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RESULTS OF THE ALCOA FOUNDATION-SURINAME EXPEDITIONS. III. CHROMOSOMAL DATA FOR BATS (MAMMALIA: CHIROPTERA) FROM SURINAME

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ABSTRACT

Standard karyotypic data are presented for 28 species involving 98 specimens. The karyotype of *Micronycteris sylvestris*, *M. daviesi*, *Phyllostomus latifolius*, and *Tonatia schulzi* are reported for the first time. Chromosomal variation is described for *Rhinophylla pumilio* and *Rhogeessa tumida*. Karyotypes for the other species examined were like those previously described in the literature.

INTRODUCTION

As part of a study of the mammalian fauna of Suriname, we have examined the karyotypes of 28 species of bats (Table 1). The specimens reported herein are part of the sample which formed the basis for the report by Williams and Genoways (1980) on bat records for Suriname. Where relevant, as in *Rhogeessa tumida*, they discuss the reasons for conclusions concerning specific identification. In many cases where karyotypes of species are indistinguishable from those previously described in the literature, we have simply presented data

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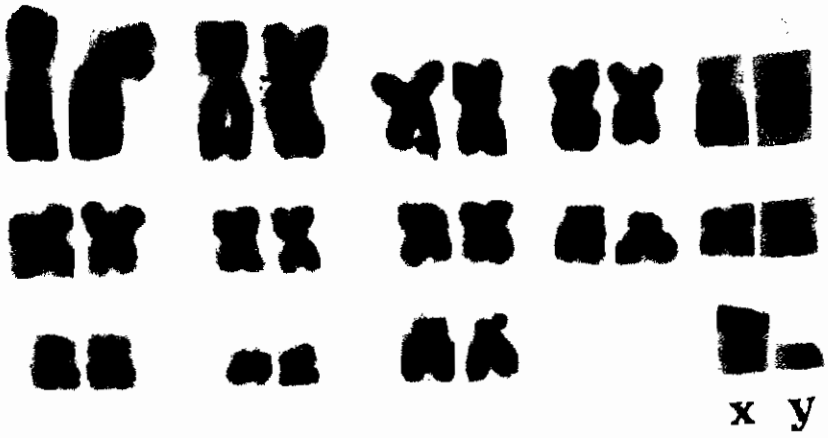

Fig. 1.—Representative karyotype of a male *Micronycteris daviesi* from Suriname: Saramacca; Raleigh Falls (CM 63573).

in Table 1 and Specimens Examined. In cases where comment is merited, data for species are discussed below.

METHODS AND MATERIALS

Standard karyotypes were prepared from *in vivo* bone marrow techniques (Baker, 1970), except for *Choeroniscus intermedius, Thyroptera tricolor, Tonatia schulzi,* and *Rhinophylla pumilio,* which were karyotyped from fibroblast cultures (Patton and Baker, 1978). A minimum of five spreads were examined per specimen. Microslides are depos-

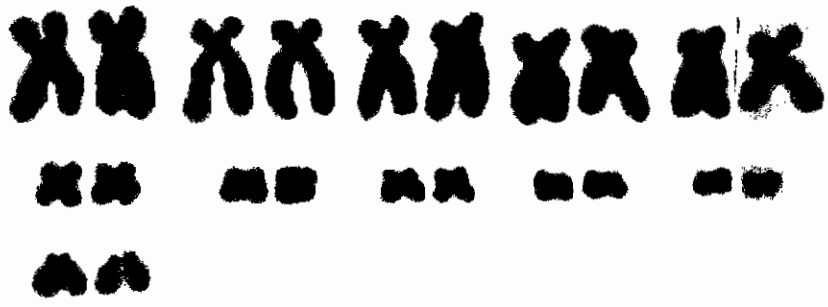

Fig. 2.—Representative karyotype of a female *Micronycteris sylvestris* from Suriname: Brokopondo; Brownsberg Nature Park, 2 km W, 8 km S Brownsweg (CM 63589).

