



# AGILE GRACILE OPOSSUM

*Gracilinanus agilis* (Burmeister, 1854)



**FIGURE 1** - Adult, Brazil (Nilton Caceres undated).

**TAXONOMY:** Class Mammalia; Subclass Theria; Infraclass Metatheria; Magnorder Ameridelphia; Order Didelphimorphia; Family Didelphidae; Subfamily Thylamyinae; Tribe Marmosopsini (Myers et al 2006, Gardner 2007). The genus *Gracilinanus* was defined by Gardner & Creighton 1989. There are six known species according to the latest revision (Gardner 2007) one of which is present in Paraguay. The generic name *Gracilinanus* is taken from Latin (*gracilis*) and Greek (*nanos*) meaning "slender dwarf", in reference to the slight build of this species. The species name *agilis* is Latin meaning "agile" referring to the nimble climbing technique of this species. (Braun & Mares 1995).

The species is monotypic, but Gardner (2007) considers it to be composite and in need of revision. Furthermore its relationship to the cerrado species *Gracilinanus agilis* needs to be examined, with some authorities suggesting that the two may be at least in part conspecific - there appear to be no consistent cranial differences (Gardner 2007). Costa et al (2003) found the two species to be morphologically and genetically distinct and the two species have been found in sympatry in at least one locality in Minas Gerais, Brazil (Geise & Astúa 2009) where the authors found that they could be distinguished on external characters alone.

Patton & Costa (2003) commented that the presence of the similar *Gracilinanus microtarsus* at Lagoa Santa, Minas Gerais, the type locality for *G. agilis*, raises the possibility that the type specimen may in fact prove to be what is currently known as *G. microtarsus*. In this case the next available name for *G. agilis* would be *G. beatrix* (O. Thomas 1910).

The description of the cryptic and hitherto unnoticed genus *Cryptonanus* by Voss, Lunde & Jansa (2005) confused the situation yet further. This species is widely sympatric with *Cryptonanus chacoensis* with which it has been consistently confused in the literature in the past. A deliberately cautious approach to the species description has been adopted here to avoid muddying the waters yet further, and every effort has been made to quote references that refer unequivocally to *Gracilinanus agilis* and not *Cryptonanus*. Synonyms adapted from Gardner (2007):

*Didelphys* [(*Grymaeomys*)] *agilis* Burmeister 1854:139. Type locality "Lagoa Santa", Minas Gerais, Brazil.

*Marmosa beatrix* O. Thomas 1910:502. Type locality "Ipu", Ceará, Brazil.

[*Didelphys* (*Grymaeomys*)] *agilis* Matschie 1916:270. Name combination.

[*Didelphys* (*Grymaeomys*)] *beatrix* Matschie 1916:270. Name combination.

[*Marmosa* (*Marmosa*)] *beatrix* Cabrera 1919:36. Name combination.

*Marmosa agilis buenavistae* Tate 1931:10. Type locality "Buenavista, Departamento Santa Cruz, Bolivia".

*Marmosa agilis peruana* Tate 1931:10. Type locality "Tingo Maria, Rio Huallaga" Huánaco, Peru.

*Marmosa agilis peruania* Tate 1933: pl.11. Incorrect spelling.

*Marmosa blaseri* A. Mirando. Ribeiro 1936:373. Type locality "S. Bento, Goiás" Brazil.

*Thylamys rondoni* A. Mirando. Ribeiro 1936:387. Type locality "Salto do Sepotuba e São João da Serra do Norte", Matto Grosso, Brazil.

*Marmosa* [(*Thylamys*)] *agilis* Cabrera 1958:27. Name combination.

*Marmosa* [(*Thylamys*)] *beatrix* Cabrera 1958:27. Name combination.

*Marmosa* [(*Thylamys*)] *buenavistae* Cabrera 1958:27. Name combination.

*Marmosa* [(*Thylamys*)] *peruana* Cabrera 1958:28. Name combination.

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

*Gracilinanus agilis* Gardner & Creighton 1989:5. First use of current name.

**ENGLISH COMMON NAMES:** Agile Gracile Opossum, Agile Mouse Opossum, Agile Opossum (Gardner 2007), Agile Gracile Mouse Opossum (Wilson & Cole 2000, Esquivel 2001, Cannevaro & Vaccaro 2007).

**SPANISH COMMON NAMES:** Marmosa ágil (Chebez 1996), Marmosa grácil ágil (Emmons 1999), Comadreja rojiza (Massoia et al 2000), Comadreja enana (Massoia et al 2000), Comadreja ágil (Massoia et al 2000).

