



# SPIX'S ROUND-EARED BAT

*Tonatia bidens* (Spix, 1823)



**FIGURE 1**– Roost, Madrejón, Departamento Alto Paraguay Photo Paul Smith (July 2011).

**TAXONOMY:** Class Mammalia; Subclass Theria; Infraclass Metatheria; Order Chiroptera; Suborder Microchiroptera; Superfamily Noctilionoidea; Family Phyllostomidae, Subfamily Phyllostominae, Tribe Phyllostomini (López-Gonzalez 2005, Myers et al 2006, Hoffman et al 2008). There are two species in this genus, one of which occurs in Paraguay. Additional species assigned to this genus in the literature are now considered to be members of the genus *Lophostoma* (Lee et al 2002). The generic name *Tonatia* is of uncertain meaning. The species name *bidens* is Latin meaning “double tooth” referring to the two lower incisors, one of the distinguishing characteristics of this genus (Braun & Mares 1995).

The type specimen is an adult of unknown sex and without number in the Zoologisches Staats-Sammlung München, Germany with type locality “Fluvium St Francisci” (=Rio São Francisco) Bahía, Brazil (Carter & Dolan 1978). The species is monotypic. References to this species in Central America and northern South America are referable to *T.saurophila* Koopman & Williams, 1951 (Williams et al 1995) a species initially described from fossil remains. Very little published data about the species today known as

*Tonatia bidens* exists. *Tonatia childreni* was described based on a subadult specimen and was considered a synonym of this species by Williams et al (1995).

Czaplewski & Cartelle (1998) describe Quaternary fossils of this species from Minas Gerais and Bahía, Brazil.

Synonyms adapted from Gardner (2007) and López-González (2005):

*Vampyrus bidens* Spix 1823:65. Type locality "Fluvium St Francisci" (=Rio São Francisco) Bahía, Brazil.

[*Tonatia*] *bidens* Gray 1827:71. First use of current name combination.

*Phyllostoma childreni* Gray 1838:488 Type locality "South America".

*Phyllostoma bidens* Schinz 1844:236. Name combination.

*Tylostoma bidens* P.Gervais 1856:49 Name combination.

[*Vampyrus*]. (*Tylostoma*) *bidens* W.Peters 1856:304 Name combination.

*Lophostoma bidens* W.Peters 1865:509 Name combination.

*Lophostoma bidens* W.Peters 1865:509 Name combination.

*Phyllostoma*. (*Tylostoma*). *Childreni* W.Peters 1865:514 Name combination.

*Tylostoma childreni* Gray 1866:114 Name combination.

**ENGLISH COMMON NAMES:** Spix's Round-eared Bat (Gardner 2007), Greater Round-eared Bat (Wilson & Cole 2000, IUCN 2009).

**SPANISH COMMON NAMES:** Falso vampiro orejas redondas (Barquez et al 1993), Murciélago de orejas redondas (Emmons 1999), Murciélago orejón grande (Ascorra et al 1991), Falso vampiro oreja redonda grande (Mares et al 1989).

**GUARANÍ COMMON NAMES:** No known names.

**DESCRIPTION:** A small Phyllostomine with ears relatively short and broad when compared to *Lophostoma* (though large when compared to most other bats. Ears are round-tipped and do not extend beyond the nose when laid forwards, the inner margins of the proximal half also being bordered with lighter-coloured hairs. They are well-separated and not joined by a line of skin across the forehead. Tragus well-developed, antitragus clearly smaller than *Lophostoma*. Dorsal pelage varies from tawny-red through greyish to blackish-brown. Ventral pelage paler and greyer with buffy wash. Bases of hairs on the neck and behind the ears whitish, bases of other dorsal hairs dark brownish. Proximal half of the forearm, base of thumb and ventral side of feet furred. Nose leaf simple, broad at the base and narrowing suddenly from the middle to the somewhat blunt tip. Muzzle furred. Membranes dark brown and naked, save for a small strip of fur at the outer edge of the plagiopatagium. Upper lip smooth, lower lip with central wart surrounded by numerous small papillae. Tail small and protruding from the middle of the upper side of the uropatagium. Uropatagium broad and supported by small, weak calcars.

