LONG-LEGGED BAT

Macrophyllum macrophyllum (Schinz, 1821)

FIGURE 1 - Adult perched on a rock (© Merlin D. Tuttle, Bat Conservation International, www.batcon.org).

TAXONOMY: Class Mammalia; Subclass Theria; Infraclass Metatheria; Order Chiroptera; Suborder Microchiroptera; Superfamily Noctilionoidea; Family Phyllostomidae, Subfamily Phyllostominae, Tribe Macrophyllini (López-Gonzalez 2005, Myers et al 2006, Hoffman et al 2008). This species is the sole representative of the genus *Macrophyllum,* Gray 1838. The origin of the generic and species name *Macrophyllum* is Greek meaning "long leaf" presumably in reference to the long nose leaf (Braun & Mares 1995).

The species is monotypic. No type specimen was ever conserved (Ávila-Pires 1965). Considerable discussion has existed in the past as to who should be recognised as the author of the species. Cabrera (1958) referred to "Wied in Schinz" though there is no evidence that Wied-Neuwied wrote the original description and under ICZN rules this means that the Schinz should be recognised as the author (López-González 2005). The exact location of the type locality has also been disputed as the Rio Mucurí flows from Minas Gerais to southern Bahía. Gardner (2007) stated that the type locality is most likely in the vicinity of Morro da Arara, a fazenda on the Rio Mucurí in the State of Bahía which is a place that Wied-Neuwied is known to have visited. Synonyms adapted from Harrison (1975), Gardner (2007) and López-González (2005):

Phyllost[*oma*]. *macrophyllum* Schinz 1821:613. Type locality "In den Wäldern von Brasilien" restricted to Rio Mucurí, Bahía by Wied-Neuwied (1826:192).
Phyllost[*oma*]. *macrophyllum* Wied-Neuwied 1826:188 Objective synonym of the above.
Macrophyllum nieuwiedii Gray 1838:489 Type locality "Brazil", first use of current generic name.
Macrophyllum neuwiedii P.Gervais 1856:50 Incorrect spelling.
Dolichopyllum macrophyllum JA Allen 1900:91 Name combination.
Macrophyllum macrophyllum Nelson 1912:93 First use of current name combination.

ENGLISH COMMON NAMES: Long-legged Bat (Gardner 2007, Redford & Eisenberg 1992), Wied´s Long-legged Bat (Harrison 1975).

SPANISH COMMON NAMES: Murciélago de patas largas (Emmons 1999), Falso vampiro patilargo (Redford & Eisenberg 1992), Murcielaguito patas largas (Chebez 1996, Barquez et al 1993), Murciélago patilargo (Massoia et al 2006), Murciélago de piernas largas (Ascorra et al 1991).

GUARANÍ COMMON NAMES: No known names.

DESCRIPTION: A small and slender bat with a long tail reaching to the outer edge of the greatly developed uropatagium (recalling Vespertilionidae). Pelage rich brown, only slightly paler ventrally than dorsally and with hairs paler towards the base. Head with short rostrum less than the width of the brain case. Lower lip with a cluster of three warts surrounded by a circle of eight smaller warts. Ears slightly longer than the head, well-separated and with pointed tips, lightly furred on the upper edge. Inner edge convex. Tragus long and pointed. Nose leaf long, pointed, crenulated on the lower edge and with broad median ridge, the horseshoe at the base being broad with an expanded lobe behind the nasal fossae. Four or five prominent glands present on the sides of the muzzle behind the nose leaf. Eyes small. Wing and tail membranes broad, naked and almost black. Wing membranes reach the distal extremity of the tibia. First digit with only one visible phalanx, other digits with two. Calcar greatly enlarged, almost twice as long as the foot. Feet greatly elongated and enlarged with long claws subequal in length to the tibia. Uropatagium characteristically features seven or so longitudinal rows of dermal denticles on the ventral side. (Harrison 1975, Barquez et al 1993, Emmons 1999). Taddei (1975) mentions two specimens from Brazil showing abnormal colouration with a large patch of white pelage on the dorsal thoracic area.