**GUARANÍ COMMON NAMES:** Anguyá-guaiquí (Massoia et al 2000).

**DESCRIPTION:** A small, slender mouse opossum with short, smooth pelage and very short, inconspicuous guard hairs. Dorsally the pelage is brownish to greyish-brown, lacking patternation but often with a slightly grizzled effect. Ventral pelage buffy-white, with an indistinct greyish base to the hairs usually present and typically a line of self-coloured hairs along the midline of the body, stretching anteriorly to the throat and chin and posteriorly to the genital area. Head scarcely paler than dorsum with narrow black periocular patches, only slightly more conspicuous than those of *Cryptonanus*, extending to the nose but not reaching the ears. Males possess a gular gland. Ears moderately large and rounded, light grey-brown in colour. Vibrissae short. Feet pale pinkish. Claws on the manus do not extend beyond the digital pads. Palmar surfaces lack a granular appearance. Tail brownish, lightly bi-coloured (darker above and paler below) and 1.2-1.4x head and body length. Tail is prehensile and lacks hair on the ventral surface at the tip. Caudal scales are arranged in annular series and bear sparse, almost invisible hairs. Females lack a pouch. Mammary are hidden when the female is not lactating. Abdominal-inguinal mammary 6-1-6 = 13, the most anterior reaching the thoracic region. (Tate 1933, Hershkovitz 1992).

**CRANIAL CHARACTERISTICS:** Skull short and broad with pointed muzzle. Nasals moderately expanded basally. Palate long and strongly fenestrated. Zygomatic expanded. Bullae large and rounded with distinct processes. Temporal ridges well-spaced. Supraorbital ridges sharp-edged and with incipient processes. Maxillary palatal vacuities, rostral process of the premaxillae and a secondary foramen ovale all present, representing the primary distinguishing features differentiating *Gracilinanus* from *Cryptonanus*. (Tate 1933, Voss, Lunde & Jansa 2005).

There is disagreement as to whether or not cranial characteristics can be used to distinguish this species from *G. microtarsus*, and Gardner (2007) states "we have found no trenchant cranial features to separate these species". Costa et al (2003) note that the posterolateral vacuities on the palate are "larger or comparable to that of the posteromedial vacuities", they being smaller in *microtarsus*. Teta et al (2007) add that the interorbital constriction, brain case and zygomatic arches are proportionately narrower in this species than in *G. microtarsus*.

Costa et al (2003) provide the following measurements for a sexed sample (males n=36, females n=24 unless stated): *Greatest Length of Skull* male 28.47mm (+/-1.07) female 26.95mm (+/-1.08); *Interorbital Width* male 4.67mm (+/-0.22) female 4.46mm (+/-0.22); *Least Pterygoid Width* male 3.02mm (+/-0.21) female 2.93mm (+/-0.20); *Zygomatic Width* male 15.49mm (+/-0.66, n=35) female 14.63mm (+/-0.70); *Petrosal Width* male 8.34mm (+/-0.25) female 8.17mm (+/-0.20); *Width of Alisphenoid Bulla* male 9.12mm (+/-0.28) female 9.96mm (+/-0.33); *Cranial Depth* male 9.61mm (+/-0.31) female 9.39mm (+/-0.34); *Rostrum Length* male 10.75mm (+/-0.53) female 10.17mm (+/-0.49); *Rostrum Width* male 4.49mm (+/-0.23) female 4.21mm (+/-0.26); *Palate Length* male 13.89mm (+/-0.56) female 13.06mm (+/-0.67); *Nasal Length* male 12.17mm (+/-0.61) female 11.39mm (+/-0.74); *Width of Braincase* male 11.40mm (+/-0.32) female 11.04mm (+/-0.33).

Mares et al (1989) give the following measurements for adults (8 males and 8 females) and subadults (n=2; 13 males and 9 females) from central Brazil: *Greatest Length of Skull* ad. males 28.9mm (27.9-31.3mm), ad females 28.9mm (28-29.7mm), subad. 26.5mm (23-29.8mm); *Condylbasal Length* ad. males 24.9mm (23.9-27.3mm), ad females 25.2mm (24.4-26mm), subad. 22.6mm (19.2-25.8mm); *Interorbital Width* ad. males 4.7mm (4.3-5.3mm), ad females 4.9mm (4.3-5.3mm), subad. 4.6mm (4.3-5.1mm); *Zygomatic Width* ad. males 15.5mm (14.8-16.5mm), ad females 16.1mm (15.5-16.9mm), subad. 14.3mm (12.2-16.5mm); *Mastoid Width* ad. males 11mm (10.7-11.3mm), ad females 11mm (10.8-11.5mm), subad. 10.5mm (9.6-11.2mm); *Palate Length* ad. males 14.4mm (13.9-15.6mm), ad females 14.4mm (13.8-14.7mm), subad. 13.3mm (11.5-14.7mm).