**CRANIAL CHARACTERISTICS:** Skull large and robust with broad, flat rostrum that lacks constriction in the orbital area. Low, broad braincase with upper edge evenly elevated from the front of the nasals and without a depression in the orbital region. Palate narrow. Sagittal crest low and slender. Lamboidal crest poorly developed. Zygomatic arches are slender, though appearing broad in lateral view, and have a medial constriction. Antero-medial foramen located between the upper incisors and incisive foramina. Secondary process on mastoid absent. Auditory bullae small, barely covering the middle of the cochlea. (Goodwin 1942, Williams et al 1995, Barquez et al 1999).

Species is sexually dimorphic in some measurements, as evidenced by the following from across the range (n=19-20 males, n=37-38 females) presented by Williams et al (1995): *Greatest Length of Skull* males 28.5mm (27.4-29.5mm), females 28.4mm (27.7-29.2mm); *Condylobasal Length* males 24.3mm (22.9-25.6mm), females 24mm (23.1-25.6mm); *Zygomatic Width* males 13.7mm (13.1-14.1mm), females 13.5mm (12.9-14.1mm); *Interorbital Constriction* males 5.9mm (5.6-6.1mm), females 5.9mm (5.5-6.2mm); *Mastoid Width* males 13.4mm (13-13.7mm), females 13.2mm (12.9-13.6mm); *Braincase Width* males 11.1mm (10.8-11.4mm), females 11.1mm (10.7-11.8mm); *Width Across Canines* males 6.1mm (5.5-6.3mm), females 6.1mm (5.8-6.4mm); *Width Across Molars* males 8.9mm (8.1-9.8mm), females 8.8mm (8.5-9.2mm).

Measurements of two male specimens from Paraguay from López-González (2005): *Greatest Skull Length* 26.6mm 27.4mm; *Interorbital Constriction* 5.8mm 5.7mm; *Zygomatic Width* 13.2mm 13.3mm; *Mastoid Width* 12.9mm 12.98mm; *Width Across Molars* 8.5mm 8.3mm; *Width Across Canines* 5.6mm 5.4mm.

Range measurements of three male specimens from Dpto Concepción, Paraguay from Smith et al (2012): *Greatest Skull Length* 26.6-28.4mm; *Condylbasal Length* 23.4-24.8mm; *Zygomatic Width* 13.5-14.2mm; *Mastoid Width* 12.9-13.6mm; *Width of Braincase* 11-11.3mm; *Length of Rostrum* 10.5-11.1mm; *Interorbital Constriction* 5.8-5.9mm; *Mandibular Length* 17.8-18.6mm; *Width Across Upper Molars* 8.8-9.1mm; *Width Across Upper Canines* 5.9-6.3mm.

Myers & Wetzel (1983) give the following measurements for a male and female respectively from Departamento Boquerón, Paraguay: *Greatest Skull Length* male 28.2mm; *Condylbasal Length* male 24.4mm; *Zygomatic Width* male 13.5mm; *Mastoid Width* male 13.2mm; *Interorbital Constriction* male 6mm; *Length of Third Metacarpal* male 48.3mm female 46.5mm; *Width Across Upper Molars* male 8.5mm; *Width Across Upper Canines* male 6.1mm female 5.6mm.

Barquez et al (1999) give the following measurements for individuals from Argentina (n=10 unless stated): *Greatest Skull Length* 27.9mm (+/- 0.46mm); *Condylbasal Length* 24.5mm (+/- 0.32mm); *Zygomatic Width* 13.6mm (+/- 0.22mm); *Mastoid Width* 13.3mm (+/- 0.13mm, n=7); *Interorbital Constriction* 7.2mm (+/- 0.4mm, n=5); *Postorbital Constriction* 5.7mm (+/- 0.12mm); *Width Across Upper Molars* 8.9mm (+/- 0.20mm); *Width Across Upper Canines* 5.9mm (+/- 0.28mm) *Palatal Length* 11.9mm (+/- 0.22mm); *Length of Mandible* 18mm (+/- 0.26mm, n=9); *Width of Braincase* 11.2mm (+/- 0.16mm).

Paca et al (2012) give the following measurements for one female (MNKM 4747) specimen from Bolivia: *Greatest Skull Length* 27.2mm; *Condylbasal Length* 23.5mm; *Zygomatic Width* 13.6mm; *Postorbital Constriction* 5.8mm; *Width of Braincase* 11.1mm.