CRANIAL CHARACTERISTICS: Skull with short, broad rostrum, length being less than width of braincase. Maxillae displaced anteriorly and nasal openings retracted to second premolars. Nasals emarginated laterally and upwards, leaving a flattened area in dorsal view at the base of the incisors. Palate long, extending posteriorly beyond the edge of the upper tooth row. Sagittal crest absent. Zygomatic arch complete but delicate. Basisphenoid fossae obsolete. Hamular process of pterygoids parallel anteriorly but strongly divergent posteriorly. Auditory bullae small not covering half the cochleae. (Miller 1907, Barquez et al 1999, López-González 2005).

The following measurements are based on a series of unsexed Paraguayan specimens (n=5) published in López-González (2005): *Greatest Skull Length* 17.4mm (+/- 0.41mm); *Condylobasal Length* 14.9mm (+/- 0.41mm); *Transverse Zygomatic Width* 9.9mm (+/- 0.25mm); *Mastoid Width* 8.9mm (+/- 0.35mm); *Interorbital Constriction* 3.2mm (+/- 0.16mm); *Width Across Upper Molars* 6.7mm (+/- 0.18mm); *Width Across Upper Canines* 3.5mm (+/- 0.17mm).

A single male collected by Baud (1989) at Rio Ypané, Departamento Concepción had the following measurements: *Greatest Skull Length* 17.3mm; *Condylobasal Length* 14.6mm; *Interorbital Constriction* 3mm; *Width of Braincase* 8.2mm; *Transverse Zygomatic Width* 9.8mm; *Mastoid Width* 9.1mm; *Width Across Upper Molars* 6.5mm; *Width Across Upper Canines* 3.3mm.

Barquez et al (1999) give the following measurements for a single specimen from Argentina: *Greatest Skull Length* 16.3mm; *Condylobasal Length* 14.3mm; *Mastoid Width* 8.4mm; *Postorbital Constriction* 3.2mm; *Width Across Upper Canines* 3.4mm; *Width of Braincase* 7.9mm.

Taddei (1975) gives the following measurements for 8 males from northeast Brazil: *Greatest Skull Length* 17mm (+/- 0.09mm); *Condylobasal Length* 14.98mm (+/- 0.06mm); *Condylocaninal Length* 14.36mm (+/- 0.07mm); *Basal Skull Length* 12.11mm (+/- 0.03mm); *Length of Palate* 6.04mm (+/- 0.05mm); *Length of Mandible* 10.64mm (+/- 0.03mm); *Width Across Upper Canines* 3.65mm (+/- 0.03mm); *Width Across Upper Molars* 6.69mm (+/- 0.07mm); *Postorbital Width* 3.19mm (+/- 0.04mm); *Transverse Zygomatic Width* 9.72mm (+/- 0.05mm); *Width of Braincase* 8.12mm (+/- 0.06mm); *Mastoid Width* 9.09mm (+/- 0.07mm); *Height of Braincase* 7mm (+/- 0.06mm).

DENTAL CHARACTERISTICS: I2/2 C 1/1 P2/3 M3/3 = 34. First upper incisor procumbent. Upper incisors completely fill the space between the canines. I1 large and incumbent. I2 reduced reaching only to the cingulum of I1. Crowns of lower incisors broad. i1 and i2 with trilobulate edges. Canines curved, approximately twice the size of the largest incisor. First upper premolar is similar in size to the outer incisor. Anterior face of p1 contacts the canines. Second lower premolar is minute and easily missed. First and third lower premolars are large and come close to making contact. First upper molar is the largest tooth in molar row and jointly with M2 has conspicuous W-shaped commissures. Two commissures and a trace of a third are present on the third upper molar. m1 and m2 similar to each other and well-developed. m3 is much smaller and talonid basin is indistinguishable due to the closeness of hypoconid and entoconid. (Miller 1907, Barquez et al 1999).

