

THE CERATOPOGONIDAE (DIPTERA) OF GRAND CAYMAN, WEST INDIES: SPECIES AND ECOLOGICAL NOTES

J. E. DAVIES¹ AND M. E. C. GIGLIOLI

Mosquito Research and Control Unit Cayman Islands Government

ABSTRACT. Ceratopogonids from light, bait and emergence traps and from inside houses were examined on the West Indian Island of Grand Cayman. Thirty-one species were found, many previously undescribed, belonging to the genera *Leptoconops*, *For-*

cipomyia, *Atrichopogon*, *Dasyhelea*, *Stilobezzia*, *Monohelea*, *Alluaudomyia*, *Ceratopogon*, *Bezzia* and *Culicoides*. The relative abundance of genera is described and ecological notes given on each species. Pictorial keys to genera are given and to the species of *Culicoides*.

INTRODUCTION AND METHODS

Ceratopogonids were examined from a number of different types of trap throughout 1973 and 1974 in the course of a longer and more detailed study of the nuisance species of *Culicoides*.

The island-wide network of light traps (New Jersey and miniature CDC models) run by the Mosquito Research and Control Unit (Cayman Islands Government) for mosquito surveillance, was one source of ceratopogonids even though the collecting bags did not retain midges efficiently. One CDC trap especially adapted to collect midges (Davies & Giglioli, in preparation) was examined for 92 nights and 15 nights catches from a human bait collecting method (paddle trap, Nathan et al, in preparation) were examined for ceratopogonids. Further collections were made from inside houses (mostly aspirated from window sills and lamps) both at times of bad biting complaints from the residents and at other times. Emergence trap catches were also examined from various sites. These were of the wooden box type covering 4 ft² of substrate.

Grand Cayman is a small, flat, irregularly shaped island of about 76 mi². About half is mangrove swamp and the other half rough wooded pasture on a thinly-soiled limestone substrate. An elevated beach ridge lines much of the coast. The vegetation is more fully described by

Swabey and Lewis (1946) and Davies and Giglioli (1977 A).

RESULTS

Thirty-one species of Ceratopogonidae were found, belonging to 10 genera representing all 4 ceratopogonid subfamilies. About 20% of the species are probably undescribed. All were examined by W. W. Wirth. Table 1 gives the species list arranged systematically. Figs 1 to 3 give keys for the identification of Caymanian ceratopogonid genera and *Culicoides* species.

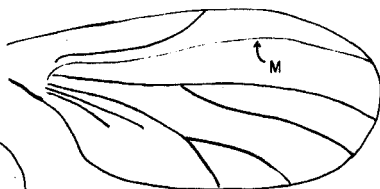
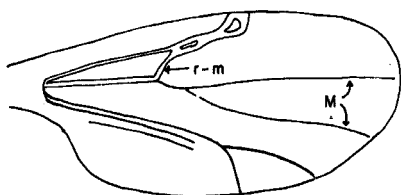
RELATIVE ABUNDANCE OF GENERA. Table 2 shows the relative abundance of ceratopogonid genera as indicated by the various collecting methods. Of the 10 genera occurring in Cayman, *Culicoides*, *Dasyhelea*, *Forcipomyia* and *Atrichopogon* were the most common. Light traps and emergence traps often produced more *Dasyhelea* than any other genus indicating that this was the most widespread and commonly occurring genus in Grand Cayman. It was only outnumbered by *Culicoides* in the total results due to the latter's prevalence in houses and at human bait. *Forcipomyia* and *Atrichopogon* were less ubiquitous but could undergo local population explosions to become the dominant types in trap collections.

All the collecting methods excluded insects of mosquito size or over except the New Jersey and unmodified CDC traps which only excluded the larger moths,

¹ Present address: Dept. Tsetse Fly Control P. O. Box 14, Maun, Botswana.

