

La Mar, Ayacucho, Perú

Seeds Dispersed and Fruits Eaten by Birds, Bats, and Rodents in a Montane Forest of Chiquintirca

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Photos: Klauss Cervantes [seeds, pyrenes], Diego Paredes [fruits]. Produced by Klauss Cervantes [klaus.cervantes@gmail.com], Diego Paredes-Burneo [diego.p.franco@gmail.com], with support from Marta Williams and Reynaldo Linares-Palomino. Acknowledgments: Biodiversity Monitoring and Assessment Program (www.bmap.pe), a partnership between the Smithsonian Conservation Biology Institute and PERU LNG. Plant habit silhouettes were created in (www.biorender.com). Animal silhouettes are from (www.kindpng.com).



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The species included in this guide inhabit montane forests on the humid eastern Peruvian Andes, Ayacucho department, province of La Mar, district of Anco, “Centro Poblado Chiquintirca”.

The landscapes consist of upper montane forests with patches of degraded forest and scrub in various stages of recovery. Many endemic species of birds, mammals, and flowering plants live there in which plant-animal interactions occur. One of them is the consumption of a wide variety of fruits and seeds. These frugivorous habits are the main processes that maintain these forests through seed dispersal via ingestion (endozoochory) or transportation (epizoochory).

The aim of this guide is to provide information for identifying plants through seeds, pyrenes (the botanical term for the seed of stone fruits, such as the peach), and fruits found in the diet of birds, bats and rodents. This document includes photos of seeds; pyrenes (highlighted in the text when present and bottom left of the main photo); fruits (bottom right of the main photo); and brief descriptions for each of them. Also, we show the variation in form of the seeds for some species.

All scale bars = 1mm. In addition, we show silhouettes that indicate:

- (1) The class/order of animal that eats the fruit: bird  ; bat  ; or rodent 
- (2) the plant's habit: tree  ; shrub plant  ; sub-shrub  ; or herb 

Height included when available.



Viburnum cf. witteanum
ADOXACEAE

Fruit: Drupe oval to elliptical [8.5 x 6 mm], greenish when immature, blackish when ripe. **Pyrene** oval to elliptical [7 x 5 mm] shown in longitudinal section at top left.

Seed: Oblong-elliptical [5.6 x 2.3 mm], seed grainy, micropyle not observed, shown at top right

Diaspore: Fruit (one seed per fruit).

Syndrome: Endozoochory.



5-11 m



Bomarea weigendii
ALSTROEMERIACEAE

Fruit: Capsule campanulate [22 x 20 mm], dehiscent, greenish when ripe.

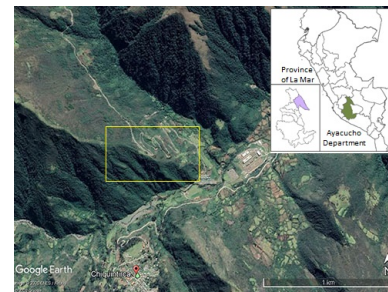
Seed: Spherical, slightly angled [3.5 x 4 mm], smooth to slightly grainy surface. Hilum opposite micropyle. Covered by a shiny red aril.

Diaspore: Seed.

Syndrome: Endozoochory.



Climbing herb



Chiquintirca's Montane Forests,
Ayacucho-Peru

La Mar, Ayacucho, Perú

Seeds Dispersed and Fruits Eaten by Birds, Bats, and Rodents in a Montane Forest of Chiquintirca

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Bomarea sp.
ALSTROEMERIACEAE

Fruit: Capsule campanulate, dehiscent, greenish when ripe, [18-25 x 2-22 mm].

Seed: Oblong-ovate [3.5 x 2.5 mm], smooth surface. Hilum opposite micropyle. Covered by a shiny red aril.

Diaspore: Seed.

Syndrome: Endozoochory.



Climbing herb



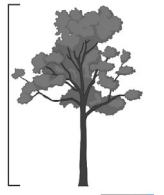
Oreopanax cuspidatus
ARALIACEAE

Fruit: Oval berry [7-8 x 5-5.5 mm], dark when ripe.

Seed: Kidney-shaped “D” shape [5.7-6 x 2.8-3.2 mm], smooth and slightly corrugated surface. Hilum adjacent to micropyle. (separated only by a bump).

Diaspore: Fruit (two seeds per fruit).

Syndrome: Endozoochory.