Sanborn (1936) gives the following measurements for three specimens in the Chicago Field Museum: *Greatest Length of Skull* 27.8-28mm; *Condylbasal Length* 24-24.4mm; *Length of Palate* 12.6-13mm; *Zygomatic Width* 13.4-13.4mm; *Interorbital Constriction* 5.6-5.8mm; *Mastoid Width* 13-13.2mm; *Braincase Width* 10.8-10.8mm; *Width Across Canines* 5.9-6mm; *Width of Rostrum Across Premolars* 5.5-5.6mm; *Width Across Molars* 7.9-8.4mm; *Mandibular Length* 17.2-17.6mm.

**DENTAL CHARACTERISTICS:** I2/2 C 1/1 P2/2 M3/3 = 32. Tooth rows converge slightly anteriorly. Inner incisors well-developed, in contact with each other, slightly procumbent and concave anteriorly, appearing slightly grooved. I2 is tiny and located within the cingulum of the canine. Lower incisors narrow, i1 weakly bilobed and higher than it is wide. Upper canines slightly curved. Lower canines either meet along posterior medial margin or are minutely separated. P1 is small and triangular in lateral view, with the anterior edge fitting completely in the canine cingulum. P2 is the highest in the tooth row. p1 and p3 are laterally compressed and unicuspidate. p2 reduced with tooth crown obscured by cingula of adjacent premolars. M1 and M2 are square with W-shape and well-developed cusps. M3 reduced with only two commissures, the parastyle being well-developed. Fourth commissure of m3 is reduced when compared to other molars. (Goodwin 1942, Williams et al 1995, Barquez et al 1999).

The following measurement from across the range (n=18 males, n=38 females) was presented by Williams et al (1995): *Length of Upper Tooth Row* males 9.9mm (9.5-10.2mm), females 9.8mm (9.4-10.2mm).

Measurements of two male specimens from Paraguay from López-González (2005): *Length of Upper Tooth Row* 9.5mm 9mm; *Length of Lower Tooth Row* 10.5mm 10.1mm.

Range measurements of three male specimens from Dpto Concepción, Paraguay from Smith et al (2012): *Length of Upper Tooth Row* 9.6-9.9mm; *Length of Lower Tooth Row* 10.7-11.2mm.

Myers & Wetzel (1983) give the following measurements for a male and female respectively from Departamento Boquerón, Paraguay: *Length of Upper Tooth Row* male 10mm female 9.8mm.

Barquez et al (1999) give the following measurements for individuals from Argentina: *Upper Tooth Row* 10mm (+/- 0.31mm, n=10); *Lower Tooth Row* 11.3mm (+/- 0.21mm, n=6).

Sanborn (1936) gives the following measurements for three specimens in the Chicago Field Museum: *Length of Upper Tooth Row* 9.6-9.7mm; *Length of Lower Tooth Row* 10.8-10.9mm.

**GENETIC CHARACTERISTICS** 2n=16. FN=20. The X-chromosome is metacentric, the Y-chromosome acrocentric. (Baker & Hsu 1970, Baker 1973).

**EXTERNAL MEASUREMENTS:** A large bat but a small Phyllostomid. Species is sexually dimorphic in forearm measurements (n=19 males, n=38 females) from across the range presented by Williams et al (1995): **FA:** males 57.3mm (55.6-59.3mm), females 56.9mm (55.1-58.4mm). This was supported by specimens captured by Esbérard & Bergallo (2004) in Rio de Janeiro: **FA:** males 52.99mm (48.8-58.8mm),



females 52.26mm (50-55.8mm); but not by weight data **WT**: males 27.93g (+/- 3.56), females 28.29g (+/- 3.69).

Measurements of two male specimens from Paraguay from López-González (2005): **TL** 80mm 93mm; **TA**: 15mm 15mm; **FT**: 15mm 17mm; **FA**: 52mm 54mm; **EA**: 25mm 30; *Length of Third Digit* 45.4mm; **WT**: 26.9g 34g.

Range measurements of three male specimens from Dpto Concepción, Paraguay from Smith et al (2012): **TL** 80-99mm; **TA** 15-25mm; **FT** 14-18mm; **FA** 54-56mm; **EA** 25-30mm; *Length of Third Digit* 44-45mm; **WT**: 26.9-31.6g.

