SANDFLIES BREEDING NEAR LAS CUEVAS AND MARACAS BEACHES

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The growing popularity of the North Coast Beaches and the plans presently being formulated for their development as resort areas for both Trinidadians and tourists have focused attention on the annoyance that can sometimes be experienced by the bites of sandflies. These minute flies, about the size of a pinhead, inflict a painful bite which may persist for one or two days afterwards, and may cause some people real distress. If they are present in large numbers, they can completely spoil any pleasure that the beach may offer, and it is perhaps fortunate that only the female takes a blood meal....otherwise there might be twice as many!

These insects belong to the Genus **Culicoides** in the family **Ceratopogonidae** of the Order Diptera, or true flies. They are greyish in colour, with spotted wings. Between forty to fifty species are known from Trinidad, but luckily only about 12 species are known to bite man. The others presumably bite animals or birds. The choice of habitat for the larvae of these insects is wide, varying from beach sand to leaf mould and rotting vegetation such as cocoa pods and banana stumps according to species, but all require damp almost water-logged situations. The eggs hatch about 3 days after laying, and the larvae usually take 2-4 weeks to mature and pupate. The adult then emerges 3-4 days later.

It is well established that the main pest on the North Coast Beaches is **Culicoides phlebotomus** (Williston) (Yasseen, 1971; Williams, 1964; Aitken, 1957). During an investigation into the pest species at Las Cuevas by the author on 31 July, 1970, in which biting insects were caught for the first fifteen minutes in every hour between 5 a.m. and 7.15 p.m., 1006 **C. phlebotomus,** 25 **C. debilipalpis,** Lutz, 4 **C. paraensis** (Goeldi) and 11 **Simulium metallicum** Bellardi (Congo Flies) were taken. **C. phlebotomus** was caught at all times, but with peak intensities at 7.00 a.m., and between 3 p.m. and 7.00 p.m. **C. debilipalpis** was taken mainly between 8.00 a.m. and 12.00 noon, and **paraensis** between 8.00 a.m. and 10.00 a.m. The **Simulium** were taken only during the afternoon.

Although Williams (1964) and Yasseen (1971) have described the main breeding habitat of **C. phlebotomus** in some detail, the object of this study was to obtain an idea of the ext-