**DENTAL CHARACTERISTICS:** I5/4 C1/1 P 3/3 M 4/4 = 50. Incisors increase slightly in size from I2 to I5. P2 and P3 of approximately equal height, though be aware of the affects of teeth wear in older specimens. Canines short and close together. C1 accessory cusps are absent. Tooth rows convergent. M3 anterior cingulum complete. (Tate 1933, Gardner & Creighton 1989, Voss, Lunde & Jansa 2005).

Mares et al (1989) give the following measurements for adults (8 males and 8 females) and subadults (n=2; 13 males and 9 females) from central Brazil: *Length of Upper Tooth Row* ad. males 11.1mm (10.7-11.4mm), ad females 10.7mm (10.4-11mm), subad. 10.3mm (9-10.9mm). Costa et al (2003) provide the following measurements for a sexed sample (males n=36, females n=24): *Length of Molar Tooth Row* male 5.49mm (+/-0.16) female 5.41mm (+/-0.15).

**GENETIC CHARACTERISTICS:** 2n=14, NA=24. (Geise & Astúa 2009). Three pairs are large submetacentric (pairs 1, 2 and 3), pair 4 is a medium metacentric and pairs 5 and 6 are small submetacentric. X chromosome is a small metacentric, Y chromosome is a small acrocentric (Carvalho et al 2002).

Garcia et al (2010) provided the first description of C-bands and Ag-NORs in this species. C-banding patterns showed small blocks of constitutive heterochromatin located at the pericentromeric regions of all autosomes and the X chromosome, while the Y chromosome was entirely heterochromatic. Ag-NORs were only present on the short arm of autosome pair 6.

**TRACKS AND SIGNS:** No information.

**EXTERNAL MEASUREMENTS:** Males significantly smaller than females (Costa et al 2003). The species shows a clinal decrease in body size from north to south, with the smallest individuals occurring in Paraguay. It averages smaller than the closely related *G. microtarsus*, especially in tail length. Smith et al (in prep.) provided measurements for a sexed sample from Reserva Natural Laguna Blanca, Departamento San Pedro, Paraguay (males n=10, females n=3): **TL:** male 201mm (range 164-233mm) female 201mm (164-236mm); **TA:** male 122cm (range 95-135cm) female 116.7cm (100-135); **FT:** male 14.8mm (range 13-16mm) female 14mm (13-15mm); **EA:** male 18.1cm (range 16-20mm) female 17.5mm (15-21.5mm); **WT:** male 13.9g (range 10-16g) female 10.5g (range 9.5-11.5g)

Costa et al (2003) provide the following measurements for a sexed sample (males n=44, females n=27 unless stated): **HB:** male 10.0cm (+/- 0.706, range 8.2-10.5cm) female 8.96cm (+/- 0.728, range 8.1-

10.8cm); **TA**: male 13.79cm (+/- 0.930, range 11-15.8cm, n=43) female 12.35cm (+/- 0.754, range 11-13.9cm); **HF**: male 1.67cm (+/- 0.098, range 1.5-1.9cm) female 1.56cm (+/- 0.121, range 1.3-1.8cm); **EA**: male 2.24cm (+/- 0.132, range 2-2.5cm) female 2.15cm (+/- 0.101, range 2-2.4cm); **WT**: male 23.56g (+/- 6.01, range 15-40g) female 16.15g (+/- 2.96, range 13-25g).

Geise & Astúa (2009) gave the following measurements for a sexed sample from Brazil (males n=4, females n=4): **HB**: male 8.85cm (+/- 0.56, range 8.3-9.6cm) female 8.67cm (+/- 0.59, range 8.1-9.4cm); **TA**: male 13.05cm (+/- 0.65, range 12.5-13.9cm) female 12.35cm (+/- 0.81, range 11.2-13.1cm); **WT**: male 16.5g (+/- 3.8, range 14-22g) female 17.63g (+/- 3.3, range 14-21.5g)

Bonvicino et al (2005) provided the following range measurements for 19 unsexed individuals from the cerrado of PN Chapada dos Veadeiros, Goiás, Brazil: **HB**: 9.2-12.9cm; **TA**: 12.6-16.4cm; **FT**: 1.2-2.2cm; **EA**: 2.2-2.4cm; **WT**: 20-45g. The long tail and ear measurements reported here suggest that a mixed species sample may be involved.