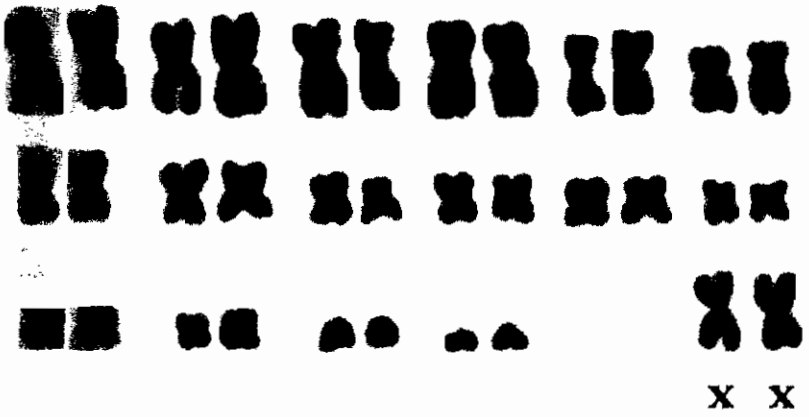

Fig. 3.—Representative karyotype of a female *Tonatia silvicola* from Suriname: Saramacca; Raleigh Falls (CM 63681).

ited in The Museum, Texas Tech University, and voucher skins and skulls are deposited in the Section of Mammals, Carnegie Museum of Natural History.

SPECIES ACCOUNTS

Micronycteris daviesi (Hill)

Fig. 1, 2n = 28; FN = 52

All autosomes are biarmed and 10 pairs are metacentric or submetacentric, whereas three pairs are subtelocentric. One medium-sized subtelocentric pair of autosomes has a secondary constriction on the short arm near the centromere. The X is a medium-sized subtelocentric and the Y is a small acrocentric. Superficially, this karyotype appears nearly identical to that described for *M. nicefori*, but *M. nicefori* has one additional pair of medium-sized subtelocentrics and no smaller sized subtelocentric elements.

Micronycteris sylvestris (Thomas)

Fig. 2, 2n = 22; FN = (36)

The karyotype of this species consists of nine pairs of biarmed and two pairs of small acrocentric elements. The biarmed elements fall int two size classes; five larger pairs have a centromere placement whi is subtelocentric in nature and three smaller pairs which are subm centric in nature. As only females were examined, the X could no identified; however, it is probably one of the biarmed pairs wl would make the FN = 36. This species has the lowest diploid nun thus far reported for the genus (Baker, 1979). Prior to this report lowest diploid number was 2n = 28 (*M. hirsuta*, *M. nicefori*, and

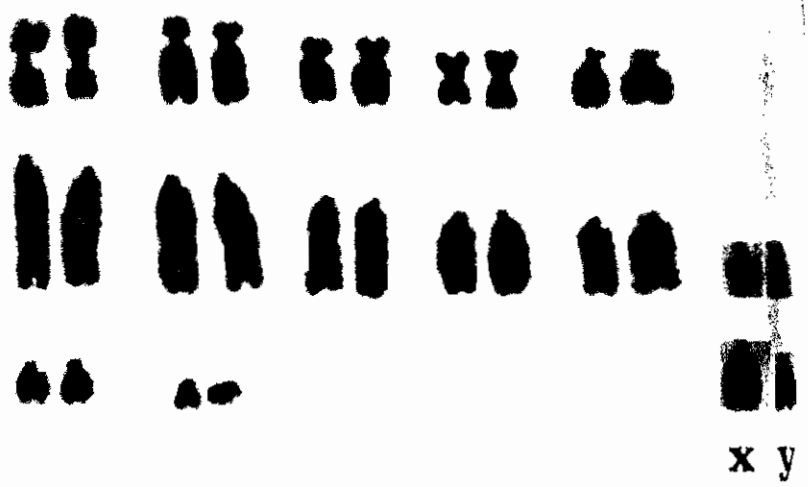

Fig. 4.—Representative karyotype of a male *Tonatia schulzi* from Suriname: Brokopondo; 3 km SW Rudi Kappelvliegveld (CM 63687).

minuta), and the lowest FN was 32 for *M. hirsuta*. Although *M. hirsuta* has a karyotype nearest to that of *M. sylvestris* in diploid and fundamental values, the two karyotypes are not similar in morphology as *M. hirsuta* has 10 pairs of acrocentrics in the cytotype with the lowest diploid value (28).