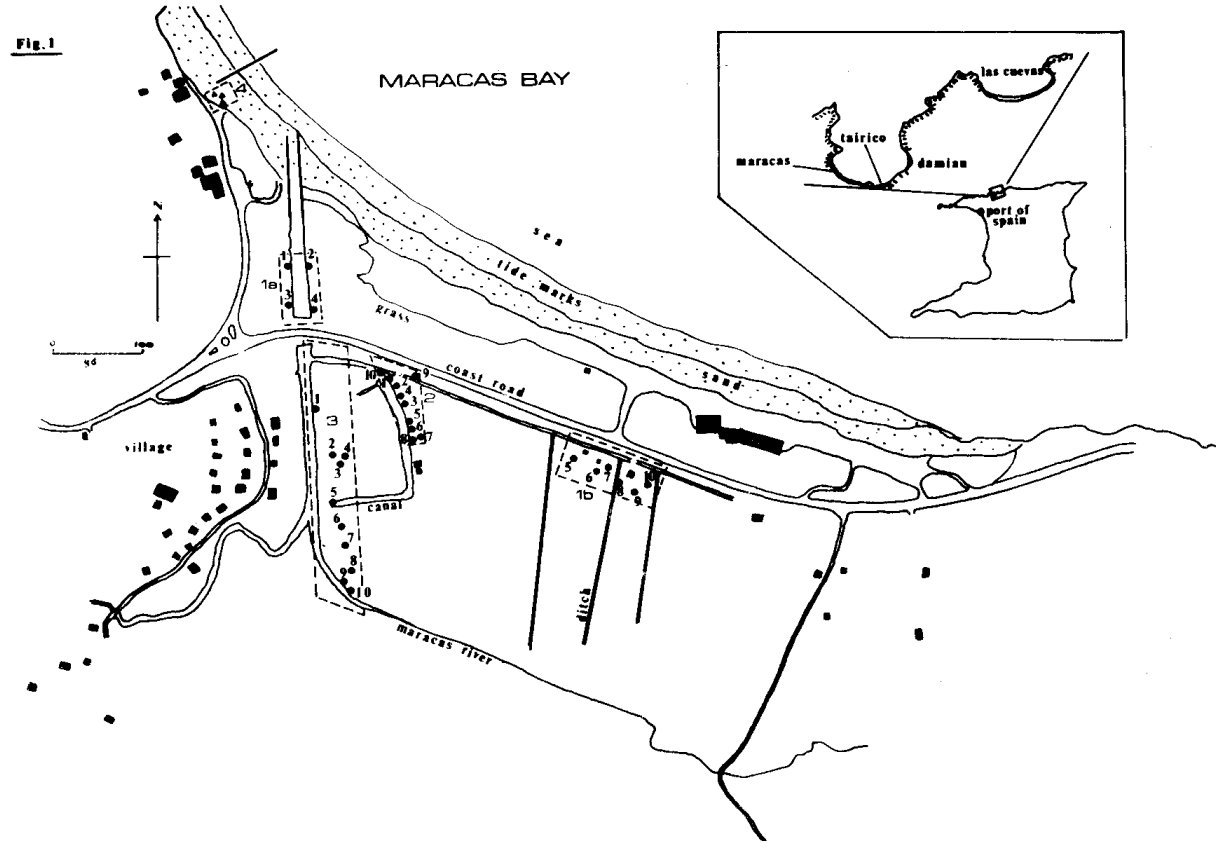

Fig. 1. Sketch map of Maracas Bay showing the five study areas and locations of Emergence Traps (solid circles) and Sand Samples (triangles). Inset shows the location of the four beaches.

remes of habitat that might be occupied by all the nuisance species in the vicinity of the Las Cuevas, Tairico, and Maracas Beaches in order that eventually recommendations for the control of the nuisance species might be made.

To achieve this, study areas were demarcated on all three beaches; 9 at Las Cuevas, 2 at Tairico (1 at Damian Bay), and 5 at Maracas. These areas sampled the main range of possible ground breeding habitats in the area, and are shown on the accompanying maps. Sandflies emerging from the substrate were caught in emergence traps (hollow cones of tarred roofing felt, with a basal area of two square feet), (Plate 1). Where emergence traps could not be used because of human interference or wave action, samples of sand or mud were taken and the larvae removed by washing. These were then reared to the adult stage before identification.

Las Cuevas Beach (Fig. 2)

This long curving beach which is over 2,000 yards in length has a fishing village at its eastern end where a small stream flows over the beach. A larger river, the Curaguate, joins the beach at about its mid-point, and frequently flows westwards parallel to and behind the beach for some distance before crossing the sand ridge to the sea. It was along the banks of this river, and in hollows left by the shifting bed of the river that Williams and Yasseen (loc. cit.) found **C. phlebotomus** breeding in greatest numbers. (Williams estimated over 2500 larvae per square foot.)

The study areas were chosen in the middle section of the beach away from the habitation to lessen the possibility of interference to the traps. Five transects of five traps were located across the beach from high tide mark to the edge of the land vegetation. Trap No. 1 was usually so placed as to be wetted by the larger waves at high tide. Transects 2 and 3 crossed the Curaguate River, while Transect 4 sampled the almost flat sand of a small rocky bay. Two transects (5 and 6) of 4 traps each sampled two wet depressions where the beach widened out, and Transect 7 was in a small depression under the face of a cliff. All three depressions were flooded by high tides or heavy rain. The traps were operated continuously between March and May 1970.

Results are given in Table 1. Traps were continually being damaged either by river floods, storms, or by human interference. However, **C. phlebotomus** was the only species collected and was taken in all but 5 of the 30 sites examined, showing that breeding was taking place in nearly every locality. As was to be expected, the most productive area was on the