Mares et al (1989) give the following measurements for adults (8 males and 8 females) and subadults (n=2; 13 males and 9 females) from central Brazil: **TL**: ad. males 22.56cm (20.3-25cm), ad females 22.99cm (21.9-24.2cm), subad. 19.73cm (16.4-23.5cm); **TA**: ad. males 13.37cm (12.1-14.3cm), ad females 12.56cm (11.5-13.5cm), subad. 11.36cm (9.5 -13.2cm); **FT**: ad. males 1.55cm (1.3-1.8cm), ad females 1.51cm (1.2-1.7cm), subad. 1.51cm (1.3-1.8cm); **EA**: ad. males 2.04cm (1.9-2.1cm), ad females 1.99cm (1.8-2.2cm), subad. 1.93cm (1.6-2.2cm); **WT**: ad. males 25.5g (19.5-33.5g), ad females 26.1g (21-32.9g), subad. 15.1g (8.5-18g).

Garcia et al (2010) give the following measurements for an unsexed set of 38 specimens from central and northeastern Brazil: **HB**: 10.6cm (7.9-12.9cm); **TA**: 14.6cm (12.1-16.4cm); **FT**: 1.8cm (1.2-2.3cm, n=37); **EA**: 2.1cm (1.7-2.4cm, n=35).

**SIMILAR SPECIES:** *Gracilinanus microtarsus* has recently been confirmed in the Atlantic Forest of Paraguay. It can be distinguished by its uniform reddish-brown to chestnut-brown pelage as compared to grizzled greyish-brown in *G. agilis*. Crucially the ventral pelage of *microtarsus* is almost entirely grey-based except for the chin; that of *agilis* is not grey-based on the chin, throat, upper breast and scrotal area. *G. microtarsus* has a notably blacker and more extensive ocular patch which reaches to the nose and ears, and the face is contrastingly paler than dorsum. Morphometrically the tail is typically >140mm and ears usually <21mm, those of *G. agilis* generally <140mm and >21mm respectively (Costa et al 2003).

When using only external characters this species should be separated from *Cryptonanus chacoensis* with utmost care. The most reliable characteristic is an examination of the belly pelage, it being greyish basally in *Gracilinanus* and self-coloured basally in *Cryptonanus*. Measurements and examination of skull characteristics may be necessary for confirmation in some cases. Typically the tail of *Cryptonanus* is shorter when compared to head and body length (usually <1.2x) than that of *Gracilinanus* (1.2-1.5x) though there may be some overlap at the extremes. Tail length is typically in the range 95-117mm for adult *Cryptonanus* and 110-165mm for *Gracilinanus*. More reliable is the ratio of premolar heights, with P2<P3 in *Cryptonanus* and the two of approximately equal height in *Gracilinanus* - though be aware of the affects of teeth wear in older specimens. On the canine C1 accessory cusps are present basally in *Cryptonanus* that are absent in *Gracilinanus*. Upon direct comparison *Gracilinanus* has larger ears, longer vibrissae and broader ocular rings than *Cryptonanus*, but these characters are difficult to judge when presented with a single specimen. Cranially maxillary palatal vacuities, rostral process of the premaxillae and a secondary foramen ovale are all present in *Gracilinanus* but absent in *Cryptonanus*.

The species can be easily separated from the two species of Paraguayan *Thylamys* by the fact that members of that genus have distinctly tricoloured pelage, whereas *Gracilinanus* is uniformly-coloured dorsally. *Thylamys* also habitually exhibit some degree of incrassation (fat deposits) in the tail and have highly granular surfaces to the feet, neither character being exhibited by this species. Furthermore the species occurring in eastern Paraguay, *Thylamys macrurus*, is considerably larger than *Gracilinanus*. *Marmosa paraguayana* and *constantiae* are much larger with thick woolly pelage and broadly pale-tipped, bicoloured tails. (Voss, Lunde & Jansa 2005).

**DISTRIBUTION:** Widely distributed from northern and eastern Peru, through northern and eastern Bolivia and Paraguay to Brazil.

In Brazil the distribution carves a wide arc south of the Amazon Basin and it has been recorded in the states of Maranhão, Ceará, Tocantins, Distrito Federal, Minas Gerais, Goiás, Matto Grosso and Matto

Grosso do Sul (Gardner 2007, Cáceres et al 2008). The species is apparently replaced by *Gracilinanus microtarsus* in the coastal Atlantic Forest from Minas Gerais (where they overlap slightly) to Rio Grande do Sul (Brown 2004, Geise & Astúa 2009).

