

LONG-TAILED FAT-TAILED OPOSSUM

Thylamys macrurus (Olfers, 1818)



FIGURE 1 - Adult, Brazil (Nilton Caceres).

TAXONOMY: Class Mammalia; Subclass Theria; Infraclass Metatheria; Magnorder Ameridelphia; Order Didelphimorphia; Family Didelphidae; Subfamily Thylamyinae; Tribe Thylamyini (Myers et al 2006, Gardner 2007). The genus *Thylamys* was defined by Gray, 1843 and Palma et al (2002) concluded that the genus was differentiated during the Pleistocene. The species currently recognised as *Thylamys* correspond roughly to the "elegans-group" as defined in the monograph by Tate (1933). There are nine known species according to the latest revision (Gardner 2007) two of which are present in Paraguay. The genus *Thylamys* is from the Greek meaning "pouched mouse". The species name *macrurus* is Greek meaning "long-tailed". The species is monotypic.

The species was described by Olfers (1818) as *Didelphys macrura*, based on de Azara's (1801: 290) "Micouré quatrième, ou Micouré à queue longue" with restricted type locality as Tapuá, Departamento Presidente Hayes, Paraguay". However Voss et al (2009) later clarified that in fact this is in error and the

correct type locality is Tapúa (note position of accent), Departamento Central on the eastern bank of the Rio Paraguay. No holotype was designated (Brown 2004). Voss et al (2009) designated a neotype (UMMZ 125243) consisting of an adult female skin and skull collected by Thomas W. Nelson (original number TWN 103) at 28 km SW Pedro Juan Caballero (22°34,9S, 55°37,9W) in Departamento Amambay, Paraguay, on 9 February 1977.

Some authors (Redford & Eisenberg 1992) recognise the descriptor as (Desmarest 1827) whose *Didelphis grisea* was also based on de Azara's description, whilst Thomas (1888) applied it to the taxon now known as *Marmosops incanus* under the name *Didelphis (Micoureus) grisea*. The earliest official description based on de Azara's "Micouré à queue longue" was in fact by Oken (1816) but his name was non-Linnean and hence unavailable. Despite the plethora of species descriptions taken from it, Azara's original description lacked precision, was apparently based on an immature specimen (Herskovitz 1959) and could refer to any small, greyish mouse opossum (Gardner 2007, Voss et al 2009). In recent literature the species has frequently been referred to as *Marmosa marmota marmota* (Tate 1933) and *Marmosa grisea* (Cabrera 1958). To further complicate matters Herskovitz (1959) concluded that Azara's (1801) fourth and sixth opossums were conspecific and that the name *Marmosa (=Thylamys) pusilla* was applicable to both. Current usage of the binomen *Thylamys macrurus* dates from Gardner & Creighton (1989).

Following an analysis of nucleotide sequence data from the mitochondrial cytochrome-*b* gene, Braun et al (2005) concluded that the species was strongly differentiated from other species in the genus and Palma et al (2002) concluded in an earlier molecular analysis that it was in fact the most primitive taxon and that migration of this species across the Rio Paraguay may have given rise to the evolution of *Thylamys pusillus*. Synonyms adapted from Gardner (2007):

[*Didelphys*] *macroura* Illiger 1815:107. Nomen nudum.

[*Didelphys*] *marmota* Oken 1816:1140. Name unavailable.

[*Didelphys*.] *macrura* Olfers 1818:205. Based on de Azara (1801:290). Type locality "Tapoua" = Tapuá, Departamento Presidente Hayes, Paraguay.

Didelphis grisea Desmarest 1827:398. Based on de Azara (1801:290). Type locality "Tapoua" = Tapuá, Departamento Presidente Hayes, Paraguay.

[*Didelphys*] [*Grymaeomys*] [*griseus* Burmeister 1856:83. Name combination.

[*Thylamys*]. *marmota* Allen & Chapman 1897:28. Name combination but not *Marmosa marmota* Thomas (1896).

[*Didelphys* (*Marmosa*)] *grisea* Trouessart 1898:1241. Name correction.

Marmosa grisea Bertoni 1914:69. Name combination.

[*Didelphis* (*Thylamys*)] *grisea* Matschie 1916:271. Name combination.

Marmosa marmota marmota Tate 1933:218. Name combination but not *Marmosa marmota* Thomas (1896).

Marmosa pusilla Herskovitz 1959:338. In part. Not *Didelphis pusilla* Desmarest (1804).

Marmosa (*Thylamys*) *grisea* Kirsch & Calaby 1977:14. Name combination.

[*Thylamys*] *griseus* Reig, Kirsch & Marshall 1987:7. Name combination.