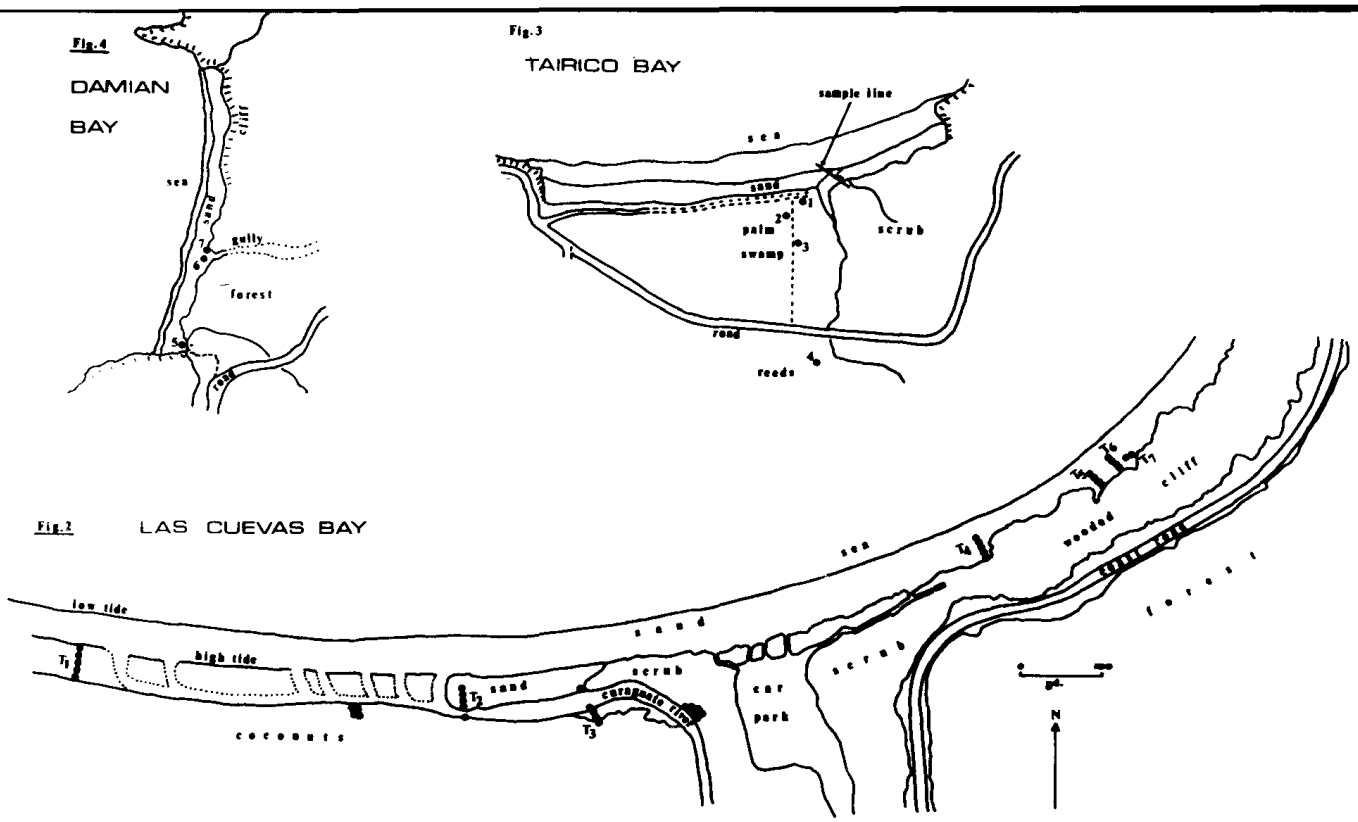

Fig. 2 Sketch Map of the center section of Las Cuevas Bay showing the location of the seven beach Transects (T 1-7), river bank and Coconut traps.

Fig. 3 Tairico Bay showing the location of the line of 12 sand samples and four Emergence Traps.

Fig. 4 The location of the Emergence Traps at Damian Bay.

banks of the Curaguate River. But bearing in mind the shorter duration of Transects 5, 6, and 7 quite high densities were found in the small depressions.

Other possible sites away from the beach comprised the muddy banks of the Curaguate River and in the sandy depressions beneath the coconut palms in the plantation. Six and four traps respectively were sited here during June 1970. In contrast to the beach, the river bank supported the breeding of four species (Table 2). In addition to **C. phlebotomus** another pest, **C. furens,** was also found. Only a single **C. phlebotomus** was taken beneath the coconuts. These catches indicate that **C. phlebotomus** is not confined to the sandy beaches but will breed in low density in mud and humus.

Maracas Bay (Fig. 1)

This well-known beach which is the main tourist and recreational beach on the north coast is about 1,300 yards long. At its eastern end the Maracas River crosses the beach between concrete breakwaters to enter the sea, beyond is a small fishing village, from which 4 open drains flow onto the beach. On the south side of the main road parallel to the beach lies an area of swamp grassland, interspersed with scanty cultivation where the ground is higher. This area is characterised by mats of floating grass and humus, and stands of a giant aroid **Montrichardia**. sp. It is drained by the Maracas River, one large canal, and several small ditches. The beach east of the river is high above sea level, and has a steep slope to the sea. It does not contain any significant areas which might support **Culicoides** breeding.

The area was divided into 5 study areas (Fig. 2). Area 1a consisted of the muddy bank of the Maracas River between the main road and the concrete breakwater and was sampled by four traps (Table 3). Area 1b was the extensive area of mud and floating grass behind the huts on the south side of the main road (Table 3). Area 2 covered the banks and adjacent swamp of the Canal (Table 4), whilst Area 3 enclosed the swamp and pasture land between the Canal and the Maracas River (Table 5).