The text description of the range provided by Gardner (2007) does not correspond to the range map provided, mentioning Uruguay and adjacent Argentina but not mapping any points south of Asunción, Paraguay – it would seem that the map is in error. Massoia et al (2000) map the species south to Provincia Buenos Aires, but their *Gracilinanus agilis* included the at the time unrecognised *Cryptonanus chacoensis* which occurs much further south. Flores (2006) considered all records of *Gracilinanus agilis* in Argentina to refer to *Cryptonanus chacoensis*, though Teta et al (2007) later documented the existence of *G. microtarsus* in Provincia Misiones.

In Paraguay the species is apparently widely-distributed in forested areas, though its precise distribution is confused by its wide sympatry with the cryptic *Cryptonanus chacoensis*. Five specimens collected at Sapucaí, Departamento Paraguari are in the British Museum (BMNH 3.2.3.39, 3.4.7.22, 3.4.7.23, 4.1.5.46 and 4.1.5.47).

**HABITAT:** Occurs in forested areas, typically dry, subhumid or riparian.

In northern Paraguay it is found in cerrado and occurs in chaco woodland in the Chaco.

Of 19 individuals in the cerrado of PN Chapada dos Veadeiros, Goias, Brazil, 11 were collected in cerrado *sensu strictu* and 7 in cerradón, but none were trapped in gallery forest (Bonvicino et al 2005). Mares et al (1989) however found the species to be exclusively arboreal and only found in gallery forest in the cerrado of central Brazil, albeit in a variety of microhabitats. Geise & Astúa (2009) described the habitat in Brazil as cerrado/forest domain with gallery forests and green coatings bush with dense undergrowth.

Specimens cited by Smith et al (in prep.) at RN Laguna Blanca were all taken above ground in semi-humid semi-deciduous transitional forest in an area surrounded by cerrado, where it was found in the same habitat as *Marmosa constantiae*.

**ALIMENTATION: Foraging Behaviour and Diet** Insectivorous, frugivorous and carnivorous. They relish sweet, juicy foods and the weak dentition means they prefer soft, pulpy items. Whilst they are incapable of breaking bark to feed on exudate, they will take advantage of the work of other animals and feed on leaking sap etc.

**Diet in Captivity** Individuals have been caught in traps baited with banana pulp and peanut butter. (Hershkovitz 1992). Astúa de Moraes et al. 2003 experimentally tested the proportions of protein, lipid, carbohydrate and fibre in the diet of adults (n=5) and juveniles (n=2) of this species under laboratory conditions. Mean proportions per 100g dry weight of food were: protein ad. 1.34g (+/-0.97), juv. 1.00g (+/-1.30); lipid ad. 0.32g (+/-0.32), juv. 0.87g (+/-1.21); carbohydrate ad. 3.41g (+/-0.90), juv. 3.09g (+/-2.28); fibre juv. 3.18% (+/-0.72). Santori et al (2004) described and illustrated the gut morphology of this species and associated it with dietary habits.

Smith et al (in prep.) captured this species in Sherman traps baited with baited with peanut butter, biscuits, oats and vanilla essence.

**REPRODUCTIVE BIOLOGY: Seasonality** Breeding is seasonal and influenced by the availability of resources, with one or two breeding seasons per year. Males collected by Mares et al (1989) in central Brazil during February, May, July and September were adults with scrotal testes. Juveniles were collected in the same region from January to May, August and December. Three females collected in October were lactating. Females were not carrying pouched young during August in PN Chapada dos Veadeiros, Goias, Brazil (Bonvicino et al 2005) and juveniles have been found in Bolivia during April and December (Tate 1933). Smith et al (in prep) document females (3 February) with an open vagina and (9 January) lactating heavily, and a male (23 February) with descended testes from Reserva Natual Laguna Blanca, Departamento San Pedro, Paraguay.

**Pregnancy** Litters consist of up to 12 young (Eisenberg & Redford 1999).

**GENERAL BEHAVIOUR: Activity Levels** Nocturnal, solitary and arboreal being most frequently trapped in the understorey amongst viney tangles and thin branches at a height of 1.5-2m.



**Locomotion** The species moves along thin branches and vines with short, rapid steps interchanged with overhand climbing when moving up and down. The hands and prehensile tail are used for grappling. The claws of the forefeet are weak, but those of the hind feet are stronger and are used to sustain the animal when climbing downwards head first. Individuals have been seen to use the tail to swing slightly when climbing down from precarious vines (Hershkovitz 1992).