[*Thylamys*]. *macrura* Gardner & Creighton 1989:4. First use of modern name and incorrect gender.

Thylamys grisea Contreras & Contreras 1992:1. Name combination and incorrect gender.

ENGLISH COMMON NAMES: Long-tailed Fat-tailed Opossum (Wilson & Cole 2000, Canevari & Vaccaro 2007), Paraguayan *Thylamys* (Gardner 2007), Paraguayan Fat-tailed Mouse Opossum (IUCN 2009).

SPANISH COMMON NAMES: No known names.

GUARANÍ COMMON NAMES: No known names.

DESCRIPTION: A medium-sized, corpulent mouse opossum with short, dense, smooth fur. Dorsally they are darkest, being greyish-brown, fading to light grey on the flanks and with a slight reddish tone on the shoulders. Darker dorsal colouration extends down the centre of the head as a medial line, the hairs being grey-based and white with dark tips except for the area above the eye and in front of the ears where they are white-based with dark tips. Dorsal pelage is composed of long guard hairs (10-12mm) which are grey for the basal third, darker distally and occasionally white-tipped; and shorter cover hairs (9-10mm) which are four-banded, grey basally and distally, changing to dark brown and creamy with dark tips. Ventrally they are creamy-white or pure white, with guard hairs 7-8mm long and cover hairs 5-6mm long

and a very narrow 3mm wide line of greyish hairs along the flanks. A highly-developed gular gland may stain the surrounding pelage yellowish. Eyes large, surrounded by narrow black patch that extends only slightly in front of the eye and onto the cheeks. Ears large, naked and reddish-brown in colour. A tuft of white fur is present behind the ears. Tail is furred for the basal 1cm, prehensile and c1.3x head and body length. It appears essentially naked without magnification. Colour brownish-grey on the dorsal side basally, greyish distally and pale greyish on the ventral side for its entire length except for a whitish tip. Tail scales are tiny, rounded or square in shape and arranged in rings with three hairs pair scale. The central hair of each caudal scale triplet is longer (4–5 scales long vs. 2–3 scales long) and thicker than the lateral hairs. The prehensile tip lacks hairs and is approximately 20mm long. Though it is often stated that there is no evidence of tail incrassation in this species, Carmignotto & Monfort (2006) found evidence of slight incrassation in all the specimens that they examined. Limbs are grey dorsally and whitish ventrally, those of the forelimbs paler dorsally. Feet are small and white with unguis tufts and short digits. The toes are long with short claws that do not extend beyond the apical pads of the forefeet, but are slightly longer on the hindfeet. Six separate pads are present on each foot, with large granules and dermatoglyphs on the palmar and plantar surfaces. Females lack a marsupium and have bilaterally symmetrical rows of teats including inguinal, abdominal and pectoral teats. The area around the teats may be stained pinkish-cinnamon in some individuals. The scrotum of males is darkly-pigmented and covered with self-pigmented hairs (Tate 1933, Canevari & Vaccaro 2007, Gardner 2007, Carmignotto & Monfort 2006, Solari 2003).

CRANIAL CHARACTERISTICS: Skull robust, with broad zygomatic arch and slender rostrum. Brain case moderately broad. Nasals long and rounded posteriorly. They show slight expansion at the maxillo-frontal suture, narrowing slightly behind it and the lateral margins are subparallel. Supraorbital crests well-developed and postorbital constriction is pronounced. Anterior part of interorbital region broader in males than females, but interorbital constriction not greatly constricted in either sex. Small temporal ridges may converge on the parietal. In the male the temporal ridges form an incipient crest on the interparietal but in the female are separated by 2-3mm. Petrosals are laterally exposed in a fenestra between the squamosal and parietal bones. Zygomatic arches slightly expanded and the external surface of the jugals exhibits a conspicuous concavity along the anterior margin of the zygomata. Lambdoidal crests moderately-developed. Lacrimal foramina large and laterally-exposed in orbital margins. Palate broad and highly fenestrated with maxillopalatine, palatine, and maxillary openings. Posterolateral palatal foramina are large and reach the lingual apices of the protocones of M4. Incisive foramina extend posteriorly to the midline of the canines and are widest anteriorly, narrowing in the middle to posterior portion. Tympanic bullae well-developed but proportionately smaller than in other members of the genus.

Voss et al (2009) give the following range measurements for 7 adult specimens (1 male, 6 female): *Condylbasal Length* male 31.9mm female 29.6-34.2mm; *Greatest Zygomatic Width* male 17.8mm female 16-19.2mm; *Width of Nasals*: male 2.6mm female 2.5-3.5mm; *Palate Length*: male 17.7mm female 15.8-18.6mm; *Palate Width*: male 10.1mm female 9.4-11mm; *Interorbital Constriction*: male 4.7mm female 4.3-5.4mm.