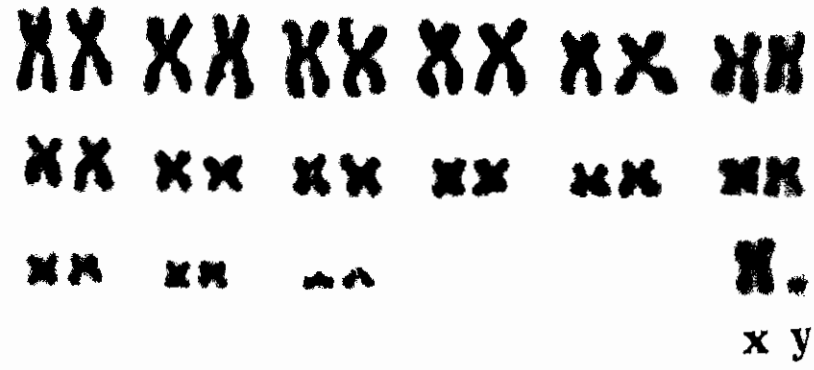

Fig. 5.—Representative karyotype of a male *Phyllostomus latifolius* from Suriname: Brokopondo; Brownsberg Nature Park, 2 km W, 8 km S Brownsweg (CM 63639).

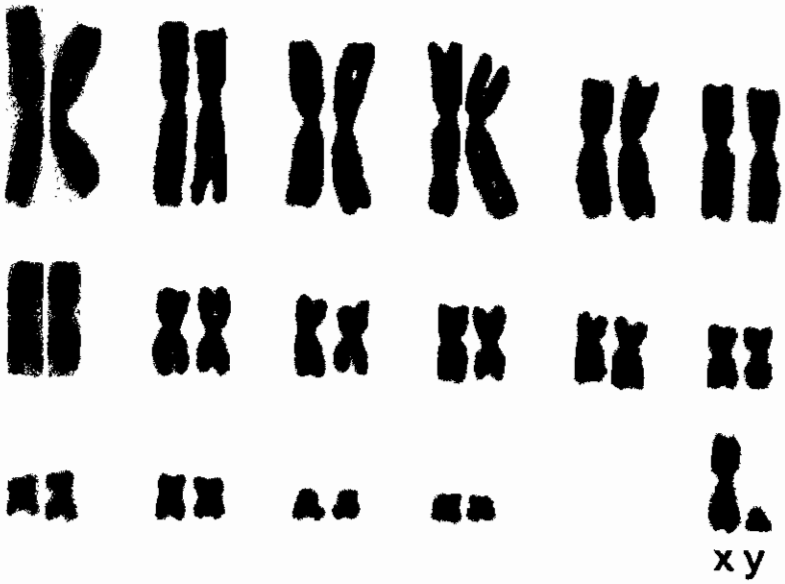

Fig. 6.—Representative karyotype of a male *Rhinophylla pumilio* from Suriname: Brokopondo; 3 km SW Rudi Kappelvliegveld (CM 63749).

Tonatia silvicola (D'Orbigny)
Fig. 3, 2n = 34; FN = 60

The karyotype of *T. silvicola*, which was reported by Gardner (1977), is identical to that of our eleven specimens from Suriname representing four localities.

Tonatia schulzi Genoways and Williams
Fig. 4, 2n = 28; FN = 36

The karyotype of this recently described species (Genoways and Williams, 1980) consists of five pairs of biarmed elements and nine pairs of acrocentric elements. The X and Y are acrocentric. Two pairs of the biarmed elements are submetacentric and three are subtelocentric. The smallest pair of biarmed elements has a very small second arm. The nine pairs of acrocentrics form a gradual series from large to small. The karyotype of this species is unique to the genus in the large number of autosomal acrocentric elements and an acrocentric X element. Based on standard karyotypes, it is impossible to determine to which other species of the genus *T. schulzi* is most closely related.