**Refuges** Nests are built from grasses and vegetable fibres in low bushes or tree holes at a height of about 1.5m. (Canevari & Vaccaro 2007).

**Grooming Behaviour** Mares et al (1989) gives the following moult data for Central Brazilian cerrado specimens: An adult taken in February was moulting behind the ears, postero-dorsally and ventrally beneath the limbs. An adult taken in July had a spotty ventral moult and one in October had a single small dorsal patch of active melanin deposition. Juveniles and subadults showed varying states of moult throughout the year.

**Defensive Behaviour** Hershkovitz (1992) described two individuals of this species which reacted to capture by raising up on their hind legs with forearms outstretched and palms facing forwards, mouth open wide exposing the dentition and making hissing sounds. When prodded with a stick the animals grasped it with the forefeet and bit it weakly.

**Mortality** Hershkovitz (1992) lists snakes, owls and lizards, as well as "any large predator large enough to gulp down a mouse-size morsel" as potential predators. A low rate of trap mortality has been observed due to the ability of this species to enter into a torpid state when cold. (Hershkovitz 1992).

**Parasites** Limardi (2006) listed the following ectoparasites from Brazilian specimens: Acari: Metastigmata *Amblyomma cajennense* and *Ixodes* sp. (Ixodidae). Acari: Mesostigmata *Bdellonyssus* sp. (Macronyssidae). Acari: Astigmata *Didelphocicinus palmeirensis* (Atopomelidae). Feijó et al (2008) describe a new species of pinworm (Oxyuridae) *Gracilioxyuris agilis* from the cecum of this species in the Pantanal of Mato Grosso do Sul, Brazil.

This species showed a 5.6% infection rate with *Trypanosoma evansi* in the Brazilian Pantanal (Herrera et al 2005). Torres et al (2007) report the Rictulariid nematode *Pterygodermatites (Paucipectines) jagerskioldi* Lent and Freitas, 1935 from the small intestine of this species in Mato Grosso State.

**VOCALISATIONS:** Animals in defensive posture make hissing sounds (Hershkovitz 1992).

**HUMAN IMPACT:** None.

**CONSERVATION STATUS:** Globally considered to be of Low Risk Least Concern by the IUCN, on account of its wide distribution, large population and occurrence in protected areas. See <http://www.iucnredlist.org/details/9417> for the latest assessment of the species. Though rarely observed, trapping studies show that this species is fairly common in forested areas. The main threat to the species is likely to be through conversion of forest habitat to agriculture and ranchland. However Henriques et al (2006) studied the small mammal populations in areas of cerrado in various stages of regrowth after fire and found the species to be much more numerous in areas that had not been burned for more than 12 years, suggesting that regular burning may negatively affect populations.

#### REFERENCES:

- Anderson S** 1997 - Mammals of Bolivia: Taxonomy and Distribution - *Bulletin AMNH* 231.
- Astúa de Morães D, Santori RT, Finotti R, Cerquiera R** 2003 - Nutritional and Fibre Contents of Laboratory-established Diets of Neotropical Opossums (Didelphidae) p225-233 in Jones M, Dickman C, Archer M Predators with Pouches: The Biology of Carnivorous Marsupials - CSIRO Publishing, Australia.
- Bonvicino CR, Lemos B, Weksler M** 2005 - Small Mammals of Chapada dos Veadeiros National Park (Cerrado of Central Brazil): Ecologic, Karyotypic and Taxonomic Considerations - *Brazilian Journal of Biology* 65: p395-406.
- Braun JK, Mares MA** 1995 - The Mammals of Argentina: An Etymology - *Mastozoologia Neotropical* 2: p173-206.
- Brown BE** 2004 - Atlas of New World Marsupials - *Fieldiana Zoology* 102.
- Burmeister H** 1854 Systematische Uebersicht der Thiere Brasiliens: Welche während einer Reise durch die Provinzen von Rio de Janeiro und Minas Geraës Gesammt oder beobachtet wurden Vol 1 - G.Reimer, Berlin.
- Cabrera A** 1919 - Genera Mammalium. Monotremata, Marsupialia - Museo de Ciencias Naturales, Madrid.