The following measurements are based on a series of unsexed Paraguayan specimens (n=5) published in López-González (2005): *Upper Tooth Row* 5.6mm (+/- 0.09mm); *Lower Tooth Row* 6.2mm (+/-

0.15mm). A single male collected by Baud (1989) at Rio Ypané, Departamento Concepción had the following measurements: *Upper Tooth Row* 5.6mm; *Lower Tooth Row* 6mm. Taddei (1975) gives the following measurements for 8 males from northeast Brazil: *Upper Tooth Row* 5.66mm (+/- 0.02mm); *Lower Tooth Row* 6.36mm (+/- 0mm).

Barquez et al (1999) give the following measurements for a single specimen from Argentina: *Upper Tooth Row* 5.5mm.

GENETIC CHARACTERISTICS: 2n=32. FN=56. (Redford & Eisenberg 1992).

EXTERNAL MEASUREMENTS: A small bat with oversized feet and a long tail c85% of head and body length. The following measurements are based on a series of unsexed Paraguayan specimens (n=5) published in López-González (2005): **TL** 92.3mm (+/- 4.08mm); **TA** 42mm (+/- 4.08mm); **FT** 14.8mm (+/- 0.75mm); **FA** 37.3mm (+/- 1.75mm); **EA** 18.2mm (+/- 0.45mm); *Length of Third Digit* 38.6mm (+/- 1.97mm); **WT** 9.5g (+/- 0.78g). These measurements correspond with the upper limits of measurements provided by Harrison (1975) for the rest of the species range.

A single male collected by Baud (1989) at Rio Ypané, Departamento Concepción had **FA:** 40.5mm. Wilson & Gamarra de Fox (1991) give the following mean measurements for nine females and a single male from PN Cerro Corá, Departamento Concepción: **TL:** male 92mm, females 92mm; **FT:** male 14mm, females 15mm; **EA:** male 18mm, females 18mm; **WT:** male 8.8g, females 9.6g.

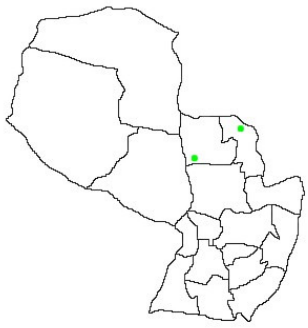
Barquez et al (1999) give the following measurements for a single specimen from Argentina: **TL** 81mm; **TA** 35mm; **FT** 10mm; **FA** 36mm; **EA** 16mm.

Taddei (1975) gives the following measurements for 8 males from northeast Brazil: **HB:** 46.19mm (+/- 0.43mm); **FT** 9.69mm (+/- 0.16mm); **FA** 36.75mm (+/- 0.12mm); **EA** 18.44mm (+/- 0.17mm); *Height of tragus* 7.88mm (+/- 0.08mm); *Third Metacarpal* 35.75mm (+/- 0.23mm); *First Phalange of Third Digit* 13.94mm (+/- 0.15mm); *Second Phalange of Third Digit* 17.31mm (+/- 0.31mm); *Third Phalange of Third Digit* 6.75mm (+/- 0.19mm); *Fourth Metacarpal* 33.62mm (+/- 0.32mm); *First Phalange of Fourth Digit* 10.44mm (+/- 0.17mm); *Second Phalange of Fourth Digit* 11.19mm (+/- 0.21mm); *Fifth Metacarpal* 34.62mm (+/- 0.26mm); *First Phalange of Fifth Digit* 9.62mm (+/- 0.16mm); *Second Phalange of Fifth Digit* 8.44mm (+/- 0.24mm); *Tibia* 16.31mm (+/- 0.13mm); *Calcar* 19.31mm (+/- 0.33mm). **WT** 7.2-7.8g (n=4).