5-7 m



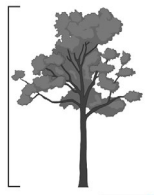
Oreopanax pariahuancae
ARALIACEAE

Fruit: Globose berry [21 x 21 mm], greenish when ripe.

Seed: Rotund [6.1-6.3 x 4.7 mm], smooth and slightly corrugated surface. Hilum and micropyle together.

Diaspore: Fruit (two seeds per fruit).

Syndrome: Endozoochory.



9-11 m



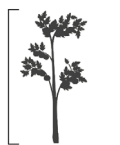
Berberis rariflora
BERBERIDACEAE

Fruit: Elliptic berry [7 x 4.5 mm], blackish when ripe.

Seed: Slightly elongated and ovate [3.5 -4 x 2.5 mm], dark, smooth surface, and raphe present. Micropyle indistinguishable.

Diaspore: Fruit (two to four seeds per fruit).

Syndrome: Endozoochory.



Prostrate plant

La Mar, Ayacucho, Perú

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Greigia macbrideana
BROMELIACEAE

Fruit: Small elongated berry [10-20 x 70-100 mm], fibrous, pulpy, and very juicy, known as a “achupalla” (local name). Whitish at the base and brownish-greenish towards the apex.

Seed: Ovate and drop-shaped [1-5 x 2-5 mm], dark, and smooth surface. Micropyle indistinguishable.

Diaspore: Seed (many per fruit).

Syndrome: Endozoochory.



Plant in rosette



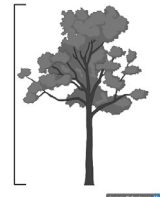
Weinmannia reticulata
CUNONIACEAE

Fruit: Two-valved dehiscent capsule [3.5 x 1.8 mm], ovate, and brownish.

Seed: Slightly flattened, kidney-shaped to irregular [1 x 0.4 mm], brownish, corrugated surface with scattered conspicuous hairs, and conspicuous raphe. Hilum and micropyle separated approx. 90 °.

Diaspore: Seed (several per fruit).

Syndrome: Mainly ballistics. Unusual, but also found in rodents' feces.



6-7 m



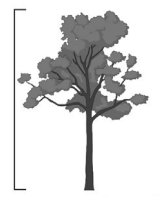
Vallea stipularis
ELAEOCARPACEAE

Fruit: Spherical capsule [8.5-9.5 x 7.5-8 mm], bacciform, and tuberculate.

Seed: Ovate [7 x 6.5 mm], brownish, slightly shiny smooth surface, and raphe conspicuous. Hilum and micropyle possibly 90 ° apart, with structure developed in the funiculus (probably a vestigial aril). Funiculus is thick.

Diaspore: Seed (up to four per fruit).

Syndrome: Mainly ballistics. Birds have been observed to be eating the fruit.



7-13 m



Gaultheria bracteata
ERICACEAE

Fruit: Capsule [4.5 x 6.5 mm] covered with fleshy calyx (bacciform). As a whole, spherical and blackish when ripe.

Seed: Generally trapezoidal [0.4 x 0.5 mm], brownish-yellow, glossy and reticulated surface, and raphe present. Opposite hilum and micropyle, hilum area rarely bulging.

Diaspore: Fruit (180-200 seeds per fruit).

Syndrome: Endozoochory.



1-2 m

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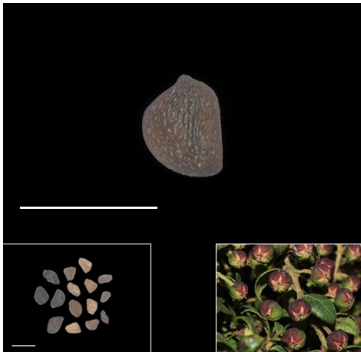
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Gaultheria buxifolia

ERICACEAE

Fruit: Capsule [5 x 5.5 mm] covered with fleshy calyx (bacciform). As a whole, spherical and reddish when ripe.

Seed: Generally trapezoidal [0.6-0.75 x 0.55-0.6 mm], mostly brownish, also yellowish-brownish, glossy and reticulated surface, and raphe present. Hilum opposite to micropyle.

Diaspore: Fruit (140-160 seeds per fruit).

Syndrome: Endozoochory.



4-7.5 m



Gaultheria glomerata

ERICACEAE

Fruit: Capsule [4.5 x 5 mm] covered with fleshy calyx (bacciform). As a whole, spherical and blackish when ripe.