- Cabrera A** 1958 - Catálogo de los Mamíferos de América del Sur - *Revista Museo Argentino de Ciencias Naturales Bernardino Rivadavia Zoology* 4: p1-307.
- Cáceres NC, Casella J, Vargas CF, Prates LZ, Tombini AAM, Goulart CS, Lopes WH** 2008 - Distribuição Geográfica de Pequenos Mamíferos Não Voadores nas Bacias dos Rios Araguaia e Paraná, Região Centro-Sul do Brasil - *Iberingia Serie Zool.* 98: p173-180.
- Cannevari M, Vaccaro O** 2007 - Guía de Mamíferos del Sur de América del Sur - LOLA, Buenos Aires.
- Carvalho BA, Oliveira LFB, Nunes AP, Mattevi MS** 2002 - Karyotypes of Nineteen Marsupial Species from Brazil - *Journal of Mammalogy* 83: p58-70.
- Chebez JC** 1996 - Fauna Misionera - LOLA, Buenos Aires.
- Chebez JC** 2009 - Otros que Se Van - Editorial Albatros, Buenos Aires.
- Costa LP, Leite YLR, Patton JL** 2003 - Phylogeography and Systematic Notes on Two Species of Gracile Mouse Opossums, Genus *Gracilinanus* (Marsupialia: Didelphidae) from Brazil - *Proceedings of the Biological Society of Washington* 116: p275-292.
- Eisenberg JF, Redford KH** 1999 - Mammals of the Neotropics: Volume 3 The Central Neotropics - University of Chicago Press, Chicago.
- Emmons LH** 1999 - Mamíferos de los Bosques Húmedos de América Tropical - Editorial FAN, Santa Cruz.
- Esquivel E** 2001 - Mamíferos de la Reserva Natural del Bosque Mbaracayú, Paraguay - Fundación Moises Bertoni, Asunción.
- Feijó IA, Torres EJJ, Maldonado A, Lanfredi RM** 2008 - A New Oxyurid Genus and Species from *Gracilinanus agilis* (Marsupialia: Didelphidae) in Brazil - *Journal of Parasitology* 94: p847-851.
- Flores DA** 2006 - Orden Didelphimorphia in *Bárquez R, Díaz, MM, Ojeda RA* eds Mamíferos de Argentina, Sistemática y Distribución - SAREM, Buenos Aires.
- Garcia JP, Oliveira JA, Corrêa MMO, Pessôa LM** 2010 - Morphometrics and Cytogenetics of *Gracilinanus agilis* and *Cryptonanus* spp. (Didelphimorphia: Didelphidae) from Central and Northeastern Brazil - *Mastozoología Neotropical* 17: p53-60.
- Gardner AL** 2007 - Mammals of South America Volume 1: Marsupials, Xenarthrans, Shrews and Bats - University of Chicago Press.
- Gardner AL, Creighton GK** 1989 - A New Generic Name for Tate's *microtarsus* Group of South American Opossums (Marsupialia: Didelphidae) - *Proceedings of Biological Society of Washington* 102: p3-7.
- Geise L, Astúa A** 2009 - Distribution Extension and Sympatric Occurrence of *Gracilinanus agilis* and *G. microtarsus* (Didelphimorphia, Didelphidae), with Cytogenic Notes - *Biota Neotropica* 9: p269-276.
- Henriques RHB, Briani DC, Palama ART, Vieira EM** 2006 - A Simple Geographical Model of Small Mammal Succession After Fire in the Brazilian Cerrado - *Mammalia* 70: p266-230.
- Herrera HM, Norek A, Freitas TPT, Rademaker V, Fernandes O, Jansen AM** 2005 - Domestic and Wild Mammals Infection by *Trypanosoma evansi* in a Pristine Area of the Brazilian Pantanal Region - *Journal of Parasitology Research* 96: p121-126.
- Hershkovitz P** 1992 - The South American Gracile Mouse Opossums Genus *Gracilinanus* Gardner & Creighton 1989 (Marmosidae: Marsupialia): A Taxonomic Review with Notes on General Morphology and Relationships - *Fieldiana Zoology Series* 1441.
- Limardi PM** 2006 - Os Ectoparasitos de Marsupiais Brasileiros p37-52 in *Cáceres NC, Monteiro-Filho ELA* Os Marsupiais do Brasil: Biologia, Ecologia e Evolução - Editora UFMS, Campo Grande.
- Mares MA, Braun JK, Gettinger D** 1989 - Observations on the Distribution and Ecology of the Mammals of the Cerrado Grasslands of Central Brazil - *Annals of the Carnegie Museum* 58: p1-60.
- Massoia E, Forasiepi A, Teta P** 2000 - Los Marsupiales de la Argentina - LOLA, Buenos Aires.
- Matschie P** 1916 - Bemerkungen über die Gattung *Didelphis* L. - *Sitzungsber. Gesells. Naturf. Freunde Berlin* 1916: p259-272.
- Mirando-Ribeiro A de** 1936 - Didelphia ou Mammalia-Ovovivipara. Marsupiales, Didelphos, Pedimanos ou Metatherios - *Revista Museu Paulista* 20: p245-427.
- Myers P, Espinosa R, Parr CS, Jones T, Hammond GS, Dewey A** 2006 - The Animal Diversity Web (online). Accessed December 2007.

