

The common opossum, *Didelphis aurita*, as a seed disperser of several plants in southern Brazil

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Evidence of seed dispersal by a didelphid marsupial, the common opossum *Didelphis aurita*, was obtained in an urban forest fragment of southern Brazil, from February 1995 to January 1996. Opossum captures were done once a week using 30 live-traps placed uniformly in the study area. Their scats were collected from the trap floor after the release of each opossum. Seeds found by fecal analysis were tested for germination in Petri dishes. As a result, the moderate to high germination rates obtained showed that this marsupial usually does not destroy the seeds of fruits that it eats, dropping them still alive. Several seed species dropped were from pioneer plants such as Solanaceous and Rosaceous species. Therefore, the common opossum has its diet based also on fruits and should be an effective seed disperser in southern Brazil.

Evidências de dispersão de sementes por um marsupial didelídeo, o gambá-de-orelha-preta, foram obtidas em um remanescente florestal urbano do Sul do Brasil, de fevereiro de 1995 a janeiro de 1996. As capturas dos gambás foram realizadas semanalmente por meio de 30 gaiolas de capturas dispostas uniformemente na área estudada.

As fezes dos animais foram coletadas no assoalho da gaiola após a sua soltura. As sementes encontradas nas fezes foram testadas quanto à viabilidade por meio de testes de germinação em placas de Petri. Como resultado, as moderadas a elevadas taxas de germinação obtidas mostram que este marsupial geralmente não destrói muitas

sementes de frutos dos quais se alimenta, defecando-os ainda viáveis. Muitos destes frutos eram de plantas pioneiras, como solanáceas e rosáceas. Assim, o gambá-de-orelha-preta apresenta sua dieta também baseada em muitas espécies de frutos e provavelmente é um efetivo dispersor de sementes no Sul do Brasil.

The common opossum, *Didelphis aurita* (1) (Fig. 1), is one of the commonest marsupial species in the eastern neotropical region, occurring from northeastern Brazil until Paraguay and northern Argentina (1). Despite the wide distribution of the species, little is known about the degree of seed dispersal pro-

moted by this marsupial. Few didelphid marsupials were studied about seed dispersal such as *Caluromys philander*, *Philander opossum*, *Micoureus demerarae* (2,3,4) and *Lutreolina crassicaudata* in the southern neotropics (5).

Among congeneric opossums, *D. marsupialis* was best studied concerning these subjects in the northern Neotropics (3,4). Thus, this study was developed to supply the general absence of information on seed dispersal by marsupials in the neotropical region and mainly in Brazil.

This study was carried out in a disturbed area of Curitiba, State of Paraná, southern Brazil (25°25'S and 49°18'W,

at 940 m above sea level). This area has five hectares covered with a disturbed mixed ombrophylous forest. Around it, there are roads, residences, buildings and barren lands. The mean annual temperature is 16.5°C and the relative humidity is usually high, with the mean annual rainfall ranging from 1100 to 1600 mm (6).

Field works ranged for 12 months, from February 1995 to January 1996. Thirty traps (20 x 20 x 40 cm), uniformly distributed at fixed points of the study area (mean distance between traps was $\approx$ 40 m), were utilized for captures of opossums. They were baited during the afternoon and checked during the fol-

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Figure 1. The common opossum, *Didelphis aurita*, in the study area. (Photo: Hudson G. Santos).

Table 1 - Germination rates and probable dispersal syndromes of fruits whose seeds were found in scats of the common opossum, *Didelphis aurita*, in a forest fragment of southern Brazil.

Fruit species	Family	Germination rate (%)	Number of seeds tested	Dispersal syndrome
<i>Asterostigma lividum</i>	Araceae	100 ^a	26	Ornithochory
<i>Melothria cucumis</i> ^e	Cucurbitaceae	6	78	Chiropterochory
<i>Casearia decandra</i>	Flacourtiaceae	20	5	Ornithochory
<i>Morus nigra</i> ^e	Moraceae	75 ^a	8	Ornithochory
<i>Psidium guajava</i> ^c	Myrtaceae	71 ^a	24	Chiropterochory
<i>Passiflora actinia</i> ^c	Passifloraceae	5	269	Ornithochory
<i>Piper gaudichadianum</i> ^d	Piperaceae	8	97	Chiropterochory
<i>Hovenia dulcis</i>	Rhamnaceae	50 ^b	6	Chiropterochory
<i>Rubus roseifolius</i> ^e	Rosaceae	68 ^a	99	Ornithochory
<i>Rubus</i> sp. ^e	Rosaceae	6	33	Ornithochory
<i>Acnistius breviflorus</i> ^{a,c}	Solanaceae ^f	65 ^b	66	Ornithochory
<i>Cyphomandra corymbiflora</i> ^{a,c}	Solanaceae ^f	60 ^b	65	Chiropterochory
<i>Physalis pubescens</i> ^e	Solanaceae ^f	86 ^a	38	Chiropterochory
<i>Solanum granulosoleprosum</i> ^e	Solanaceae ^f	57 ^b	113	Chiropterochory
<i>S. maioranthum</i> ^e	Solanaceae	100 ^a	7	Ornithochory
<i>S. sanctae-catharinae</i> ^e	Solanaceae ^f	44 ^b	143	Chiropterochory
<i>S. swartzianum</i> ^{a,c}	Solanaceae ^f	50 ^b	32	Chiropterochory