Myers & Wetzel (1983) give the following measurements for a male and female respectively from Departamento Boquerón, Paraguay: **TL** male 99mm; **TA** male 20mm; **FT** male 19mm; **FA** male 57.1mm female 54.9mm; **EA** male 27mm.

Barquez et al (1999) give the following measurements for individuals from Argentina (n=12 unless stated): **TL** 96.1mm (+/- 5.13mm); **TA** 16.5mm (+/- 2.36mm); **FT** 15.3mm (+/- 2.30mm); **FA** 57.6mm (+/- 1.16mm); **EA** 25.2mm (+/- 2.25mm); **WT** 32.7g (+/- 9.63mm, n=4).

Paca et al (2012) give the following measurements for one male (MNKM 4745) and two female (MNKM 4746, 4747) specimens from Bolivia: **TL** male 90mm female 85mm, 91mm; **TA** male 17mm female 15mm, 19.5mm; **FT** male 12mm female 11.5mm, 17.5mm; **FA** male 56.6mm female 55.5mm, 50.8mm; **EA** male 28mm female 27mm, 22mm; *Calcar* male 21mm female 18.2mm, 24mm; *Tibia* male 26mm female 25.3mm, 23.1mm; **WT** male 31.7g female 29g.

Sanborn (1936) gives the following measurements for three specimens in the Chicago Field Museum: **FA**: 54.6-56.2mm; **EA**: 24.7-25.4mm; *Length of Second Digit* 34.4-36.6mm; *Length of Third Metacarpal* 45.6-48.5mm; *Length of First Phalanx of Third Digit* 18.7-19.6mm; *Length of Second Phalanx of Third Digit* 21.7-23.4mm; *Length of Third Phalanx of Third Digit* 16.5-18.5mm; *Length of Fourth Metacarpal* 46-49.9mm; *Length of First Phalanx of Fourth Digit* 14.5-16.1mm; *Length of Second Phalanx of Fourth Digit* 15.6-16.4mm; *Length of Fifth Metacarpal* 49-51.5mm; *Length of First Phalanx of Fifth Digit* 15.3-16.2mm; *Length of Second Phalanx of Fifth Digit* 13.7-15mm; *Height of Nose Leaf* 9.9-10.1mm; *Width of Nose Leaf* 6.4-6.5mm; *Tibial Length* 24.7-26.8mm; *Calcar Length* 17.9-19.1mm.

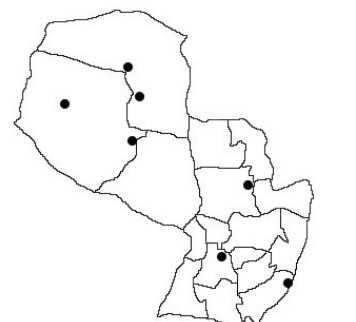
**SIMILAR SPECIES:** This is a small Phyllostominae (long ears, nose leaf well-developed with horseshoe shape enclosing the nostrils) with a short tail and round-tipped ears. Bats in the genus *Lophostoma* are extremely similar to *Tonatia bidens* and can be most easily separated on account of the naked or sparsely-furred muzzle and the fact that they roll their ears when handled. Both *Tonatia* and *Lophostoma* are unique amongst small Phyllostomids in having only one pair of lower incisors, the character being shared only by the much larger *Chrotopterus auritus*.

When compared to *Lophostoma*, *Tonatia bidens* has clearly separated ears, they are connected by a small band of skin in *Lophostoma*. *Lophostoma brasiliense* is much smaller with a forearm <45mm, whereas in this species the forearm is >50mm. *Lophostoma silvicolum* is of similar size to this species but has a variably conspicuous white throat patch that may be restricted to the chin or extend to the chest. Note also the unique shape of the tragus in *L.silvicolum*, being long, with three tooth-like projections near the base of the outer border, that of *Tonatia bidens* is shorter and with smooth, rounded edges (Genoways & Williams 1980). The antitragus is noticeably smaller in *T.bidens* than in *L.silvicolum*. Typically *L.silvicolum* has ear length >30mm whereas it is <30mm in this species.