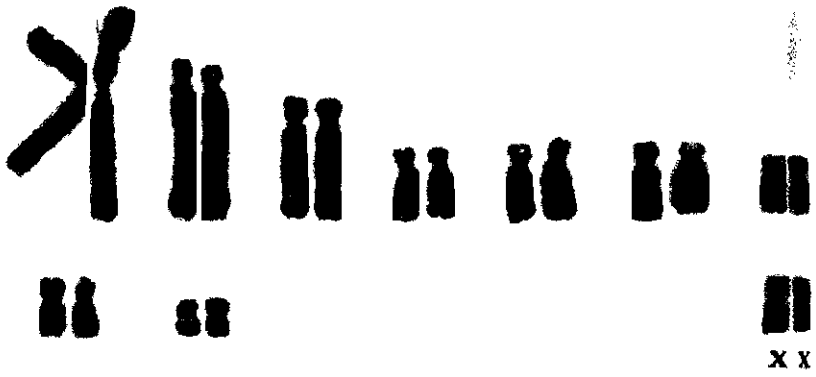

Fig. 7.—Representative karyotype of a female *Choeroniscus intermedius* from Suriname: Nickerie; Grassalco (embryo from CM 63702).

Phyllostomus latifolius Thomas
Fig. 5, 2n = 32; FN = 60

The karyotype of this species is identical to that described for *P. hastatus*, *P. elongatus*, and *Phylloderma stenops*. All autosomes are biarmed except for the smallest pair which is acrocentric. The X appears to be a medium-sized submetacentric and the Y a small dot-like acrocentric.

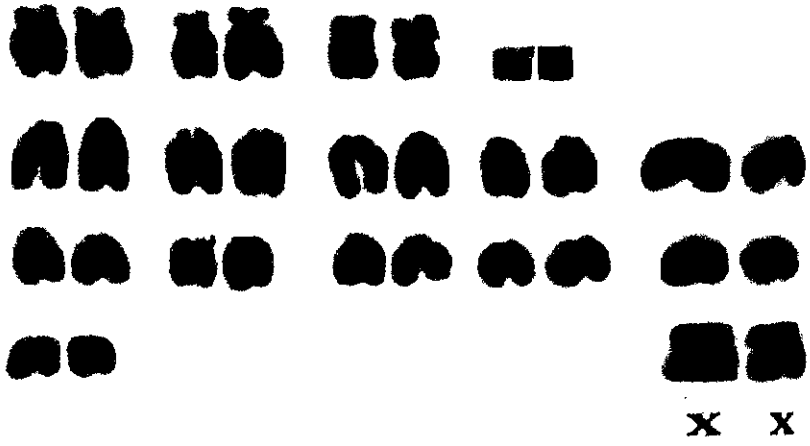

Fig. 8.—Representative karyotype of a female *Lonchophylla thomasi* from Suriname: Brokopondo; Brownsberg Nature Park, 2 km W, 8 km S Brownsweg (CM 63713).

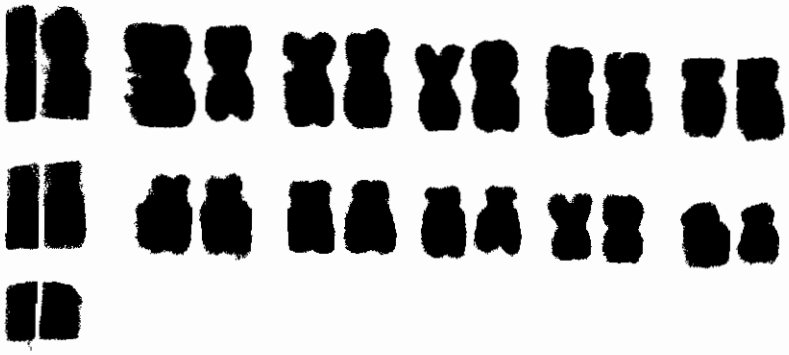

Fig. 9.—Representative karyotype of a female *Vampyressa bidens* from Suriname: Brokopondo; 1 ½ km W Rudi Kappelvliegveld (CM 63894).