^a High germination rates.

^b Moderate germination rates.

^c Germination rates: Nonsignificantly different from fruiting plants in the region.

^d Germination rates: significantly different ($p < 0.05$) (CHI-SQUARE TEST) from fruiting plants in the region.

^e Pioneer plants.

^f Solanaceous species data treated in Cáceres et al (18).

lowing morning, at least once a week. The bait utilized was ripe banana with peanut butter and cod liver oil, which previously had proved to be efficient.

Seeds were collected on the trap floor after each opossum capture, when it dropped during the night. Thereafter, seeds were washed in the laboratory

using a sieve (1 mm mesh) and placed in closed Petri dishes (diameter = 9 cm) containing wet absorbing paper (3 layers) to verify germination rates. These dishes were left in a natural environment with diffuse light promoted by some ferns, simulating a gap in the forest. Seeds were always watered when they

became dry. When dishes were opened, the seeds being tested were treated with a commercial fungicide to avoid contamination. As control experiments, some seed species of the fruits consumed by the opossum were collected from fruiting plants in the region of the study. They were tested for germination as described above. Seed species identified from scats, based on seed shape or seedlings after germination, were classified according to their habitat in the region of the study area: If from gaps (pioneer plants) or from undisturbed forests.

Germination tests showed that several seeds from fruit species consumed by the common opossum had moderate (between 33-66%) to high germination rates (> 67%), with emphasis on Solanaceous seeds (Table 1). Some seed species collected from fruiting plants showed germination rates similar to the seeds from scats (Table 1). There was no relationship between germination rates and dispersal syndromes (7,8), with higher and lower rates being similarly distributed between the two syndromes observed, the chiropterochory (53%) and the ornithochory (47%) (Table 1). All seeds dropped uninjured by opossums ($N = 19$ species) were less than 1 cm in length (Fig. 2). Seeds dropped injured ($N = 2$ species) were only from *Erythroxylum deciduum* and from an Arecaceae tree, *Syagrus romanzoffiana* (only fibers), Arecaceae both with seed size greater than 1 cm (1 to 2 cm).

As it occurs with other marsupials such as the brown thick-tailed opossum *Lutreolina crassicaudata* (5), the gray four-eyed opossum *Philander opossum* and the bare-tailed woolly opossum *Caluromys philander* (2,3), common opossums appear to be important seed disperser (2,3,4), mainly when we consider the importance of fruits in the diet of *Didelphis* (9,10,11,12). Corroborating this, the majority of plants consumed in the field showed moderate to high germination rates, as was also observed in southeastern (13) and southern Brazil by us (unpublished data) for a congeneric species, the white-eared opossum, *D. albiventris*. These germinations imply that seeds crossed undamaged the digestive tract and that their probab-