Cranially the sagittal crest of *L.silvicolum* is more developed and the postorbital constriction of *T.bidens* is broader (>5mm in *Tonatia*, <5mm in *L.silvicolum*). Ratio of greatest skull length to postorbital constriction is <5.5mm in *Tonatia*, >5.9mm in *L.silvicolum* Note also the presence of antero-medial foramina behind the upper incisors in *Tonatia*, being absent in *Lophostoma*.

**DISTRIBUTION:** Locally distributed from northeast Brazil east of the Amazon south to Paraguay and northern Argentina. Literature references to the species presence in western and northern South America and Central America refer to *T.saurophila*.

In Brazil the species has been recorded in the following states: Bahía, Ceará, Espírito Santo, Minas Gerais, Mato Grosso do Sul, Mato



Grosso, Pernambuco, Paraná, Rio de Janeiro, Santa Catarina and São Paulo (dos Reis et al 2007).

In Argentina it has been recorded in Provincias Jujuy and Misiones (Barquez et al 1993, Barquez et al 2006) though the original specimens were identified incorrectly as *Lophostoma silvicolum* (Barquez et al 1999). The species has recently been reported for Bolivia from two localities in the east of Departamento Santa Cruz (Paca et al 2012).

In Paraguay the species is known only from diverse localities in the Chaco and Oriental region which suggest a more widespread distribution than currently known. Known localities are in Departamento Boquerón (Nueva Asunción km589 Ruta Trans-Chaco; UMMZ and Orloff; FMNH), Departamento Alto Paraguay (Estancia Tres Marías; 3 specimens TK 65259, 65260 and 65261; Madrejón - Smith et al 2012), Departamento Concepción (Estancia San Luis), Departamento Itapúa (Arroyo San Rafael; UMMZ 125871), Departamento San Pedro (Yaguareté Forest; TK 56633) and Departamento Paraguari (Sapucaí; BMNH).

**HABITAT:** A low density habitat generalist able to utilise a range of both humid and dry habitats when sufficient food resources and roost sites are available.

Myers, White & Stallings (1983) captured specimens in Paraguay over an isolated pond in thorn (Chaco) scrub (Boquerón) and over a stream flowing through high tropical (Atlantic) forest (Itapúa). The species likely occurs widely through Paraguay in low densities in almost all natural habitats.

Paca et al (2012) report the species from dry Chiquitania forest (bosque ribereño Chiquitano de galería and chaparral de abayoy) in Bolivia. Esbérard & Bergallo (2004) did not catch the species in urban areas in Rio de Janeiro and found it associated with forest edge in restinga, banana plantations and capueira. They captured the species below 100m, and did not capture any individuals above 600m.

**ALIMENTATION:** Considered a foliage-gleaning insectivore by Willig (1985). However subsequent studies revealed a high degree of carnivory and frugivory (Martuscelli 1995) in the diet, meaning that it is best considered a foliage-gleaning omnivore.

**Foraging Behaviour and Diet** Martuscelli (1995) first documented feeding on birds from specimens in the Brazilian Atlantic Forest, including the use of feeding shelters. Such shelters were utilised between 8.30 and 11.30pm, alone and only when feeding. Shelters were used year round, and of 10 shelters reported, five were located in tree cavities, two in *Ficus enormis* (Mart. ex Miq.). Miq. (Moraceae), two in *Cedrella fissilis* Linnaeus (Meliaceae) and one in *Schizolobium parahyba* (Vell.) Toledo (Leguminosae). The remaining five were located in abandoned houses and in a cave. A total of 66 bird remains of 28 species were recorded. The following 18 species that are present in Paraguay were recorded in the diet: *Forpus xanthopterygius* (Psittacidae), *Melanotrochilus fuscus*, *Thalurania glaucopsis* (Trochilidae), *Xenops minutus* (Furnariidae), *Thamnophilus caerulescens* (Thamnophilidae), *Chiroxiphia caudata* (Pipridae), *Mionectes rufiventris* (Tyrannidae), *Notiochelidon cyanoleuca* (Hirundinidae), *Troglodytes aedon* (Troglodytidae), *Vireo olivaceus* (Vireonidae), *Basileuterus culicivorus*, *Parula pitaiayumi* (Parulidae), *Coereba flaveola* (Coerebidae), *Sporophila caerulescens* (Emberizidae), *Dacnis cayana*, *Tangara seledon*, *Thraupis sayaca* (Thraupidae), *Euphonia violacea* (Fringillidae). Bird remains were more prevalent during the rainy season (November to May, 90%) compared with the dry season when insect remains predominated. It was suggested that habitat density may also effect bird consumption, being greater in more open habitats where manoeuvrability and prey exposure is greater. Birds were carried in the mouth, held by the neck. Once at roost, the bat used its wings to hold the bird, ingested the prey's head then the body, and discarded the wings and tail. A bat was timed to take just five minutes to eat a Blue-winged Parrotlet *Forpus xanthopterygius*. Bird prey taken weighed between 4 and 24g, lighter than the bats themselves. A predominance of passerines in the diet is probably related to size selection of prey on the basis of size.