SIMILAR SPECIES: This species can be easily identified as a result of its small size and over-sized feet, the latter being shared only by the very much larger Bulldog Bats of the family Noctilionidae. Note however that this species is rich brown in colouration, has a well-developed, long nose leaf and a long tail that reaches to the border of the uropatagium. Furthermore this species possesses rows of dermal denticles on the uropatagium that are not shared with any other bat species.

DISTRIBUTION: Widespread throughout the Neotropics from southern Mexico (Tabasco) south to northern Argentina (Provincia Misiones). Distribution is predominately east of the Andes and throughout Amazonia, being absent from the Pacific coasts of Ecuador and Peru. Despite the vast range no subspecific differences have been described.

In Argentina it is confined to the single locality of Cueva Maria Antonia in Provincia Misiones (Barquez et al 1999, Chebez 2009). In Bolivia the species has been recorded in lowland areas of Departamentos Beni, Pando and Santa Cruz (Aguirre 2007). In Brazil the species has been recorded in the following states: Acre, Amazonas, Amapá, Bahía, Espirito Santo, Goiás, Minas Gerais, Paraná, Rio de Janeiro and São Paulo (dos Reis et al 2007).



The first published record of the species was by Baud (1989) who collected a specimen MHNG 1698.47 in Departamento Concepción in October 1985. This was not however the first record for Paraguay as stated in that publication as specimens had been collected in February 1982 but were not published until much later (Wilson & Gamarra de Fox 1991). All records for the country come from two localities in the northern Orient - PN Cerro Corá, Departamento Amambay and Rio Ypané, Departamento Concepción (López-González

2005). However the species presence in Misiones Province (Departamentos Capital, San Ignacio and Gral. San Martín), Argentina (Chebez 1996, Massoia et al 2006) very close to the Rio Paraná suggests that it may be more widespread than currently thought.

HABITAT: Considered a species of humid forest interior and clearings by Emmons (1999) always in the vicinity of water. López-González (2005) noted that Paraguayan specimens were collected from a small cave over the Arroyo Tacuará, PN Cerro Corá and from the Río Ypané close to Belén, Departamento Concepción where the predominant vegetation type is tropical semi-deciduous forest.

ALIMENTATION: Considered the only obligate insectivore amongst the Phyllostomidae (Gardner 2007), this little bat uses its greatly enlarged feet and uropatagium to scoop insect prey from on or near the surface of water (Weinbeer & Meyer 2006).

Foraging Behaviour and Diet Following their radiotelemetry study on Barro Colorado Island, Panama Meyer et al (2005) concluded that the species forages exclusively over water - unique amongst the Phyllostomids. Foraging areas ranged from 2.7 to 96.1ha (median 12.3ha for both sexes) and there was high night to night consistency in their use. Core use areas corresponded to approximately 35% of the foraging area and were greater in females (median 5.3ha; range 1.1-54.1ha) than males (median 3.3ha; range 2.6-8.7ha). Davis et al (1964) correctly surmised that the oversized feet were used to take aquatic prey and mentioned insects as a likely prey, but their hypothesis that they may use the feet for "flipping small minnows into the air" has not been borne out by stomach contents data obtained since. The species forages in small groups of 3 to 10 individuals (Weinbeer & Meyer 2006).

Wied (1826) found only insect remains in stomachs whilst Harrison & Pendleton (1975) found stomachs from El Salvador to contain nothing other than "finely chewed insect remains". Analysis of the contents of the latter detected the presence of Lepidoptera, Diptera and Coleoptera and it was concluded by Harrison (1975) that flying insects make up the bulk of the prey. Gardner (1977) found water-striders (Hemiptera, Gerridae) in Panamanian stomachs, confirming that prey may be taken from the surface of water. Whitaker & Findley (1980) examined five pellets of the species from Costa Rica and found in order of abundance midges (Chironimidae) 43.3% by volume, Araneida 28.3%, unidentified Coleoptera 15%, unidentified Lepidoptera 4.2%, unidentified Diptera 4.2%, unidentified Hemiptera 3.3% and water-striders (Gerridae) 1.7%. Baud (1989) found microlepidoptera and Trichoptera in the stomach of a male collected in Paraguay on 12 October 1985. Fornes et al (1969) found chitinous remains on the inner side of the uropatagium of Argentine specimens.