Rhinophylla pumilio Peters
Fig. 6, 2n = 34; FN = 64

Baker and Bleier (1971) reported a 2n = 36, FN = 62 for specimens of this species from Leticia, Colombia. A female from 1 mi west Puerto Linares, Dept. of LaPaz, Bolivia, collected by David Webster, had a karyotype like that reported by Baker and Bleier (1971). Four specimens (a female and her male embryo, plus another male and female) from Suriname had a 2n = 34, with no acrocentrics (the Colombian and Bolivian specimens had three pairs of acrocentrics). A centric fusion of two acrocentric pairs found in the Colombian cytotypes could explain the reduction in diploid number and the reduction by two pairs in the number of acrocentrics in the karyotype. A pericentric inversion or short arm addition of heterochromatin could explain the additional differences between the two cytotypes.

Choeroniscus intermedius (J. A. Allen and Chapman)
Fig. 7, 2n = 20; FN = (36)

The karyotype of this mainland specimen of *Choeroniscus intermedius* is essentially like that described for the species from Trinidad (Baker, 1979). Koopman (1978) has discussed the relationship of the intermediate-sized members of the genus in South America and has recognized two species—*intermedius* and *minor*. Williams and Genoways (1980) have followed this arrangement but have questioned the distinctness of these taxa. If only one species is recognized, the name to be applied would be *Choeroniscus minor* (Peters).

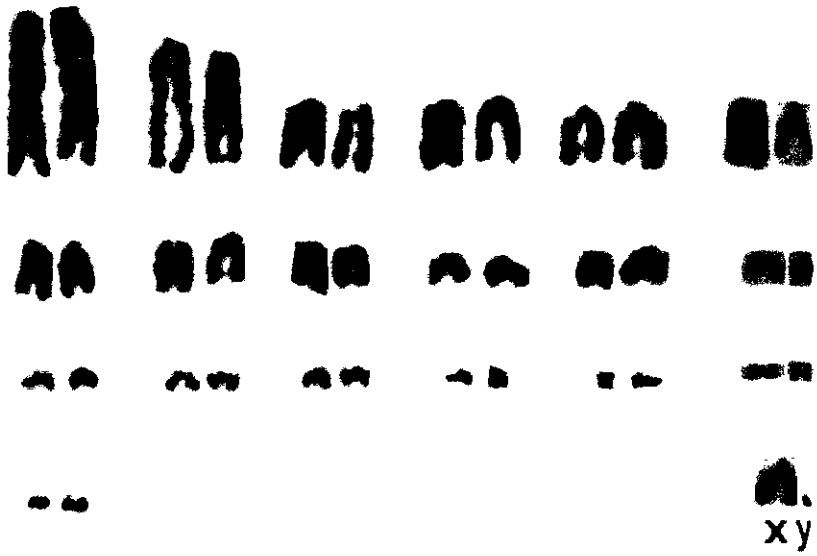

Fig. 10.—Representative karyotype of a male *Thyroptera tricolor* from Suriname: Brokopondo; 1 ½ km W Rudi Kappelvliegveld (CM 63894).

Lonchophylla thomasi Allen
Fig. 8, 2n = 32; FN = 38

Two karyotypes have been described for this species. Baker (1973 and Plate 29 in Baker, 1979) reported a 2n = 30, FN = 34 for *L. thomasi*. Gardner (1977) reported a 2n = 32, FN = 38 for *L. thomasi*. The values reported by Gardner are identical to those for the karyotype of our six specimens. The difference between the two karyotypes is a minute pair of distinctly biarmed elements which are present in the 2n = 32 cytotype, but absent in the 2n = 30 cytotype. Gardner's specimens were from Peru, which means the 2n = 32 cytotype is found both to the east and west of where the 2n = 30 form was collected (Leticia, Colombia, from Baker, 1979).

Vampyressa bidens (Dobson)
Fig. 9, 2n = 26; FN = (48)

The karyotype of *Vampyressa bidens* was reported by Gardner (1977). However, he presented only a drawing of the karyotype. Karyotypes of our specimens are like those figured by Gardner and are shown in Fig. 9.