Anterior median vein forked

Cross vein r-m present



Anterior median vein single

Cross vein r-m not present

LEPTOCONOPINAE

Claws gently curved

Claw markedly curved

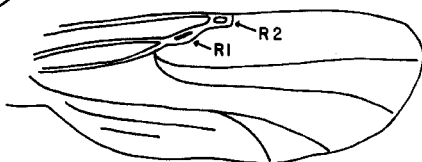
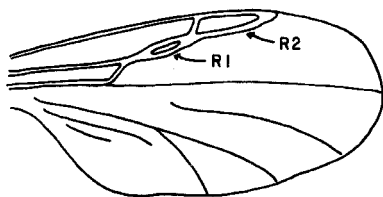
Empodium small or vestigial

Empodium well developed



FORCIPOMYIINAE

First radial cell nearly or completely obliterated, second obliterated or square ended ending at or before middle of wing



One or both radial cells well developed, second radial cell not square ended ending past middle of wing

DASYHELEINAE

CERATOPOGONINAE

Fig. 1. Key to subfamilies of the Ceratopogonidae (after Wirth 1959).

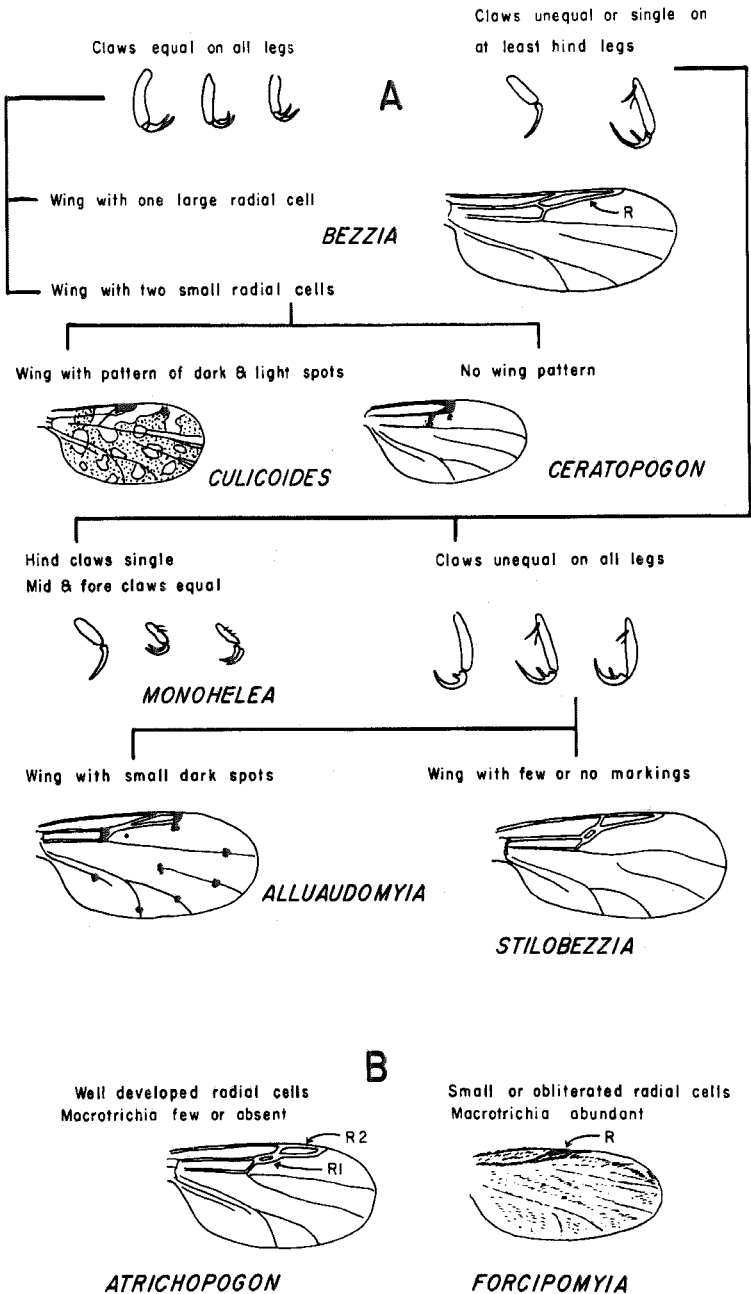


Fig. 2. Key to genera of A. Ceratopogoninae and B. Forcipomyiinae occurring in Grand Cayman. (Details of claws refer to females only).