Quelch (1892) speculated incorrectly that blood-feeding may supplement the diet.

Diet in Captivity Under captive conditions Weinbeer & Kalko (2007) observed the foraging behaviour of the species. They demonstrated that prey can be found using only echolocation with a 100% success rate, and proved the importance of echolocation in prey capture by showing experimentally a 0% success rate in capture of prey items located just below the water surface where echolocation could not be used for detection. Bats actively searching for food (the search phase) circled low over the water at a flight speed of 2.95ms^{-1} (+/-0.8 ms^{-1}). Once prey was detected (the approach phase) they switched to a more direct flight style, directing the head, ears and nose leaf towards the prey and reducing speed slightly to 2.48ms^{-1} (+/-0.6 ms^{-1}). Mean detection distance was 1.39m +/-0.3 (range 0.91-1.91m). The terminal phase (including capture of prey) begins with a further reduction in flight speed to 2.22ms^{-1} (+/-0.4) at a distance of 0.47m +/-0.1 (range 0.32-0.61m).

To capture prey the uropatagium is lowered perpendicular to the body stabilized by the long calcars and the head is bent downwards. At this point the claws are maintained parallel to the flight direction either side of the uropatagium and are not lowered into the water (as in Noctilionidae). Upon arriving at the target the distal part of the tail membrane is slid over the surface of the water with only the tips of the calcars touching the water surface and once prey is contacted with the tail membrane the feet are moved together. As a result prey is captured primarily by the tail membrane with the assistance of the claws, and in most cases the claws are not used for removing prey from the water surface. The dermal denticles on the ventral part of the uropatagium probably increase friction for seizing prey, whilst their alignment in longitudinal rows helps reduce water resistance. Following capture the head, ears and nose leaf are returned to the normal position, the head was bent down to remove the prey to the mouth and the bat flew to a perch to consume its meal. During this experiment bats were fed mealworms and each bat consumed 80-100 per night.

Bloedel (1955) noted that his captive individual died after only two days without touching the fruit that was offered as food.

REPRODUCTIVE BIOLOGY:

Seasonality Baud (1989) that a male collected in Departamento Concepción had enlarged testicles (diameter 3.7mm) but that they had not descended to the scrotum. Wilson & Fox (1991) noted that females collected on 10 February 1982 showed signs of recent lactation and some subadults with incomplete fusion of long bones were also present.

Rest of range Pregnant females were taken in Guatemala in both the wet and dry seasons, in El Salvador in October, in Costa Rica in March and May and in French Guiana in October and November. (Nowak 1991). Males taken in December in El Salvador were considered sexually active by Felton (1956).

Courtship Wilson & Fox (1991) collected one male and 16 females from a small cave on the Arroyo Tacuara in PN Cerro Corrá, Departamento Amambay and suggested that a harem breeding system may operate. Furthermore they cite Felten (1956) who found five males together in a small roost in El Salvador as possible evidence that males without a harem roost together and an unpublished series of specimens collected by Dr CO Handley in Panama and housed at the National Museum of Natural History in Washington which also figured single males with groups of females. An absence of subadult males in the roost that they sampled suggested that young males either disperse or are chased from the harem at an early age. Weinbeer & Meyer (2005) noted that reproductively active males spend less time foraging and more time at the roost than non-reproductive males.

Pregnancy Harrison (1975) notes that a foetus measuring 17.5mm taken from a pregnant female in El Salvador during October already possessed feet and claws 8mm long, at that stage of development equal to the forearm length and almost half the body length, and that the dermal denticles were already discernible on the uropatagium.