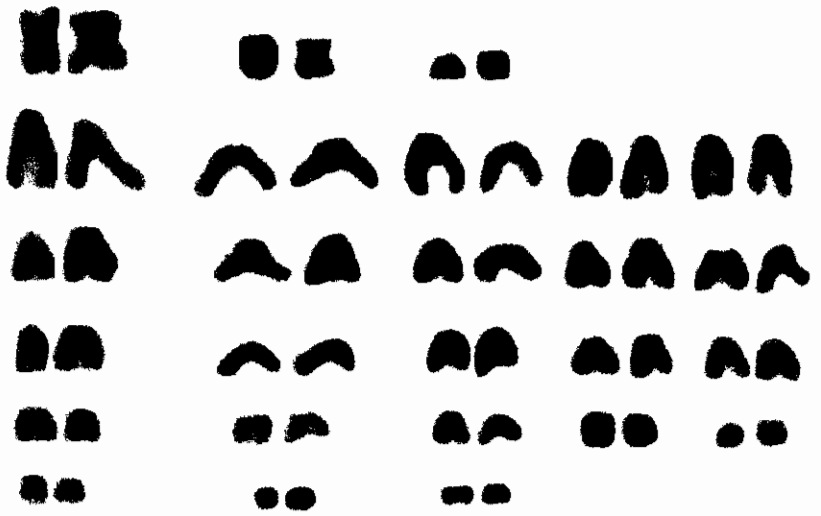

Fig. 11.—Representative karyotype of a female *Rhogeessa tumida* from Suriname: Nickerie: Sipaliwini Airstrip (CM 63934).

Vampyressa brocki Peterson
2n = 24; FN = 44

Baker et al. (1972*b*) reported the karyotype of this species based on examination of three females. Based on a heterochromatic pair in the two males from Suriname, the sex-chromosome system in this species appears to be XX/XY. Another sex-chromosome system has been reported for species in the genus (Baker, 1973) where the males have a diploid value of one less than that found in females.

Thyroptera tricolor (Spix)
Fig. 10, 2n = 40; FN = 38

Diploid and fundamental values were reported for this species by Baker (1970) based on a specimen from Trinidad. As a karyotype has not been published, one is shown in Fig. 10.

Rhogeessa tumida H. Allen
Fig. 11, 2n = 52; FN = (52)

Diploid values reported for *R. tumida* are 42, 34, 32, and 30 (Bickham and Baker, 1977), with the higher diploid numbers being found in Central America. All previously examined specimens of this species

Table 1.—*Chromosomal data for bats from Suriname. Symbols are 2n, diploid number; FN, fundamental number; M, metacentric; SM, submetacentric; ST, subtelocentric; A, acrocentric.*

Taxon	2n	FN	X	Y	Source of photograph of karyotype	Number of specimens reported in this study	
						♂	♀
Emballonuridae							
Saccopteryx bilineata	26	36	ST	ST	Baker and Jordan, 1970	1	
Phyllostomatidae							
Phyllostomatinae							
Chrotopterus auritus	28	52	SM	A	Yonenaga, 1968	1	1
Micronycteris daviesi	28	52	SM	A	This paper	1	
Micronycteris megalotis	40	68	ST	A	Baker, 1979	1	
Micronyteris minuta	28	(50)			Baker, 1979		1
Micronycteris nicefori	28	(52)			Baker, 1979		2
Micronycteris sylvestris	22	(40)			This paper		7
Mimon crenulatum	32	60	SM	A	Baker et al., 1972*a*: Baker, 1979	4	5
Phylloderma stenops	32	58	SM	A	Baker, 1979	2	1
Phyllostomus latifolius	32	58	SM	A	This paper	2	11
Tonatia schulzi	28	36			This paper	2	
Tonatia bidens	16	20	M	A	Baker, 1979	1	6
Tonatia brasiliense	30	(56)			Baker, 1979		1
Tonatia silvicola	34	60	SM	A	This paper	6	5
Trachops cirrhosus	30	(56)			Baker, 1979		1
Glossophaginae							
Anoura caudifer	30	56	SM	A	Baker, 1979	1	
Anoura geoffroyi	30	(56)			Baker, 1979		1
Choeroniscus intermedius	20	(36)			Baker, 1979		1
Lionycteris spurrelli	28	(50)			Baker, 1979		1
Lonchophylla thomasi	32	38	ST	A	This paper	2	1