Seed: Trapezoidal [0.5 x 0.3-0.45 mm], brownish to yellowish brown, reticulate surface, and raphe present. Opposite hilum and micropyle.

Diaspore: Fruit (180-200 seeds per fruit).

Syndrome: Endozoochory.



Prostrate plant
0.3-0.8 m



Gaultheria reticulata

ERICACEAE

Fruit: Capsule [5 x 5.5 mm], covered with fleshy calyx (bacciform). As a whole, spherical and white-greenish.

Seed: Trapezoidal [0.6-0.75 x 0.55 mm], light brownish, reticulated and shiny surface, and raphe present. Opposite hilum and micropyle.

Diaspore: Fruits (150-170 seeds per fruit).

Syndrome: Endozoochory.



1-5 m



Gaultheria vaccinioides

ERICACEAE

Fruit: Capsule [5 x 6 mm], covered with fleshy calyx (bacciform). As a whole, spherical and blackish when ripe.

Seed: Trapezoidal "D" shape [0.55-0.75 x 0.4-0.5], light brownish, glossy and reticulated surface, and raphe present. Opposite hilum and micropyle.

Diaspore: Fruit (180-200 seeds per fruit).

Syndrome: Endozoochory.



Prostrate plant
0.1 m

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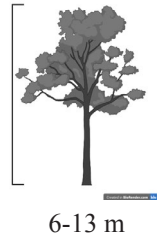
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Escallonia myrtilloides
ESCALLONIACEAE

Fruit: Capsule [9 x 12 mm], bell-shaped, greenish when ripe, and with persistent calyx.
Seed: Oblong [1.2-1.4 x 0.3-0.4 mm], brownish, reticulated surface, and raphe present. Hilum opposite to micropyle; Hilum area callose.
Diaspore: Seed (500-600 seeds per fruit).
Syndrome: Mainly ballistic. Unusual, but also found in rodents' feces.



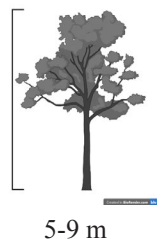
Sisyrinchium junceum
IRIDACEAE

Fruit: Oblong capsule [7.5 x 4 mm], dehiscent, and dark greenish when ripe.
Seed: Spherical [1-1.2 mm in diameter], black, smooth surface, and raphe conspicuous. Micropyle not observed (probably juxtaposed with the hilum).
Diaspore: Seed (30-40 seeds per fruit).
Syndrome: Mainly ballistic. Birds have been observed to be eating the fruit.



Gaiadendron punctatum
LORANTHACEAE

Fruit: Spherical berry [11-12 x 5-6 mm], yellow to slightly orange.
Seed: Oblong-elliptical [5 x 1.9 mm], brown, rough surface, and elongated area of the hilum at one end.
Diaspore: Fruit (one seed per fruit).
Syndrome: Endozoochory.



Struthanthus acuminatus
LORANTHACEAE

Fruit: Berry elliptic to oblong [6 x 5 mm], reddish-purple when ripe.
Seed: Oblong [3.5 x 2 mm], black, smooth surface, Hilum area flattened; Seed entirely covered with a sticky fruit tissue, difficult to remove [4 x 2.5 mm].
Diaspore: Fruit (one seed per fruit).
Syndrome: Endozoochory.



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Brachyotum huancavelicae
MELASTOMATACEAE

Fruit: Dehiscent capsule [10 x 7 mm], bell-shaped, reddish when ripe, and with persistent calyx.

Seed: Cochleate [1-1.1 x 1.1-1.5 mm], light brownish, tubercular surface especially in the area opposite the hilum, raphe conspicuous with dark brown ariloid tissue. Hilum area wide and flattened.

Diaspore: Seed (many per fruit >500)

Syndrome: Mainly ballistic. Unusual, but also found in rodents and bird's feces.



1.3-2 m



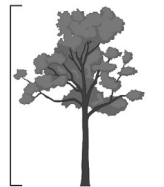
Miconia aprica
MELASTOMATACEAE

Fruit: Spherical berry [2.5 x 2.5 mm] and purple-green when ripe.

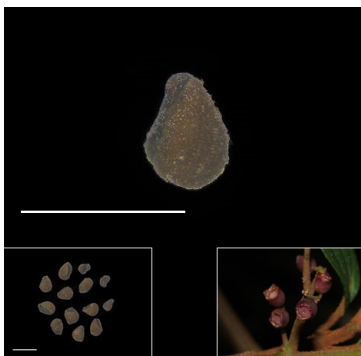
Seed: Ovate or drop-shaped [0.8 x 0.4 mm], brown, smooth and shiny surface; conspicuous and elongated raphe covered in darker ariloid tissue.