GENERAL BEHAVIOUR: ***Activity Levels*** Weinbeer & Meyer (2006) noted maximum activity of the species on Barro Colorado Island, Panama at dusk, when the bats spent about 30 continuous minutes on the wing and that activity continued at a lower, but relatively constant level throughout the night. There was no sexual difference in the amount of time spent in continuous flight (mean 7mins; maximum 60mins), but males spent slightly less time on the wing per night than females (median for males 193.4 v females 207mins). Periods of activity were interrupted by hanging phases at night roosts or in the day roost (median 5.8mins, maximum 3 hours). Bats were found to spend more time in the hanging phase shortly after midnight than they did either at dawn or dusk.

Rain reduced or ceased time spent in the air, and though they would continue foraging during drizzle, heavy rain signalled a return to the roost. Emergence time and return to roost were correlated with time of sunset (mean 20.6min +/-1.7min after sunset) and sunrise (mean 30.1min +/-2.5min before sunrise) respectively. Bats tuned their foraging activity to the abundance of aerial prey.

Flight Pattern Flight is fast and fluttery, almost butterfly-like. The species is difficult to capture when foraging and most mist-netting captures are at the roost site (Seymour & Dickerman 1982). The species is most frequently captured low over water (Whitaker & Findley 1981) and Davis et al (1964) caught their specimens "in the bottom pocket of the net" within "a foot of the water".

Roosts They roost alone or in small groups in caves (López-González 2005), tunnels (Dickerman et al 1981), abandoned buildings (Hill & Bown 1963), ravines ("quebradas" – Ascorra et al 1991), subterranean cavities (Brosset & Charles-Dominique 1990) or under bridges (Gardner 2007). In Panama Bloedel (1955) found colonies to be small and consist of a few individuals, frequently accompanied by *Desmodus rotundus*. In El Salvador a colony in a culvert was shared with *Glossophaga soricina* (Harrison & Pendleton 1975). Peracchi & Albuquerque (1971) noticed a roosting association with *Glossophaga soricina* and *Carollia perspicillata* in Brazil. Baud (1989) collected a male from a roost at Rio Ypané, Departamento Concepción which was also occupied by *Desmodus rotundus, Noctilio albiventris* and *Platyrrhinus lineatus*. Fornes et al (1969) reports that two Argentine specimens were collected in a cave a few metres from the Rio Paraná which had two entrances, a narrow one occupied by a colony of 150 *Desmodus rotundus* and a wider one where this species was taken with a single *Carollia perspicillata*.

One colony in a 10m long culvert in Brazil contained 50 individuals (Peracchi et al 1984) whilst a colony in culverts at La Avellana, a Guatemalan coastal marsh numbered up to 70 (Dickerman et al 1981). Bats at the Guatemalan roost only used culverts containing water and were absent from dry culverts. They

flew freely from one culvert to another when disturbed and mark-recapture data suggested that individual bats use several different roosts. Typically males greatly outnumber females at roost sites and on many occasions are completely absent, suggestive of alternate, undiscovered roosting behaviour by females (Nowak 1991).

Home Range Meyer et al (2005) studied the ranging behaviour of four males and five females on Barro Colorado Island, Panama using radio-telemetry. Home range size was found to be greater than for other similar-sized Phyllostomid bats with a median of 23.9ha (range 7.3-150.7ha). Home range of males (median 17.3 ha; range 7.3-24.9ha) was slightly but not significantly smaller than that of females (median 44.4ha; range 16.3-150.7ha). Individuals travelled an estimated 35–47km on a nightly basis, and females moved significantly greater distances than did males. Although the species employs a gleaning foraging strategy, it closely parallels aerial insectivorous bats in terms of range size and movement distances (Meyer et al 2005).

Mortality Weinbeer & Meyer (2005) observed a Bat Falcon *Falco rufigularis* taking individuals of this species over water at Barro Colorado Island, Panama.