Table 1.—*Continued.*

Taxon	2n	FN	X	Y	Source of photograph of karyotype	Number of specimens reported in this study ♂	♀
Carolliinae							
Rhinophylla pumilio	34	64			This paper	2	2
Stenoderminae							
Mesophylla macconnelli	21–22	20	A		Baker, 1979	1	1
Uroderma bilobatum	42	50	ST	SM	Baker and Lopez, 1970	6	8
Vampyressa bidens	26	(48)			This paper		2
Vampyressa brocki	24	44	ST	A	Baker, 1979	2	
Vampyrops helleri	30	56	ST	SM	Baker, 1979	1	2
Thyropteridae							
Thyroptera tricolor	40	38			This paper	1	
Vespertilionidae							
Rhogeessa tumida	52	(52)			This paper		1

from South America (Trinidad and Venezuela) have a diploid number of 30. The Suriname specimen does not fit this pattern of geographic distribution of cytotypes. In fact, this specimen has a higher diploid number than has previously been reported for the family Vespertilionidae, and adds further support to the fact that *R. tumida* (as recognized by standard taxonomic methods) contains more chromosomal variation than any other species of bat.

In our opinion, what is currently recognized as *R. tumida* is actually several biological species which are difficult, if not impossible, to distinguish by examination of skins and skulls. Clearly, the factors that promote and/or allow chromosomal evolution are different in *R. tumida* than in most other species of bats (especially the family Vespertilionidae, Bickham, 1979). An understanding of the biology of this species should be extremely valuable in providing insights into the role of chromosomal change in evolution.

Based on G-band chromosome data from the 2n = 30 and 34 cytotypes, Bickham and Baker (1977) hypothesized that the primitive diploid number for the genus *Rhogeessa* was 2n = 50 with a karyotype like that characteristic of *Eptesicus fuscus*. The 2n = 52 cytotype from Suriname differs in gross chromosomal morphology from that proposed as primitive for the genus by a higher diploid number (by two) and a higher fundamental number (by four). Several different combinations of events could explain these differences; however, of all these events, those which produced the higher diploid number are the most difficult to explain from a cytogenetic standpoint.

SPECIMENS EXAMINED

Specimens examined from Suriname were as follows: *Saccopteryx bilineata*—Brokopondo: 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (♂, CM 63536). *Chrotopterus auritus*—Nickerie: Sipaliwini Airstrip (♂, CM 63571). Brokopondo: 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (♀, CM 63570). *Micronycteris daviesi*—Saramacca: Raleigh Falls, 4°44'N, 56°12'W (♂, CM 63573). *Micronycteris megalotis*—Brokopondo: 1 ½ km W Rudi Kappelvliegveld, 330 m, 3°47'N, 56°10'W (♂, CM 63575). *Micronycteris minuta*—Commewijne: Nieuwe Grond Plantation, 5°53'N, 54°54'W (♀, CM 63582). *Micronycteris nicefori*—Commewijne: Nieuwe Grond Plantation, 5°53'N, 54°54'W (♀, CM 63586). Brokopondo: 1 km N Rudi Kappelvliegveld, 300 m, 3°48'N, 56°08'W (♀, CM 63585). *Micronycteris sylvestris*—Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (7♀, CM 63587–89, 63592–94, 63598). *Mimon crenulatum*—Commewijne: Nieuwe Grond Plantation, 5°53'N, 54°54'W (♀, CM 63608). Brokopondo: 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 45°10'W (4♀, CM 63599, 63502–03, 63605; 4♂, CM 63600–01, 63604, 63606). *Phylloderma stenops*—Saramacca: Raleigh Falls, 4°44'N, 56°12'W (♂, CM 63614). Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (♂, CM 63609); 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 45°10'W (♀, CM 63610). *Phyllostomus latifolius*—Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (♀, CM 63638; ♂, CM 63639); Rudi Kappelvliegveld, 320 m, 3°47'N, 56°08'W (♀, CM 63649); 1 km N Rudi Kappelvliegveld, 300 m, 3°48'N, 56°80'W (4♀,