The results are given in Tables 3 to 5. In all, 8 species of **Culicoides** were found, of which two, **C. furens,** and **C. insignis** are known pests. **C. furens** was found in the tidal mud of the river and canal, and in the drainage ditch alongside the main road. It was also found in mud beneath the **Montrichardia** and in the floating mats of grass, whilst **C. insignis** was found in most locations.

The damp area of dirty sand at the mouth of the main village drain adjacent to the pier (Area 4) was sampled by

Plate 1. Emergence Trap No. 5, Area 2, at Maracas Bay revealed a high density of **Culicoides furens** breeding in the tidal mud of the canal. The dark area on the trap indicates the water level at high tide.

(Photo: C.O.R. Everard)

taking 5 collections of sand. Totals of 9 and 96 **C. phlebotomus** larvae were recovered from two of the collections.

Tairico Bay (Fig. 3)

A small bay lying just east of the headland east of Maracas Bay. On survey maps this bay is unnamed and is presumably part of Maracas Bay, since Tairico is the name given to the small bay to the east which local usage calls Damian Bay. The beach is dominated by a small stream which flows over a sand bar onto the beach.

The rather swampy thicket area behind the beach was sampled by four emergence traps. Three north of the road and one south of it. The results are given from traps 1, 2, 3, 4 of Table 6. No pest species were taken.

The mouth of the stream, however, was sampled by twelve samples taken across the beach just east of the river mouth and crossing a large depression left by a previous course of the river. As can be seen from Table 7, **C. phlebotomus** was abundant in the depression and bank of the stream.

Damian Bay (Fig. 4)

This bay is only accessible by means of a foot path from the main road. There is a lot of shale mixed with the sand on this beach, and in general the slope of the sand is very steep to the water. The beach is bounded by a line of low cliffs.

This beach was sampled by three emergence traps sited at the mouths of the two streams which flow over the sand. In these locations a quantity of reddish clay had been washed into the sand by the streams. No other suitable areas for sandfly breeding were apparent.

Table 6, traps 5, 6, and 7, show that only three **C. phlebotomus** were taken from two of these traps. It may be concluded that a low level of breeding exists in the very limited areas at the mouths of these two streams.

Conclusions

Altogether ten species of **Culicoides** were found emerging from a variety of ground habitats in the vicinity of Las Cuevas, Maracas, Tairico and Damian beaches. **Culicoides phlebotomus,** the main pest was found on all four, although in very limited areas at Maracas, Tairico and Damian, where it was limited to beach sand. However, the fact that small numbers were collected from the humus beneath coconuts and from the mud of a river bank at Las Cuevas, indicates that a low level of breeding probably exists in the swamp to the south of Maracas Bay although these surveys did not reveal it. This would account

for the fact that larger numbers of this species may be found biting on this beach than could be attributable to the small breeding areas by the fishing beach.

Culicoides furens was found in abundance along the tidal canal by the Maracas River, as well as distributed over the swamp. It was also present on the banks of the Curaguate River at Las Cuevas. Of the other species, only **C. pusillus** and **C. insignis** which are known pests in some countries were also found in the Maracas swamp.

As far as the control of **C. phlebotomus** is concerned, it is clear that measures would have to be concerned with controlling the outflow of all rivers and drains across the beaches, and possibly with landscaping the remainder to eliminate any permanent depressions Because of its few off-beach breeding grounds, it is unlikely that eradication would be achieved although it should be possible to reduce the biting to an acceptable level.

Acknowledgements

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TABLE 1

Total numbers of **Culicoides phlebotomus,** of both sexes, recovered from emergence traps set between March and May 1970 at Las Cuevas.

Transect No.	**Trap** Set	**Weeks** Lost	Trap Nos. 1*	2	3	4	5	Total	Sandflies per operative trap week
T1	32.5	16	1	1	3	2	0	7	0.04
T2	32.5	18	4	0	15	55	44	118	8.14
T3	45.0	5	14	55	16	2	2	89	2.23
T4	45.0	6	3	0	3	1	0	7	0.18
T5	10.0	1	12	13	9	4		38	4.22
T6	10.0	0.5	7	21	7	0		35	3.68
T7	5.0	0.0	18	8				26	5.20

* Trap No. 1 always stationed nearest to the sea

TABLE 2

Total numbers of each species of **Culicoides** taken by Emergence Traps sited away from the beach at Las Cuevas during 3½ weeks, 2nd to 30th June, 1970.

