fuscopennatus* was not more abundant than elsewhere, and at one of the places, namely on the slopes of Mount Elgon, I found no mosquitoes at all.

"With regard to the Tabanidæ, I met with at least two species. The genus is common in many parts of the Protectorate far away from the Sleeping Sickness area. One species (*T. dorsoritta*) was particularly abundant in the Nile Provinces. Another species belonging, I believe, to this genus, and peculiar, as far as my observations went, to Lake

Kioga, was conspicuous by its very large size, and was, I think, instrumental in the death of a mule I had with me. Unfortunately a tube containing a number of these flies, and a few Tsetse, has been lost."

Dr. Christy also sends me the following table showing the localities, grouped under Provinces, in which were collected specimens belonging to the *Anophelinæ*. The localities, he says, correspond with the different foci of malaria in regions traversed by him, and in fact include all the malarious parts of the Uganda Protectorate. The table is interesting as tending to point to the species mainly implicated in the transmission of the disease.

Province.	Locality.	Species.	Malaria.
Kavirondo	Mumia's	*Chry. implexa*	Simple tertian.
	Majira (Wapoto)	*Cellia squamosa*	?
	Lusinga Island	*M. funesta*	Simple tertian.
Busoga	Siriwanga	? (too damaged)	,,
	Naniumia	*P. costalis*	,,
	Labingwa's	? (too damaged)	,,
	Gabula's (several camps)	*P. costalis* *M. funesta* *Chry. implexa*	
Bukedi	Sambwa (Lake Kioga)	*P. costalis* *M. funesta* *M. paludis*	,,
	Ngola	*M. funesta*	,,
Toro	Pokino forest	*Chry. implexa*	,,
Uganda	Kisimbika	*M. paludis*	,,
	Entebbe	*P. costalis*	,,
Buddu	Bikiri (mission station)	*P. costalis*	,,
	Bujuju	*M. mauritianus*	?
Ankole	Mlema (Kagera river)	*Chry. implexa*	?
Nile provinces	Wadelai and Sir-cows	*Cellia pharoensis*	Simple tertian and sub-tertian.
	Blue Nile	*Cellia pharoensis*	,,
	Bahr el Ghazal	*M. paludis* *M. mauritianus*	,,

MAP
of the
UGANDA PROTECTORATE.

Showing districts traversed, and in which mosquitoes were collected.

Scale of Miles.

Natural Scale, 1: 2,000,000 or 31·56 miles = 1 inch.

Heights in feet.

Extreme Eastern limit of Filaria Perstans.

Note in comparison the distribution of Taeniorhynchus fuscopennatus, Theobald.

Railway completed. *Railway constructing.*