CM 63640–43; 1♂, CM 63645); 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (3♀, CM 63650–52); 1½ km W Rudi Kappelvliegveld, 330 m, 3°47'N, 56°10'W (2♀, CM 63646, 63648). *Tonatia schulzi*—Brokopondo: 1 km N Rudi Kappelvliegveld, 300 m, 3°48'N, 56°08'W (♂, CM 63686); 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (♂, CM 63687). *Tonatia bidens*—Saramacca: Voltzberg, 4°40'N, 56°12'W (2♀, CM 63664–65); Bitagron, 5°06'N, 56°04'W (♀, CM 63663). Nickerie: Grassalco, 4°46'N, 56°46'W (3♀, CM 63659–60, 63662). Brokopondo: Rudi Kappelvliegveld, 320 m, 3°47'N, 56°08'W (♂, CM 63658). *Tonatia brasiliense*—Commewijne: Nieuwe Grond Plantation, 5°53'N, 54°54'W (♀, CM 63667). *Tonatia silvicola*—Saramacca: Raleigh Falls, 4°44'N, 56°12'S (♀, CM 63681); Voltzberg, 4°40'N, 56°12'W (♀, CM 63685; 2♂, CM 63683–84); Bitagron, 5°06'N, 56°04'W (♀, CM 63680). Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (2♀, CM 63672, 63679; 4♂, CM 63669–71, 63674). *Trachops cirrhosus*—Nickerie: Sipaliwini Airstrip (♀, CM 63689). *Anoura caudifer*—Brokopondo: 1 km N Rudi Kappelvliegveld, 300 m, 3°48'N, 56°08'W (♂, CM 63696). *Anoura geoffroyi*—Nickerie: Sipaliwini Airstrip (♀, CM 63699). *Choeroniscus intermedius*—Nickerie: Grassalco, 4°46'N, 56°46'W (♀, CM 63702). *Lionycteris spurrelli*—Nickerie: Grassalco, 4°46'N, 56°46'W (♀, CM 63711). *Lonchophylla thomasi*—Nickerie: 24 km S, 60 km E Apoera, 4°41'N, 56°07'W (2♂, CM 63718–19). Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (♀, CM 63713). Nickerie: Sipaliwini Airstrip (♂, CM 63750). *Rhinophylla pumilio*—Brokopondo: 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (1♀ and her ♂ embryo, CM 63749); Brownsberg Nature Park, 2 km W, 8 km S Brownsweg, 4°55'N, 55°11'W (♀, CM 63744). *Mesophylla macconnelli*—Nickerie: Sipaliwini Airstrip (♂, CM 63830). Commewijne: Nieuwe Grond Plantation, 5°53'N, 54°54'W (♀, CM 63829). *Uroderma bilobatum*—Nickerie: Sipaliwini Airstrip (3♀, CM 63855–56, 63858; ♂, CM 63857). Brokopondo: Brownsberg Nature Park, 2 km W, 8 km S, Brownsweg, 4°55'N, 55°11'W (1♀, CM 63863; 4♂, CM 63860, 63862, 63864–65); Rudi Kappelvliegveld, 320 m, 3°47'N, 56°08'W (♀, CM 63853; ♂, CM 63852); 1 km N Rudi Kappelvliegveld, 300 m, 3°48'N, 56°08'W (2♀, CM 63866–67); 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (♀, CM 63854). *Vampyressa bidens*—Brokopondo: 3 km SW Rudi Kappelvliegveld, 320 m, 3°46'N, 56°10'W (♀, CM 63870); 1½ km W Rudi Kappelvliegveld, 330 m, 3°47'N, 56°10'W (♀, CM 63869). *Vampyressa brocki*—Nickerie: 24 km S, 60 km E Apoera, 4°41'N, 56°07'W (2♂, CM 63871–72). *Vampyrops helleri*—Nickerie: Sipaliwini Airstrip (♀, CM 63883; ♂, CM 63882). Brokopondo: Rudi Kappelvliegveld, 320 m, 3°47'N, 56°08'W (♀, CM 63879). *Thyroptera tricolor*—Brokopondo: 1½ km W Rudi Kappelvliegveld, 330 m, 3°47'N, 56°10'W (♂, CM 63894). *Rhogeessa tumida*—Nickerie: Sipaliwini Airstrip (♀, CM 63934).

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