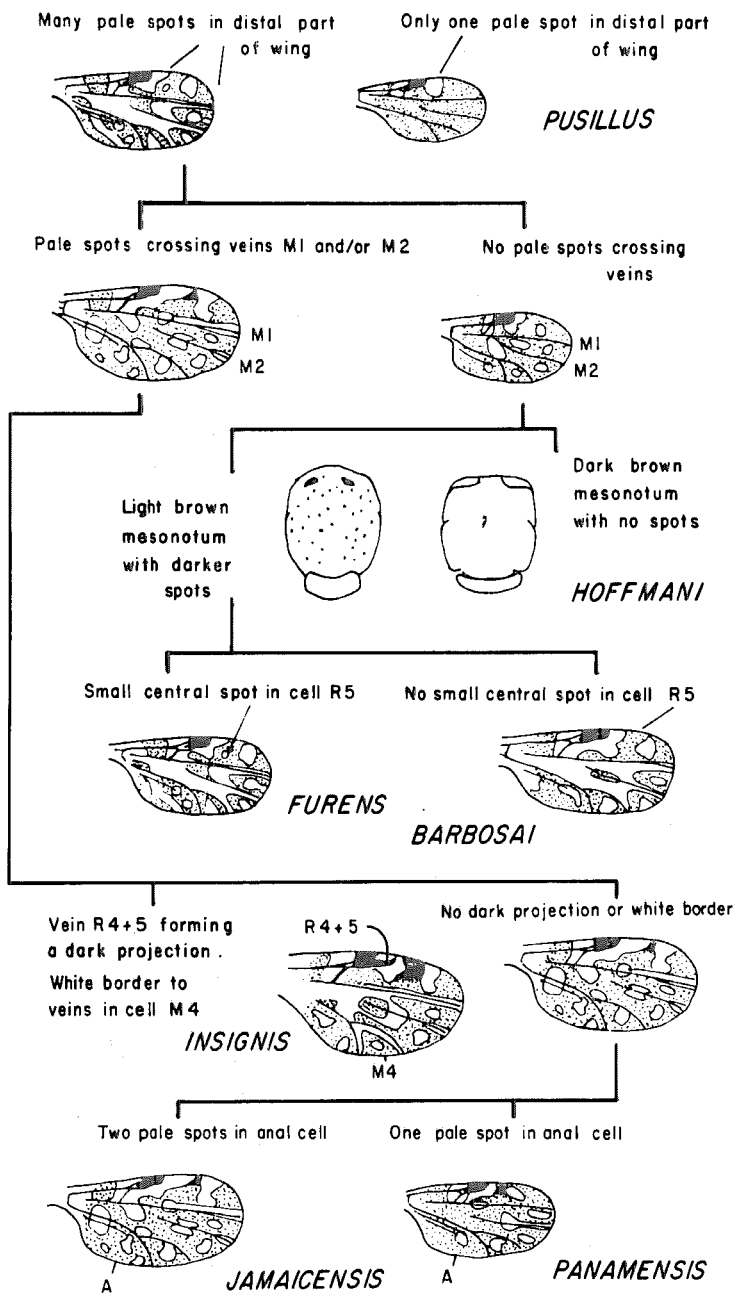


Fig. 3. Key to species of *Culicoides* occurring in Grand Cayman.

Table 1. Species list of Cayman Ceratopogonidae arranged systematically.