Species	6 Traps on River Bank			4 Traps beneath Coconuts		
	Male	Female	Total	Male	Female	Total
C. martinezi	20	39	59			
C. phlebotomus	0	1	1	0	1	1
C. furens	4	2	6			
C. limai	1	0	1			

TABLE 3

Total numbers of **Culicoides** recovered from 10 Emergence Traps at Maracas Bay 28th August to 6th October, 1970 (39 days).

Area	Trap No.	Site	1	2	3	4	5	6
1a	1	Tidal mud canal bank	77					2
	2	Tidal mud canal bank						
	3	Tidal mud canal bank	47					
	4	Tidal mud canal bank						
1b	5	Mud and crab holes	1	3	2			
	6	Mud and grass	56	30	2	44	1	
	7	Mud beneath **Montrichardia**	2	1		1		
	8	Floating mat of grass and mud	11	2				
	9	Floating mat of grass and mud						
	10	Soft mud and grass						
		Total	194	36	4	45	1	2

Key to Columns 1-6

1 — **furens** (Poey)
2 — **insignis** Lutz
3 — **martinezi** W. & B.
4 — **leopoldoi** Ortiz
5 — **galindoi** W. & B.
6 — **filariferus** Hoffman

TABLE 4

Total numbers of **Culicoides** taken in 10 Emergence Traps at Area 2 Maracas Bay 15th October to 6th November, 1971, (22 days)

Trap No.	Site	1	2	3	4	5
1	Tidal mud creek bank	15				
2	Mud near **Montrichardia**		3		1	1
3	Grass and crab holes					
4	Grass and crab holes					
5	Tidal mud and **Montrichardia**	62				
6	Tidal mud and **Montrichardia**	2				
7	Tidal mud creek bank	36				
8	Tidal mud creek bank	20				1
9	Mud on bank of road drain	78				
10	Sand spit in creek	7		1		
	Total	205	3	1	1	2

Key to Columns 1-5
1 — **furens** (Poey)
2 — **martinezi** W. & B.
3 — **leopoldoi** Ortiz
4 — **filariferus** Hoffman
5 — **paucienfuscatus** Barbosa

TABLE 5

Total Numbers of **Culicoides** collected by 10 Emergence Traps in Area 3 at Maracas Bay between 30th December, 1971 and 3rd February, 1972. (34 days)

Trap No.	Site	1	2	3	4	5	6	7
1	Tidal mud, canal bank	3						
2	Mud beneath young **Montrichardia**	2	5					
3	Grass and mud		5			1		
4	Grass and mud							
5	Tidal mud bank of creek						158	1
6	Dry mud, **Montrichardia**		162			4	1	
7	Dry mud, **Montrichardia**	4	40		1	9		
8	Tidal mud with reeds	4	12	49		28		
9	Tidal mud with reeds		5			2	9	
10	Tidal mud with reeds	2				1	1	
	Total	15	229	49	1	45	169	1

Key to Columns 1-7
1 — **martinezi** W. & B.
2 — **leopoldoi** Ortiz
3 — **pusillus** Lutz
4 — **limai** Barretto
5 — **insignis** Lutz
6 — **furens** (Poey)
7 — **filariferus** Hoffman

TABLE 6

Total numbers of **Culicoides** taken in 7 Emergence Traps at Tairico and Damian Bays 14th March to 17th April, 1972. (34 days)

	Trap No.	Site	1	2	3	4	5
TAIRICO	1	Muddy stream bank		14			2
	2	Swampy dead leaf litter		1	7		5
	3	Damp mud and crab holes		14	1		7
	4	Grassy swamp mud		18		5	3
DAMIAN	5	Beach sand, mouth of stream	1				
	6	Beach sand, mouth of stream	2				
	7	Beach sand, mouth of stream					
		Total	3	47	8	5	17

Key to Columns 1-5

1 — **phlebotomus** (Williston)
2 — **leopoldoi** Ortiz
3 — **martinezi** W. & B.
4 — **filariferus** Hoffman
5 — **limai** Barretto

TABLE 7

Numbers of **Culicoides phlebotomus** larvae and pupae recovered from a transect of one quart sand samples taken at 9 ft. intervals across the beach and a small stream at Tyrico Bay, 26 July 1970.

Sample No.	Position	Larvae	Pupae
1	Amongst leaves on land	—	—
2	Sloping sand	—	—
3	Sloping sand	3	—
4	Sloping Sand	—	—
5	Edge of stream	4	—
6	Bottom of depression	167	217
7	In Hollow	975	8
8	Stream bed	14	1
9	Stream bed	117	2
10	Bank of stream	4	—
11	Above bank	—	—
12	Beach crest before sea	5	—