Parasites One Nycteribiid, four Streblid bat flies listed by Webb & Loomis (1977) as well as an Argasid tick, one Labiocarpid mite, one Spinturnicid mite and one Trombiculid mite. Guerrero (1985) added a tick, a mite and three further Streblid bat flies, and added four additional Streblids in a later publication (Guerrero 1997).

Longevity The species apparently lives for several years. Seymour & Dickerman (1982) recaptured 9 bats 900-966 days after their original capture as adults.

VOCALISATIONS: The majority of this section is taken from experimental studies performed by Weinbeer & Kalko (2007). This species is the only Phyllostomid that forages in open areas over water and as a result receives less background echoes ("clutter") from its surroundings allowing echolocation to be the primary source of prey detection. This results in a more complex repertoire of emissions compared to the relatively uniform calls used by other members of the family which aim to detect stationary items in a clutter-full environment. Consequently this species does not need to rely on visual clues and is able to detect prey using only echolocation.

Though call structure closely resembles that of other Phyllostomid bats (short, multiharmonic, and with steep frequency-modulated signals), the pattern and complexity of calls is closer to that of bat families that rely on an aerial and insectivorous diet, with distinct search, approach, and terminal group calls present in foraging individuals.

During the search phase (see **Alimentation**) groups of two long (1.9-3.6ms), multiharmonic search notes are produced at varying pulse intervals and large bandwidths. Peak frequency barely varied over the sequence (53.6-55.2 kHz). In the approach phase the ears, head and nose leaf are directed at the prey and calls are emitted in 2 to 4 groups of 3 to 7 signals each with groups interrupted by pulse intervals of intermediate duration (36.7ms +/-3). Approach calls are preceded by a long pause of 46.3ms +/-9. Approach calls (within-groups) had a lower pulse interval and shorter pulse duration than search calls, whereas repetition rate, duty cycle, sweep rate, and bandwidth were larger. Terminal group calls are given during the terminal phase at a mean distance of 0.47m +/-0.1 (0.32-0.61m). They consist of 20.6 +/-2.2 (range 14-27) short calls with a high repetition rate and a total duration of 179.6 ms +/-32 (range 98-301). They are preceded by a short pulse interval of 28.3ms +/-3. During the final approach (0.35-0.28 m from the prey) when the first 2 to 8 terminal group calls have already been emitted, the bat enters the pulse-echo overlap zone where pulses with a duration of 1.6-2.1 ms overlap with echoes returning from the prey. Pulse duration shortens as the bat gets closer to prey but never drops below 0.8-1.2 ms. Throughout the terminal group, pulse interval and bandwidth were continuously reduced, duty cycle and sweep rate increased slightly, and repetition rate doubled.

HUMAN IMPACT: Human impact likely negligible. The use of culverts and abandoned buildings as roost places means that the bats may benefit to a low degree from human activity, but similarly may be persecuted due to perceived threats to humans or livestock spurred on by the erroneous belief that all bats are "vampires" or carriers of disease.

CONSERVATION STATUS: Globally considered to be of Least Concern by the IUCN, see http://www.iucnredlist.org/details/12615 for the latest assessment of the species. Considered stable in Paraguay by López-Gonzalez (2005) though the species is currently known to occur in just two localities,

one of which is within a national park (PN Cerro Corá, Departamento Amambay). The species presence in Provincia Misiones, Argentina (the southern extremity of its known range) suggests that it may be more widespread than currently thought in Paraguay. There are only three records of the species in Misiones, Argentina however and Chebez (2009) considered it rare there as it has undoubtedly suffered from campaigns to eradicate *Desmodus rotundus*. Given the fact that this species is associated with watercourses within forested habitats it has likely declined as a result of habitat destruction, removal of appropriate roosting sites and with aquatic insects making up a significant part of the diet it may also suffer from pollution of rivers and streams in agricultural areas.

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CITATION: Smith P 2008 - FAUNA Paraguay Handbook of the Mammals of Paraguay Number 27 *Macrophyllum macrophyllum* - www.faunaparaguay.com/macmachb.html.