Subfamily	Genus	Subgenus	Species
Leptoconopinae	Leptoconops		becquaerti (Kieffer)
Forcipomyiinae	Forcipomyia	(Microhelea)	fuliginosa (Meigen)
		(Euforcipomyia)	quasiingrami Macfie
		(Blantonina)	caribbea Worth & Dow
		(Forcipomyia)	n. sp. near squamitibia Lutz
		(Forcipomyia)	genualis (Loew)
		(Forcipomyia)	n. sp. near cinctipes (Coq)
		(Synthyridemyia)	tenuiforceps Macfie
		(Lasiohelea)	prob. n. sp.
		Atrichopogon	sp. A
			sp. B
	sp. C		
Dasyheleinae	Dasyhelea		lutcogrisea Wirth & Williams
			atlantis Wirth & Williams
			cincta (Coquillett)
Ceratopogoninae	Stilobezzia		coquilletti Kieffer
			scutata Lane & Forattini
	Monohelea		stonei Wirth
			hieroglyphica group
	Alluaudomyia		bella (Coquillett)
	Ceratopogon	(Brachypogon)	fuscivenosus (Lutz)
		(Brachypogon)	prob. n. sp.
	Bezzia		punctipennis (Williston)
			prob. n. sp.
	Culicoides	(Oecacta)	furens (Poey)
(Oecacta)		barbossi Wirth & Blanton	
(Oecacta)		hoffmani Fox	
(Hoffmania)		insignis Lutz	
(Avaritia)		pusillus Lutz	
(Culicoides)		jamaicensis Edwards	
	(Culicoides)	panamensis Barbosa	

beetles etc. The last column in Table 2 shows that ceratopogonids comprise an important part of the small insect population and at times the dominant part. Emergence traps indicated brackish mangrove swamps to be the most important breeding sites. Fresh water and drier areas produced lower percentages of ceratopogonids compared with other families. Of those small insects invading houses via window mosquito screens, ceratopogonids were frequently the dominant group.

NOTES ON SPECIES

Leptoconops bequaerti. Biting by this species was experienced on only 3 occasions

at 2 localities (Nov. 1972, April 1973, on the north coast; May 1973 on the west coast). It occurred in the shade of trees between 1500 and 1600 hours in bright sunny weather. Biting seemed to be weak and ineffectual, and few individuals were present. The species seemed very rare probably due to lack of suitable breeding sites. Emergence trapping in damp sandy areas near the sea produced negative results.

Forcipomyia fuliginosa. This was the most common *Forcipomyia* species. It occurred regularly in light traps, usually in small numbers, and was more common in rough pasture than mangrove areas. It readily entered houses in large numbers. Only two specimens were taken in

Table 2. Relative abundance of *Ceratopogonid* genera.

Trap type	Vegetation type	No. days	Percentage of each genus*					Total Cerat.	% Total catch
			C	D	F	A	Other		
Unmodified CDC & NJ light	Various	11	26.6	28.5	15.0	21.9	8.0	807	10.0 to 90.0
Modified CDC Emergence		Rough pasture	92	7.5	69.4	21.7	0.6	0.8	4166
Emergence	Beach r./ mangrove	81	36.5	18.7	18.7	3.1	22.9+	96	13.7
Emergence	Mangrove	138	2.9	94.1	1.7	1.3	0.02	5356	83.0
Emergence	Rough pasture	25	10.4	88.1	0	0	1.5	135	25.1
Inside house	"	180	33.4	17.7	42.7	3.1	3.1	2080	—
Inside house (bad biting complaints)	"	6	98.3	0.7	0.9	0.05	0.05	3299	89.9
Paddle (human bait)	Various	15	96.6	2.3	0.4	0.6	0.1	8330	100.0
Total		548	52.4	36.6	8.6	1.6	0.8	24269	—

* C=Culicoides.

D=Dasyhelea.

F=Forcipomyia.

A=Atrichopogon.

+ 22.9% *Brachypogon* prob. n. sp.

emergence traps, both from the mangrove-beach ridge transition zone.

F. quasingrami. This species was taken regularly in light traps mostly in small numbers. It was recorded emerging from wet mangrove mud and also drier beach ridge areas, also from a damp patch on bare open calcareous fill dredged from the sea bed.

F. caribbea. Light traps in pasture and beach ridge areas showed this species, but it was not common.

F. new species near *squamitibia*. This was uncommon in light traps, only occurring in rough pasture areas where it was also found resting in grass and herbs around rain flooded areas. Emergence traps did not show it but it occurred inside houses.

F. genualis. Small numbers were taken in light traps in pasture and beach ridge areas and a few specimens in emergence traps on the beach ridge and beach ridge-mangrove transition zone.