Smith (2012) found primary feathers with the wing joints attached of a *Parula pitaiayumi* at a feeding roost site at PN Defensores del Chaco, in addition to hind legs and wing casings of a *Belocephalus* sp katydid (Orthoptera, Tettigoniidae), wings of an Aeshnid dragonfly (Odonata) and the seeds of the fruits of *Ziziphus mistol* (Rhamnaceae). Remains of Polydesmid milipeds were discerned to be unassociated with bat feeding and present because of their detritivorous feeding behaviour.

Esbérard & Bergallo (2004) found feeding roosts in abandoned and used buildings, palm trees, caves and water wells. One feeding roost was in constant use for 48 months and the number of bats present varied from 1 to 11 individuals. The following prey remains were recorded: Lepidoptera (Arctiidae,

Nymphalidae; wings and thorax); Orthoptera (Mantidae; wings); Coleoptera (Scarabaeidae, Cerambycidae; elytra, antennae, thorax); Hemiptera (Belostomatidae; wings); Odonata (wings); Thysanoptera (wings); Blattellidae (wings, thorax, legs, antennae); Anura (pelvis and hind legs); Squamata (Gekkonidae; part of rostrum, tail); Passeriformes (Emberizidae; rostrum, retrices, legs); Chiroptera (Vespertilionidae; wings, posterior part of body including tail). Prey is brought to the feeding roost several times during the night and carried in the mouth, and one specimen was caught carrying prey 33 minutes before sunset. Insect remains were the most numerous amongst prey remnants, and the frequent presence of the cockroach *Periplaneta americana* in samples proves that they frequently hunt close to human residences when they are located in forest edge areas.

Esbérard & Bergallo (2004) made captive observations of prey capture. The bat pounces on the prey and immobilises it with a bite to the head or neck. It then carries the prey to the site where it is to be consumed, holding the prey in the wings with the pollex being used for manipulation. Consumption begins with the head and the prey may be rotated if necessary using the teeth or pollex, and the viscera are consumed entirely. When offered rodent prey (up to 25g) the bats rejected the posterior third of the body, the tail, rostrum and part of the intestines. Hairless juvenile rodents ("pinkies") were completely ingested. Only the abdomen of insect prey was consumed. Legs and wings were discarded from mantids, cicadas and Lampyrid beetles that were offered. Small examples of amphibians such as *Hypsiboas faber* were consumed except for the hind legs, and reptiles such as *Hemidactylus mabouia* and *Tropidurus torquatus* had their head, forelegs and part of mid sections consumed. The Common Waxbill Estrilda astrild was consumed apart from the wings and legs, but an adult House Sparrow *Passer domesticus* was ignored. A bat *Myotis nigricans* (3.5g) was accepted and the head and part of thorax consumed, the rest being discarded, but a larger individual of *Molossus molossus* (9.5g) was not attacked. Fruits such as banana, apple, guava, papaya and orange were not consumed.

Barquez et al (1999) noted that while observations of carnivorous feeding are rare, one specimen taken in Jujuy Argentina had a stomach filled with downy feathers, indicating recent consumption of a young bird.

Gardner (1977) lists fruit and insects, citing Ruschi (1953). Myers & Wetzel (1983) note that the stomach of a specimen in the High Chaco at Nueva Asunción, Departamento Boquerón contained large amounts of insect chitin and an "unidentified whitish pulp".

**REPRODUCTIVE BIOLOGY:** Little known. Virtually all published data refers to *Tonatia saurophila*.

**Seasonality** No data available for Paraguay. Polyestral with seasonal reproduction, with a bimodal reproduction pattern showing its peak in the rainy season (Esbérard & Bergallo 2004).