Carmignotto & Monfort (2006) give the following measurements for 8 specimens (3 male, 4 female and one of indeterminate sex) from Matto Grosso do Sul, Brazil and Paraguay without distinguishing between the sexes: *Basal Length*: 31.47mm (+/-1.41); *Greatest Cranial Length*: 32.02mm (+/-1.46); *Greatest Cranial Height*: 10.26mm (+/-0.44); *Width of Braincase*: 12.09mm (+/-0.38); *Greatest Zygomatic Width*: 17.63mm (+/-1.17); *Length of Nasals*: 13.6mm (+/-1.06); *Width of Nasals*: 2.96mm (+/-0.32); *Palate Length*: 16.61mm (+/-0.68); *Palate Width*: 10.05mm (+/-0.58); *Interorbital Constriction*: 5.14mm (+/-0.56); *Postorbital Constriction*: 5.33mm (+/-0.22); *Width of Rostrum*: 5.24mm (+/-0.47); *Width Across Bullae*: 11.47mm (+/-0.56); *Width Between Bullae*: 5.20mm (+/-0.36); *Bullae Width*: 3.11mm (+/-0.08); *Minimum Pterygoid Bridge Width*: 2.71mm (+/-0.14); *Mandibular Length*: 23.22mm (+/-1.56).

Tate (1933) and Contreras & Contreras (1992) published the following skull measurements: *Basal Length*: male 31.8mm, female 31.3mm; *Greatest Cranial Length*: male 34.9mm, female 33.5mm; *Greatest Zygomatic Width*: male 18.6-19.8mm, female 19mm; *Mandible Length*: male 26-27.2mm, female 25.9mm; *Length of Nasals*: male 15.1-16.3mm, female 14mm; *Palate Length*: male 18.6mm, female 17.5mm; *Bullae Width*: male 3.5mm, female 3.5mm.

DENTAL CHARACTERISTICS: I5/4 C1/1 P 3/3 M 4/4 = 50. Incisors increase in size from I2 to I5. Canines well-developed with posterior accessory cusps. P3 exceeds P2 in height and anteroposterior

length. Molar rows convergent. Molars are compressed antero-posteriorly, especially M4. Styler cusp C is well developed on the upper molars, and is similar in size to styler cusps B and D in M1, and smaller than styler cusps B and D in M2 and M3. The ectoflexus is serrated giving the styler shelf a serrated profile in lingual view.

Voss et al (2009) give the following range measurements for 7 adult specimens (1 male, 6 female): *Length of Upper Toothrow*: male 12.4mm female 11.9-12.9mm; *Length of Upper M1-M4*: male 6.4mm female 6.1-6.5mm; *Length M1-M3*: male 5.5mm female 5.3-5.6mm.

Carmignotto & Monfort (2006) give the following measurements for 8 specimens (3 male, 4 female and one of indeterminate sex) from Matto Grosso do Sul, Brazil and Paraguay without distinguishing between the sexes: *Length of Upper Toothrow*: 12.38mm (+/-0.42); *Length of Upper M1-M4*: 6.14mm (+/-0.21); *Length of Mandibular Row of Molars*: 6.93mm (+/-0.17); *Upper Canine Length*: 2.43mm (+/-0.37); *Upper Canine Width*: 1.48mm (+/-0.11); *Upper P3 Length*: 1.76mm (+/-0.33).

Tate (1933) and Contreras & Contreras (1992) give the following for Paraguayan specimens: *Length of Mandibular Row of Molars* male 7-7.4mm, female 7.3mm.

GENETIC CHARACTERISTICS: 2n=14 (Svartman & Vianna-Morgante 1999); FN=20. X chromosomes are small acrocentrics (Palma 1995).

TRACKS AND SIGNS: No information.

EXTERNAL MEASUREMENTS: The larger of the two Paraguayan *Thylamys* and second only to *Marmosa* in size amongst the Paraguayan Mouse Opossums. There is no overlap in measurements with *T.pusillus*. There is evidence of some sexual size dimorphism with males being larger than females in most measurements (Cáceres et al 2007). The following measurements are taken from Cáceres et al (2007) for specimens in southeastern Brazil: **HB**: male 12.24cm (+/-1.11, n=31) female 11.13cm (+/-5.3, n=12); **TA**: male 13.84cm (+/-0.79, n=31) female 13.39cm (+/-0.55, n=12) approximately 1.2x head and body length; **FT**: male 1.69cm (+/-0.14, n=30) female 1.58cm (+/-0.1, n=12); **EA**: male 2.14cm (+/-0.28, n=30) female 1.92cm (+/-0.24, n=12); **WT**: male 52.4g (+/-12.2, n=37) female 41g (+/-10, n=17).