- Patton JL, Costa LP** 2003 - Molecular Phylogeography and Species Limits in Rainforest Didelphid Marsupials of South America in *Jones ME, Dickman FR, Archer M* eds *Predators with Pouches: The Biology of Carnivorous Marsupials* - CSIRO, Collingwood, Australia.
- Reig OA, Kirsch JAW, Marshall LG** 1985 - New Conclusions on the Relationships of the Opossum-like Marsupials with an Annotated Classification of the Didelphimorphia - *Ameghiniana* 21: p335-343.
- Santori RT, Astúa de Moraes D, Cerqueira R** 2004 - Comparative Gross Morphology of the Digestive Tract in Ten Didelphidae Marsupial Species - *Mammalia* 69: p27-36.
- Smith P, Pheasey H, Atkinson K, Ramakers J** in prep. - The Didelphimorphia of Reserva Natural Laguna Blanca, Departamento San Pedro, Paraguay - *Acta Zoologica Lilloana*
- Tate GHH** 1931 - Brief Diagnoses of Twenty-six Apparently New Forms of *Marmosa* from South America - *AMNH Novitates* 493.
- Tate GHH** 1933 - A Systematic Revision of the Marsupial Genus *Marmosa* - *Bulletin AMNH* 66.
- Teta P, Muschetto E, Maidana S, Bellomo C, Padula P** 2007 - *Gracilinanus microtarsus* (Didelphimorphia, Didelphidae) en la Provincia de Misiones, Argentina - *Mastozoología Neotropical* 14: p113-115.
- Thomas O** 1910 - On Mammals Collected in Ceará, NE Brazil by Fräulien Dr Snethlage - *Annals and Magazine of Natural History Series* 8 6: p500-503.
- Torres EL, Maldonado A, Lanfredi RM** 2007 - *Pterygodermatites (Paucipectines) jagerskioldi* (Nematoda: Rictulariidae) from *Gracilinanus agilis* and *G. microtarsus* (Marsupialia: Didelphidae) in Brazilian Pantanal and Atlantic Forest by Light and Scanning Electron Microscopy - *Journal of Parasitology* 93: p274-279.
- Voss RS, Lunde DP, Jansa SA** 2005 - On the Contents of *Gracilinanus* Gardner & Creighton 1989 with the Description of a Previously Unrecognised Clade of Small Didelphid Marsupials - *AMNH Novitates* 3482.
- Wilson DE, Cole FR** 2000 - *Common Names of Mammals of the World* - Smithsonian Institution Press, Washington and London.

**CITATION:** Smith P 2009 - FAUNA Paraguay Handbook of the Mammals of Paraguay Number 35 *Gracilinanus agilis* - [www.fauparaguay.com/gracilinanusagilis.html](http://www.fauparaguay.com/gracilinanusagilis.html).



**FIGURE 2** - (FPMAM1068PH) **Agile Gracile Opossum** *Gracilinanus agilis*.

Dorsal skull of specimen CZPLT 205. Reserva Natural Laguna Blanca, Departamento San Pedro. Photo Helen Pheasey.

**FIGURE 3** - (FPMAM1070PH) **Agile Gracile Opossum** *Gracilinanus agilis*.

Lateral skull of specimen CZPLT 205. Reserva Natural Laguna Blanca, Departamento San Pedro. Photo Helen Pheasey.



**FIGURE 4 - Agile Gracile Opossum** *Gracilinanus agilis*.

Ventral skull of specimen CZPLT 205. Reserva Natural Laguna Blanca, Departamento San Pedro. Photo Helen Pheasey.

**FIGURE 5 - (FPMAM1069PH) Agile Gracile Opossum** *Gracilinanus agilis*.

Ventral skull of specimen CZPLT 205. Reserva Natural Laguna Blanca, Departamento San Pedro. Photo Helen Pheasey.



**FIGURE 6 - (FPMAM20PH) Agile Gracile Opossum** *Gracilinanus agilis*.

Adult lateral. Tobatí, Departamento Cordillera, undated Photo Philip Myers.