F. new species near *cinctipes*. This species was shown regularly but in small

numbers by light traps. A few specimens were taken in mangrove and beach ridge emergence traps.

F. tenuiforceps. This species was often quite common and was taken in emergence traps from dry sand of the beach ridge through to the wettest part of the mangrove swamp. However it only occurred in mangrove pneumatophore zones and not bare mangrove mud.

F. (Lasiohelea) new species. This species was very rare.

Atrichopogon sp. A. Light traps in all areas commonly trapped this species but emergence traps showed that breeding only occurred in mangrove swamps. It was seen resting in large numbers on pneumatophores in both exposed damp mud and flooded areas. Large numbers entered houses a mile from the nearest mangrove indicating that the adult has good powers of dispersal.

Atrichopogon sp. B. This species was taken in a few light traps in rough pasture areas, mostly in small numbers.

Atrichopogon sp. C. Light traps in

pasture and beach ridge areas showed small numbers of this species.

Dasyhelea luteogrisea. Commonly taken in light traps in all areas, this species was observed resting on flooded pasture vegetation and on pneumatophores protruding from flooded mangrove. Emergence traps confirmed breeding in both flooded pasture (salinity 1 g/l chloride) and mangrove swamp (10 g/l). In the latter the largest numbers were taken from the lowest, wettest mangrove pneumatophore zone and bare mud on the edge of a mangrove pool also produced large numbers. Few emerged from the transition zone of mangrove with beach ridge and none from the drier sandy beach ridge itself. An emergence trap on a mangrove pneumatophore substrate produced 1603 *D. luteogrisea* in 77 days while the water level was below mud level. Catches fell off gradually as water level rose and 55 days of trapping with the mud level flooded produced no catch. Small numbers were collected from inside houses. Human bait paddle trapping showed a dusk activity peak on one night at a site where this species was very plentiful. Very little biting occurred at the time and this could be attributed to the presence of small numbers of *Culicoides furens*.

D. atlantis. This species was exceedingly common, being found everywhere in light traps. Adults were found resting in tall grass and herbs in flooded pastures and on pneumatophores in mangrove areas. Emergence traps showed breeding in pasture land, both in flooded conditions and from dry earth. Even small rain water pools in rocky areas produced this species. A small amount of breeding was shown in quite dry beach ridge sand, but more occurred at the boundary with mangrove and large amounts in the wetter pneumatophore zones. Bare mud around mangrove pools produced large numbers but the pneumatophore zone appeared to be favored. In the latter an emergence rate of 5.5 per day (104 days) was noted when mud was exposed and

3.6 (34 days) when flooded. During 3 days when flooding was actually taking place the emergence rate went up to 373.0 per day. (These rates were for one emergence trap covering 4 ft² of substrate.) Thus *D. atlantis* is probably the most common ceratopogonid in Grand Cayman, breeding in habitats from fresh to brackish and flooded to almost dry. Flooding seems to stimulate emergence.

D. cincta. The least common of the three *Dasyhelea* species, this was occasionally taken in light traps, mostly in rough pasture areas. It was found emerging from damp soil in flooded pastureland but was not recorded from mangrove swamp.

Stilobezzia coquilletti. This species occurred in small numbers in light traps in mangrove and rough pasture areas. It was noted emerging from damp sand in the mangrove—beach ridge transition zone where there were no pneumatophores and the water level was about 6 in. below ground.

S. scutata. Light traps showed this species to be present in small numbers, mostly in rough pasture areas, and a few were caught while paddle trapping. An emergence trap on damp soil in flooded pastureland produced a few specimens.

Monohelea stonei. This species was taken in small numbers in light traps in pasture and mangrove sites.

M. sp. hieroglyphica group. Small numbers were taken in rough pasture areas in light traps.

Alluadomvia bella. This was recovered in rough pasture in small numbers in light traps and also a few specimens were taken while paddle trapping. It was found inside houses, and there was 1 record of emergence from damp soil in a flooded pasture.