Voss et al (2009) give the following range measurements for 7 adult specimens (1 male, 6 female): **HB**: male 11cm female 10.6-13.5cm; **TA**: male 13.2mm female 13.8-15.4cm; **FT**: female 1.6-1.9cm; **EA**: female 2.3-2.7cm; **WT**: female 31-57g.

Carmignotto & Monfort (2006) give the following measurements for 8 specimens (3 male, 4 female and one of indeterminate sex) from Matto Grosso do Sul, Brazil and Paraguay without distinguishing between the sexes: **HB**: 11.2cm (+/-1.02); **TA**: 14.45cm (+/-0.67) approximately 1.3x head and body length; **FT**: 1.75cm (+/-0.09); **EA**: 2.35cm (+/-0.23); **WT**: 38.83g (+/-9.92).

Contreras & Contreras (1992) cite the following measurements for two male specimens from Paraguay, the first of unknown provenance and the second from Cordillera de los Altos, Departamento Paraguari: **TL**: 28cm, 29.2cm; **HB**: 14.5cm, 13.1cm; **TA**: 13.5cm, 16.1cm; **FT** (including claw): 1.9cm, 2.02cm; **EA**: 2.3cm, 2.85cm; and the following for a single female specimen from Sapucaí, Departamento Paraguari: **TL**: 30.8cm; **HB**: 14.7cm; **TA**: 16.1cm; **FT** (including claw): 1.8cm; **EA**: 2.5cm.

SIMILAR SPECIES: Members of the genus *Thylamys* can be distinguished from other mouse opossums by their noticeably bicoloured pelage, being darker dorsally and paler laterally, and by the densely-granulated soles of the feet. Furthermore female *Thylamys* have the teats arranged in bilaterally symmetrical rows and not in a circular pattern as in other mouse opossums. The only other member of the genus present in Paraguay is *Thylamys pusillus*, which is principally distinguished on size, being typically <35g in weight and with a tail typically much less than 135mm in length (compared to >40g and >135mm in this species). Note that this species frequently shows a whitish tip to the tail which is absent in *T.pusillus*. The two species of *Thylamys* are apparently allopatric, this species being so far only conclusively recorded in eastern Paraguay, whilst *T.pusillus* appears to be confined to the Chaco. Cranially the posterolateral foramen does not exceed M4 in this species, though it does in *T.pusillus*.

DISTRIBUTION: The geographical range of this species is poorly known and it may prove to be more widespread than is currently thought. In Brazil it occurs from near Campo Grande, Mato Grosso do Sul in the north and east, south to north-eastern Paraguay. Anderson (1997) provides details of a single specimen from Santa Cruz, Bolivia, the first record for that country. It may be present in the southern Pantanal of Brazil where suitable habitat is apparently present. (Cáceres et al 2007). In Paraguay specimens are known

from Asunción, Departamento Central, Departamento Concepción, Pedro Juan Caballero, Departamento Amambay, Coronel Oviedo, Departamento Caaguazú and Sapucaí and Cordillera de los Altos, Departamento Paraguairí, and there is a literature citation from San Ignacio, Departamento Misiones (Contreras & Contreras 1992).

The original description of the species was based on de Azara's vague description of his "Micouré à longue queue" which failed to conclusively identify this species. The type locality given was Tapuá, Departamento Presidente Hayes (Gardner 2007), but Tate (1933) quotes Schuller (undated) in stating that the location of Tapuá is "a few miles northeast of Asunción" at 25° 10' 25" latitude and 0° 9' 11" taking Asunción as a meridian of 0°, which presumably places it on the east bank of the Río Paraguay in Departamento Central. Given the uncertainty over the identity of de Azara's specimen, the precise locality of Tapuá and the lack of further specimens from the Chaco we prefer to consider its presence on the western bank of the Río Paraguay as hypothetical pending new information.

HABITAT: Though traditionally considered a species of semideciduous forest (Cannevari & Vaccaro 2007), Cáceres et al (2007) called that into question and demonstrated that the species occurs in open shrubby savanna and cerrado, including cerradón in southwestern Brazil. In fact they considered that functional adaptations were typical of an open-country species and hypothesised that once its distribution is better known it may prove to be present in humid chaco, transitional dry forests and arboreal savannas. They suggested that the presence of the species in forest could be explained by a scansorial mode of life. Carmignotto & Monfort (2006) state that the species is exclusively found in cerrado in Brazil with specimens collected in dense cerrado *sensu stricto*.