Diaspore: Fruit (many seeds per fruit).

Syndrome: Endozoochory.



11 m



Miconia biappendiculata
MELASTOMATACEAE

Fruit: Spherical berry [2.5 x 2.5 mm] with reddish fruit when immature and purple when ripe.

Seed: Ovoid drop-shaped [0.8 x 0.4 mm], yellow-brownish, grainy surface, and raphe elongated to slightly concave with darker ariloid tissue.

Diaspore: Fruit (many seeds per fruit).

Syndrome: Endozoochory.



3 m



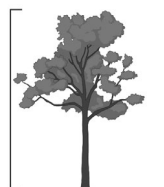
Miconia miles-morganii
MELASTOMATACEAE

Fruit: Spherical to campanulate berry [2.5 x 2.5 mm], reddish when ripe.

Seed: Ovoid-tapered [0.9 x 0.4 mm], yellow-brownish, smooth and slightly shiny surface, raphe elongated to slightly concave with darker ariloid tissue.

Diaspore: Fruit (many seeds per fruit).

Syndrome: Endozoochory.



6-12.5 m

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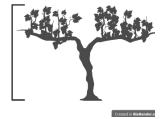
Morella pubescens
MYRICACEAE

Fruit: Spherical drupe [5 x 4.5 mm], pruinose, and dark. Spherical to slightly ovate Pyrene spherical to slightly ovate [4 x 3.5 mm], shown in longitudinal section at top left.

Seed: Ovate and drop-shaped [2 x 3 mm], yellowish-brownish, and smooth surface shown at top right. Opposite hilum and micropyle.

Diaspore: Fruit or pyrene (one seed per fruit).

Syndrome: Endozoochory, Epizoochory



2.5-8.5 m



Myrteola phyllicoides
MYRTACEAE

Fruit: Spherical berry [5-6 mm in diameter], lustrous and brilliant fuchsia color.

Seed: Kidney-shaped [1.5-1.8 x 1.1-1.3 mm], brownish, shiny and smooth surface. Sunken and dark hilum with conspicuous raphe.

Diaspore: Fruit (10-15 seeds per fruit).

Syndrome: Endozoochory.



0.35-1.6 m



Passiflora mixta
PASSIFLORACEAE

Fruit: Indehiscent capsule [10.3 x 4.5 cm], oblong-elliptical, and yellowish when ripe.

Seed: Elliptic-obovate [5.3-6.3 x 3.2 mm], flattened with margins, brown with dimples on the flattened sides. Raphe along the entire length of one of the margins; the end opposite the hilum with sharp protuberance. Seed covered in translucent creamy aril.

Diaspore: Fruit and seed (many seeds per fruit >200).

Syndrome: Endozoochory.



Climbing vine



Monnina conferta
POLYGALACEAE

Fruit: Ovoid drupe [7 x 4.5 mm], dark purple when ripe. Ovoid **pyrene** [5 x 2.8 mm], light gray-brown, rough, with concavities and two keels, one of them more prominent.

Seed: Ovoid [3.5 x 1.6 mm], brown, smooth with pleated surface; hilum broad and dark. Raphe dark and conspicuous; micropyle opposite raphe and hairy area near micropyle.

Diaspore: Fruit (one seed per fruit).

Syndrome: Endozoochory.



5 m

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Monnina ovata
POLYGALACEAE

Fruit: Ovoid drupe [6.5 x 4 mm], pilose, and dark purple when ripe. Ovoid **pyrene** [5.7 x 3 mm], with concavities and three keels (smaller on opposite side of keels).

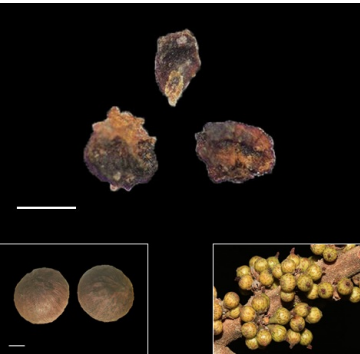
Seed: Tapered [4.1 x 1.7 mm], yellowish, and smooth surface. Tapered hilum and dark raphe.

Diaspore: Fruit (one seed per fruit).