Ceratopogon fuscivenosus. A few specimens were collected in rough pasture light traps and mangrove and beach ridge paddle traps. A few records from emergence traps showed breeding from the beach ridge through the transition zone to the mangrove. It was also found

emerging from a damp patch on the surface of otherwise rough dry fill.

Ceratopogon prob. new species. A rare species, most were taken from emergence traps on the landward side of the beach ridge but some occurred in light traps.

Bezzia punctipennis. Only one specimen was taken, a male from a light trap in a beach ridge site.

Bezzia prob. new species. Only one rough pasture site produced this species, 46 females being taken in a light trap.

Culicoides furens. This was the main nuisance species of ceratopogonid occurring on the Island. Its distribution was island wide and numbers were often high. It also occurred in large numbers in the lesser islands—Cayman Brac and Little Cayman. It was taken in all types of traps where it comprised, on average, more than 95% of the total catch of *Culicoides* species. Ecological details are published elsewhere (Davies & Giglioli 1977 B).

C. barbosai. This species seemed to be most common around the edge of the North Sound, a huge lagoon fringed by red mangrove. Its density here could be very high but it was not a major pest as most residential areas were away from this area. Its distribution corresponded to its habits in other countries, but it was never taken in emergence traps so its actual breeding sites were never delineated. There were some indications that peaks of abundance occurred before and after the rainy season.

C. insignis. This species was more widespread than the previous species but was never trapped in large numbers. It did however occur in emergence traps and seemed to favor non-saline breeding sites, which were a minor part of available habitats though widely spread over the Island (Davies & Giglioli 1977 A). The species was also recorded in Cayman Brac. Peak densities appeared to occur after the rainy season when ground water levels were falling, usually in December and January. Later in the dry season numbers were reduced possibly because non-saline habitats then became too dry.

This species was never taken at human bait but almost 10% of the *Culicoides* attracted to a goat bait near a nonsaline site were *C. insignis*.

C. jamaicensis. Of the remaining 4 rare species of *Culicoides* this one was the most widespread being found in most areas of the Island and also in Cayman Brac. Light traps showed that it occurred in all the main vegetation types but it was not taken at all at human or goat bait. Most specimens were caught in the wettest months, usually October and November.

C. hoffmani. This species was only found in the western half of the Island and appeared to favor mangrove areas. In common with the other rare species it was not taken in emergence traps. It occurred more commonly in bait traps, both human and goat, than in light traps and appeared to increase in density with the first rains in the middle of the year though not reaching peak densities till the main rains in September to November.

C. pusillus. This species was recorded only from the southwest section of the Island where most trapping was done, but it occurred in all vegetation types. Most specimens were taken in light traps but some at goat bait though never at human bait. No males were seen. Most were trapped from December to February, winter months following the rain indicating non-saline breeding sites.

C. panamensis. Only 2 female specimens were taken, one in a light trap near a non-saline breeding site and the other at human bait on the beach ridge. Both areas were in the southwest section of the Island.

ACKNOWLEDGMENTS

We would like to thank the Cayman Islands Government for supporting research on the Ceratopogonidae and gratefully acknowledge the considerable assistance and encouragement of Dr. W. W. Wirth of the U.S.D.A. Systematic Entomology Laboratory, Washington.

References Cited

Davies, J. E. and Giglioli, M. E. C. 1977 A. The breeding sites and seasonal occurrence of *Culicoides furens* in Grand Cayman with notes on the breeding sites of *C. insignis* (Diptera: Ceratopogonidae) Mosquito News 37: 414-423.

Davies, J. E. and Giglioli, M. E. C. 1977 B. Water levels and the emergence of *Culicoides*

furens (Diptera: Ceratopogonidae) from mangrove swamps in Grand Cayman. Mosquito News 37:426-435.

Swabey, C. and Lewis, C. B. 1946. Forestry in the Cayman Islands. Devel. and Welfare in the W. Indies. Bull. 23 (Barbados).

Wirth, W. W. 1959. Systematic arrangement of Ceratopogonidae (Heleidae). U.S. Dept. Agric. Unpublished. 13 pp.