Voss et al (2009) noted that there were "substantive discrepancies" between Paraguayan and Brazilian habitats where this species has been collected. Paraguayan localities were typified by tall subtropical, moist, semi-evergreen forest interspersed with agricultural fields, regenerating secondary growth and pastures. They state that the stated Brazilian habitats do not resemble any intact vegetation formations that they have seen in eastern Paraguay and that the collector of the neotype TW Nelson emphatically stated that the Brazilian habitats were unlike the secondary moist forest in which he had trapped the species close to Pedro Juan Caballero, Departamento Amambay.

ALIMENTATION: Foraging Behaviour and Diet Considered primarily an insectivore with omnivorous tendencies (Cannevari & Vaccaro 2007), though no detailed information has ever been published on the diet of the species.

Diet in Captivity Cáceres et al (2007) captured individuals in Rio Grande do Sul, Brazil in traps baited with a mixture of bacon, pumpkin, and cod liver oil.

REPRODUCTIVE BIOLOGY: Seasonality Cáceres et al (2007) caught only one juvenile in the dry season (July) in Mato Grosso do Sul, Brazil compared to 32 in the wet season (October to March), despite the same trapping effort. More males were caught (35/57 total captures) during the dry season (April to September) and more females (27/40 total captures) during the wet season (October to March). The authors speculated that the differences in trapping success between the sexes (with more males than females captured) coupled with the sexual size dimorphism was possibly indicative of a non-monogamous social system owing to the fact that males are more mobile when in search of mates. The higher trapping rate of males in the dry season and bias of juveniles captured in the wet season was associated with a highly seasonal breeding system beginning in the dry season when males search for mates and culminating in the wet season with the birth and growth of young. Females would thus be expected to be more active in the wet season whilst occupied with lactation and care of young, this being further supported by the greater trapping success of females during that season.

GENERAL BEHAVIOUR: Activity Levels Considered crepuscular in behaviour (Cannevari & Vaccaro 2007). Cáceres et al (2007) caught this species on the ground and in the understorey using pitfall and baited live traps. Previous authors had considered the species arboreal, but they seem more adapted to



a scansorial way of life and 32 of 39 (82%) released individuals opted for a terrestrial escape compared to just 7 (18%) which climbed the nearest tree. However the species does have some adaptations to suggest that they are more arboreal than other members of the genus, including longer, more pointed toes and claws.

Parasites Cáceres et al (2007) found the following parasites on six individuals from Matto Grosso do Sul, Brazil: Tick *Argas miniatus* (17 individuals present on 100% of specimens), Trombiculinae (3 individuals; 17% prevalence) and lice *Gyropus lenti lenti* (1 individuals; 17% prevalence).

VOCALISATIONS: No information.

HUMAN IMPACT: None.

CONSERVATION STATUS: Globally considered to be of Low Risk Near Threatened by the IUCN on account of an inferred population decline due to habitat destruction and conversion to agriculture, see <http://www.iucnredlist.org/details/21867> for the latest assessment of the species. The limited information available on the biology of this species makes its threat status difficult to assess, though Cáceres et al (2007) found it to be the commonest small marsupial in their study area in Mato Grosso do Sul, Brazil. Few specimens are known from Paraguay, but sampling effort has been sporadic and of low intensity, and the species may theoretically be more widespread than is currently known. However habitat destruction is occurring rapidly in eastern Paraguay and like many mammal species with specialist habitat requirements it is undoubtedly declining. The species occurs in some protected areas in Paraguay but apparently does not in Brazil.

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FIGURE 2 - Long-tailed Fat-tailed Opossum *Thylamys macrurus*.
Adult specimen lateral. Brazil. Photo Nilton Caceres.

FIGURE 3 - Long-tailed Fat-tailed Opossum *Thylamys macrurus*.
Adult specimen head detail. Brazil. Photo Nilton Caceres.



FIGURE 4 - (FPMAM312PH) Long-tailed Fat-tailed Opossum *Thylamys macrurus*.
Adult specimen lateral. Location unknown. Photo Ulf Drechsel www.pybio.org.

FIGURE 5 - (FPMAM313PH) Long-tailed Fat-tailed Opossum *Thylamys macrurus*.
Adult head detail. Location unknown. Photo Ulf Drechsel www.pybio.org.



FIGURE 6- (FPMAM314PH)
Long-tailed Fat-tailed Opossum *Thylamys macrurus*.
Adult head detail. Location unknown.
Photo Ulf Drechsel www.pybio.org.