Syndrome: Endozoochory.



Climbing shrub



Myrsine coriacea
PRIMULACEAE

Fruit: Spherical drupe [3 x 3 mm], light brown when ripe. Spherical **pyrene** [2.5 mm in diameter], creamy with purple spots.

Seed: Irregular to ovate [0.9-1.1 x 0.5-1], dark brown, hilum at the narrowest end of the seed, and raphe not observed.

Diaspore: Fruit (one seed per fruit).

Syndrome: Endozoochory.



3 m



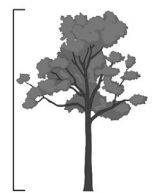
Hesperomeles ferruginea
ROSACEAE

Fruit: Obovate drupe [9 x 8 mm], red when ripe. Deltoid-pyramidal **pyrene** [4.5 x 2.8 mm], ferruginous and rough surface.

Seed: Ovoid-falcate [2.5 x 2 mm], yellowish and smooth. Conspicuous raphe and juxtaposed to the micropyle, and dark chalaza.

Diaspore: Fruit (five seeds per fruit, one per pyrene).

Syndrome: Endozoochory.



6 m



Hesperomeles obtusifolia
ROSACEAE

Fruit: Spherical drupe [12 x 8 mm], blackish when ripe. Tapered **pyrene** [6.6 x 2.5 mm] tapered at the top and blunt at the bottom, with a light brownish color.

Seed: Ovate-falcate [3.7 x 2 mm], yellow-brownish and smooth. Conspicuous raphe and juxtaposed to the micropyle, and dark chalaza.

Diaspore: Fruit (five seeds per fruit, one per pyrene).

Syndrome: Endozoochory.



0.6-1 m

La Mar, Ayacucho, Perú

Seeds Dispersed and Fruits Eaten by Birds, Bats, and Rodents in a Montane Forest of Chiquintirca

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Photos: Klauss Cervantes [seeds, pyrenes], Diego Paredes [fruits]. Produced by Klauss Cervantes [klaus.cervantes@gmail.com], Diego Paredes-Burneo [diego.p.franco@gmail.com], with support from Marta Williams and Reynaldo Linares-Palomino. Acknowledgments: Biodiversity Monitoring and Assessment Program (www.bmap.pe), a partnership between the Smithsonian Conservation Biology Institute and PERU LNG. Plant habit silhouettes were created in (www.biorender.com). Animal silhouettes are from (www.kindpng.com).



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Rubus bogotensis
ROSACEAE

Fruit: Racemose aggregate of fleshy drupes [20-30 x 20-30 mm] each containing one seed. Reddish when unripe and dark purple when ripe. Semi-globular **pyrene** [5 x 4 mm], mustard-yellowish.

Seed: Oblong [3.5 x 1.2 mm], brownish and slightly corrugated. It is the largest of all *Rubus* species. Hilum at the narrowest end of the seed. Micropyle and raphe not seen.

Diaspore: Fruit (one seed per fruit, many per raceme drupe).

Syndrome: Endozoochory.



1-2 m



Rubus roseus
ROSACEAE

Fruit: Racemose aggregate of fleshy drupes [20-30 x 20-30 mm] each containing one seed. Greenish when unripe and reddish when ripe. Flattened and trapezoidal **pyrene** [4.5 x 3 mm], mustard-yellowish.

Seed: Oblong-elliptical [2.5 x 0.8 mm], and dark brownish. Hilum at the narrowest side of the seed. Micropyle and raphe not seen.

Diaspore: Fruit (one seed per fruit, many per raceme drupe).

Syndrome: Endozoochory.



1-2 m



Lycianthes lehmannii
SOLANACEAE

Fruit: Ovate berry [23 x 12 mm], greenish when ripe.

Seed: Irregular to slightly kidney-shaped [1.2-1.8 x 1.1-1.8 mm], yellowish, and grainy surface. Sunken hilum and dark raphe.

Diaspore: Fruit (many seeds per fruit >40).

Syndrome: Endozoochory.



Slightly
procumbent
1 m



Solanum nutans
SOLANACEAE

Fruit: Spherical berry [12 mm in diameter], greenish when ripe.

Seed: Irregular to slightly kidney-shaped [2-3 x 2-3 mm], brown, and smooth to rough surface. Sunken hilum and conspicuous raphe.

Diaspore: Fruit (20-30 seeds per fruit).

Syndrome: Endozoochory.



1-2 m