**Argentina** A male with well-developed scrotal gonads was collected in Jujuy, Argentina in June (Barquez et al 1999).

**Brazil** Willig (1985) captured a pregnant female in the caatinga of northeast Brazil in September.

Working in Rio de Janeiro State, Esbérard & Bergallo (2004) report four pregnant females in November, lactating females in January, April and May and post-lactant females in May. Subadults were captured in December, February, May and June. Six captured females gave birth in captivity during November, December and early January. Males with visible testes were observed in January, March, April, May, June, September, November and December.

**Pregnancy** Gestation period is greater than 3.5 months (Bergallo & Esbérard 2004).

#### **GENERAL BEHAVIOUR:**

**Activity Levels** Smith (2012) noted that one individual left the Madrejoón roost at 17.50pm, about 20 minutes before sunset. The simultaneous capture in nets of several individuals may be suggestive that the species flies in groups (Bergallo & Esbérard 2004).

**Roost** Smith et al (2012) report on a persistent roost in unused buildings at Madrejoón, PN Defensores del Chaco. Five bats were found roosting in a darkened corner of a bathroom and one in a wardrobe between July 2011 and July 2012, suggesting a certain fidelity to roost sites. Bats sought the darkest corners of the rooms for roosting and flew out through a skylight when a flashlight was shined on them. Smith (2012) reports that a single roosting bat at the same location became agitated and chirped audibly when a flashlight was shined on it, eventually flying to another corner of the room, returning to its original location when the light source was removed. Three males were also collected roosting inside an



abandoned building at Estancia San Luis de la Sierra, Departamento Concepción in November 1999 (Smith et al 2012).

Esbérard & Bergallo (2004) reported day roosts in palm trees at a height of 7m, in caves (with *Carollia perspicillata* and *Desmodus rotundus*) and in a well 12m long by 0.75m wide where on one occasion it was shared with *Lophostoma silvicolum*. The number of specimens present varied from 5 to 7.

**Parasites** Presley (2005) found 42 parasites on 3 specimens of this bat in Paraguay having a monoxenous spinturnicid (*Periglischrus tonatii*) and 70% of all *Parichoronyssus crassipes* detected in the country, despite the rarity of the host in the sample.

Esbérard & Bergallo (2004) recorded five species of Streblidae on this species in Rio de Janeiro: *Strebla mirabilis*, *Strebla* sp., *Trichobius* sp from *parasiticus* complex, *Trichobius* sp. and *Trichobius dugesioides*.

**VOCALISATIONS:** No information.

**HUMAN IMPACT:** None. This species is possibly naturally rare and rarely comes into contact with humans. A roost in a partially used building at Madrejón, guard post for PN Defensores del Chaco was left unmolested by park guards.

**CONSERVATION STATUS:** Globally considered to be Data Deficient by the IUCN, on account of ongoing taxonomic problems and an absence of recent data on range, status and ecological requirements. See <http://www.iucnredlist.org/details/21983/0> for the latest assessment of the species. The species apparently occurs at naturally low population levels throughout its range and consisted of just 0.4% of all captures in a study in Rio de Janeiro (Esbérard & Bergallo 2004). Following extensive sampling in Paraguay, Willig et al (2000) found this species to account for 0.19% of all bats caught in the Alto Chaco region (n=3989). The species might best be considered Data Deficient in Paraguay.

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**FIGURE 2 -** (FPMAM949PH)  
**Spix's Round-eared Bat** *Tonatia bidens*.  
Madrejón, Departamento Alto Paraguay.  
Photo Paul Smith (April 2011).

**FIGURE 3 -** (FPMAM952PH)  
**Spix's Round-eared Bat** *Tonatia bidens*.  
Madrejón, Departamento Alto Paraguay.  
Photo Paul Smith (April 2011).



**FIGURE 4-** (FPMAM951PH) **Spix's Round-eared Bat** *Tonatia bidens*.  
Madrejón, Departamento Boquerón. Photo Paul Smith (April 2011).

**FIGURE 5 - Spix's Round-eared Bat** *Tonatia bidens*.  
Adult, head detail (©Marco Mello [www.casadosmorcegos.org](http://www.casadosmorcegos.org)).



**FIGURES 6-11** - Skull (©Philip Myers/Animal Diversity Web <http://animaldiversity.ummz.umich.edu>).