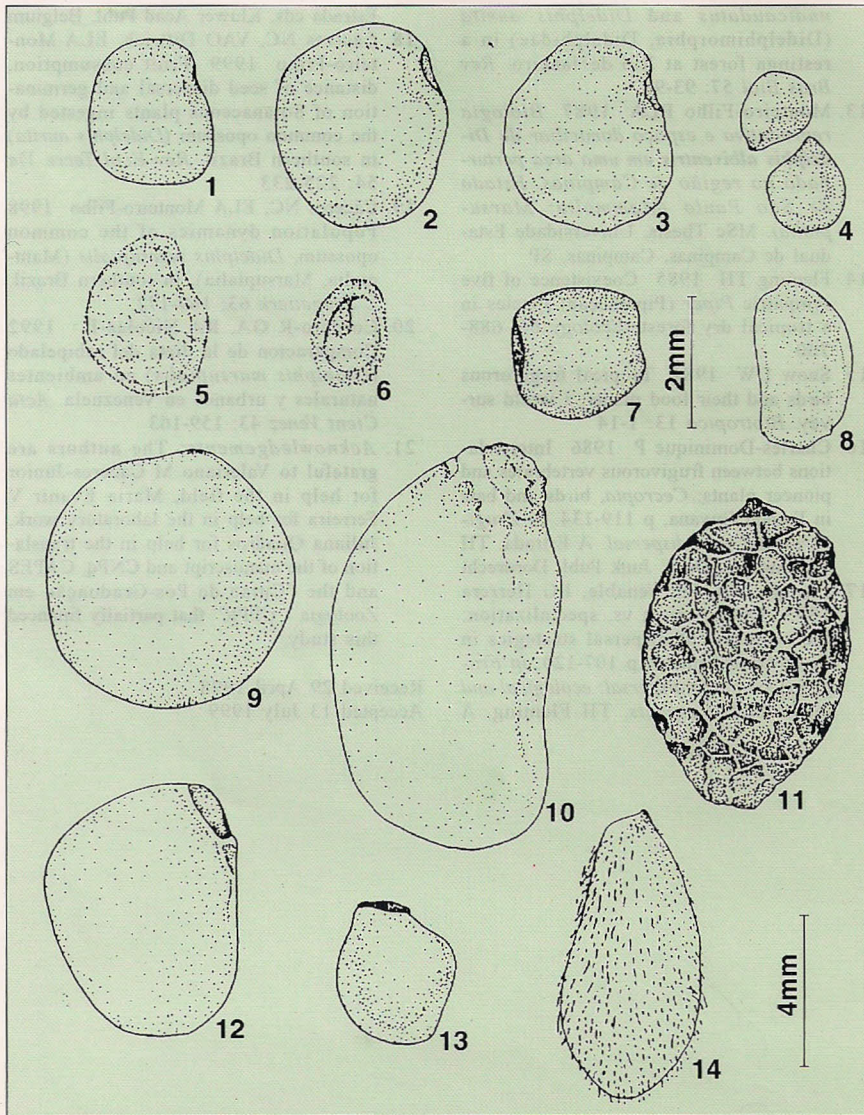


Figure 2. Seeds of fruits consumed and probably dispersed by the common opossum in a forest fragment of Curitiba city, southern Brazil. 1. *Solanum granuloso-leprosum*; 2. *S. swartzianum*; 3. *S. sanctae-catharinae*; 4. *S. maioranthum*; 5. *Cyphomandra corymbiflora*; 6. *Acnistus breviflorus*; 7. *Piper gaudichadianum*; 8. *Rubus roseifolius*; 9. *Hovenia dulcis*; 10. *Asterostigma lividum*; 11. *Passiflora actinia*; 12. *Psidium guajava*; 13. *Morus nigra*; 14. *Melothria cucumis*. Except for seeds 7 and 8 with the scale of 2 mm, all other seeds belong to the scale of 4 mm.

ity of germination in the field is high. However, based on germination rates, seeds of *Piper*, *Melothria* and *Passiflora* should be better dispersed by other vertebrates such as bats and birds in accordance with other studies (14,15,16).

This close plant-animal relationship may be directly related to the seed size. Small seeds would have more chances to cross undamaged the marsupial digestive tract (2,3,4,10), in addition to be able to accept a wide range of seed dispersers with different body sizes (17). The largest seed species to cross

the digestive tract of the common opossum, *D. marsupialis*, in French Guiana was *Passiflora* and seeds greater than this were discarded near the parent plant there (3). Although *Passiflora* has also been consumed here, *Asterostigma lividum* was the greatest seed species to cross undamaged the digestive tract of the common opossum (Fig. 2).

Despite the strong evidence concerning the seed dispersal effectiveness by the common opossum, this animal in the study area seems to be not effectively involved in any known dispersal syndrome (7,8). Then, the observed rate

of opossum consumption of cryptically colored fruits, which were usually thought to be better dispersed by bats, was similar to the rate of consumption of bright colored fruits usually dispersed by birds (7,8). On the other hand, the population of the common opossum in French Guiana revealed a rate of consumption directed toward a chiropterochoric syndrome (3). Considering that the study area is a forest fragment and that the main seed plants dispersed by South American *Didelphis* are pioneer plants (3,11,16,18), this opossum may be aiding in the recovery of disturbed environments, transporting viable seeds from the forest to disturbed areas. *Didelphis marsupialis* appears to be an important disperser of some pioneer plants in the northern Neotropics (3,4). Although *D. aurita* is more restricted to forested environments in mixed forests of southern Brazil (19), it may perform short migrations to areas outside fragments searching for food, such as that found in garbage (20). During these movements, the common opossum could drop scats with pioneer plant seeds in these suitable microenvironments (4).

Therefore, there is strong evidence that the common opossum is an effective seed disperser in southern Brazil. Further studies are required to corroborate this hypothesis in other regions of Brazil and its role in the forest conservation should be better researched. ■

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