RED LISTS FOR MALAGASY PLANTS

IV: SPHAEROSEPALACEAE

***Rhopalocarpus undulatus*, Montagne des Français, 2004**
photo - Fidisoa Ratovoson

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INTRODUCTION

Nowhere in the World can rival Madagascar in terms of the diversity and uniqueness of its flora. Estimates of the total number of plant species in the country continue to climb and now it is thought that at least 13,000 species of higher plant grow in the country (pers. comm. P. Phillipson). This remarkable diversity is especially important given that nearly all these species (around 90% - Schatz 1999) grow only in Madagascar. Sadly Madagascar's exceptional flora is highly threatened and an alarming number of plant species are now on the very brink of extinction. We must now choose whether to make strenuous efforts to conserve the Malagasy flora or accept, within the next few decades, the loss of a large number of plant species. Now is the last chance to make this choice.

An important part of effective conservation is prioritization: the relatively small amount of money available for conservation must be used where it will have most impact. To assist with the prioritization of conservation actions for the Malagasy flora a series of documents will be produced containing risk of extinction estimates for species in selected Malagasy plant families.

The research presented here was conducted as a collaborative project between Missouri Botanical Garden (MBG), Antananarivo University and Madagascar's National Association for the Management of Protected Areas (ANGAP).

METHODS FOR ESTIMATING RISK OF EXTINCTION

The identification of the species with the highest priority for conservation action is based on estimates of the likelihood that they will become extinct in the next few decades. However before the risk of extinction of a species can be investigated it is necessary to ensure that it has been delimited using a taxonomic framework that closely reflects the real distribution of variation (that in turn reflects underlying evolutionary history) within the genus/family to which the species belongs. Thus, each taxon included in this series of redlists has been subject to a recent taxonomic revision.

Information on the risk of extinction of each species was obtained from the analysis of its distribution and from observations made in the field. Most of this work was conducted by Malagasy students as part of their DEA (= Masters) studies. Species distribution was estimated using geo-referenced locality data obtained from herbarium specimens in the five herbaria (K, MO, P, TAN, TEF) with large holdings of Malagasy plants. Most recent herbarium specimens include precise longitude and latitude coordinates of the collection location obtained using a GPS, but many older specimens do not, necessitating *post facto* allocation of coordinates by locating the collection site on maps with the aid of MBG's Madagascar gazetteer (available on line at (http://www.mobot.org/MOBOT/Research/madagascar/gazetteer). The collection sites were mapped and analyzed using ArcView Geographic Information System (GIS) software. The resultant species distribution was quantified in terms of extent of occurrence, area of occupancy, and number of subpopulations. The analysis of each species' distribution in relation to various environmental base maps provided information on the habitat of the species in terms of geology, vegetation type, bioclimate and elevation.

Information on the habitat, abundance, pollination, seed dispersal, regeneration, threats, uses and vernacular name for each species was obtained by locating and studying at least one population in the wild. The best method of locating species proved to be with the assistance of local people living close to previous collection sites. Information on the vernacular name and uses of the species were also obtained from the labels of herbarium specimens.

Further information on the methods used in the study is provided in Table 1.

The information collected for each species is summarized in a Risk of Extinction Datasheet

Table 1. Methods for the collection of information presented in each of the data fields of the Risk of Extinction Datasheet.

<table>
<tr><td>Species name and author: name of species according to the most recent taxonomic revision and name of author(s) who defined the species</td><td>Risk of extinction: based on the application of criteria presented in IUCN (2001)</td></tr>
<tr><td>Vernacular names: from information collected in the field and captured from herbarium specimens.</td><td>Conservation recommendations: our recommendations for actions to reduce the risk of extinction of the species.</td></tr>
<tr><td>Description: based on information in the literature and our own observations of herbarium specimens and living plants in the field.</td><td rowspan="4"></td></tr>
<tr><td>Habitat:
• Vegetation type: defined by observations in the field and analysis of the distribution of the species related to the vegetation map of DuPuy & Moat (1996)
• Bioclimate: defined by the analysis of the distribution of the species related to the bioclimate map of Cornet (1974)
• Geology: defined by observations in the field and analysis of the distribution of the species related to the geology map of DuPuy & Moat (1996)
• Altitude: based on field observations and information captured from the notes accompanying herbarium specimens</td></tr>
<tr><td>Biology:
• Pollination: probable pollinator identified from characteristics of flower and observations in the field
• Seed dispersal: probable method of seed dispersal identified from characteristics of fruit and observations in the field</td></tr>
<tr><td>Uses: based on information collected by interviewing local people in the field and captured from the literature and notes on herbarium specimens.</td></tr>
<tr><td rowspan="4">Distribution: distribution of the species represented by the locations of the collection sites of the herbarium specimens attributed to the species in the five herbaria with large collections from Madagascar. Map created using Arcview 3.2 software.</td><td>Observations of study population(s)
Location: study site with geo-reference
• Regeneration observed: presence of regeneration assumed from the presence at the site of individuals representative of all size classes.
• Tolerant to disturbance: presence of regenerating populations of the species in severely degraded vegetation (>50% of original biomass lost).
• Density: average number of mature individuals of the species per ha of appropriate habitat based on counts in replicated plots or along transects.
• Abundance: estimated number of mature individuals at the study site based on the density of the species at the site and an estimate of the area of suitable habitat available (abundance classes based on thresholds used in IUCN (2001).</td></tr>
<tr><td>Predicted future decline:
• Due to habitat loss: estimate of decline of population based on observations of tolerance of species to habitat perturbation and estimates of rate of loss of primary vegetation from (FAO 1993, Green & Sussman 1990, Steininger et al. 2002). Classes of population decline (i.e. 0-30%, ≥30-50%, ≥50-80%, ≥80%) relate to thresholds used in the IUCN (2001).
• Due to exploitation or poor regeneration: in addition to loss of habitat it is possible that populations may decline because of selective exploitation or poor regeneration resulting for example from the increasing rarity of pollinators or seed dispersers. Although we were unable to quantify these factors, their possible significance is noted.</td></tr>
<tr><td>Distribution attributes for total population:
(These analyses made using ArcVeiw 3.2)
• Extent of occurrence: estimated as the area contained within the shortest continuous imaginary boundary drawn to encompass all the collection locations for the species.
• Area of occupancy: estimated as the area of suitable habitat (defined in terms of vegetation type, bioclimate, altitude and geology) for the species within the extent of occurrence.
• Number of subpopulations: estimated as the number of collection locations but combining locations that are separated by less than 5 km.</td></tr>
<tr><td>Representation in protected areas:
Protected areas are defined as National Parks (PN), Special Reserves (RS), Nature Reserves (RNI), Biosphere Reserves (RB).
• Number of subpopulations: number of data points within protected areas but combining locations separated by less than 5 km.
• Protected areas: list of protected areas where the species has been recorded.</td></tr>
<tr><td colspan="2">Herbarium specimens examined: list of herbarium specimens examined for this study</td></tr>
</table>

SPHAEROSEPALACEAE Tiegh.

Sphaerosepalaceae (sometimes incorrectly called Rhopalocarpaceae) is one of five families that are now recognised as being endemic to Madagascar. Recent molecular *rbc*L sequence data suggest a close relationship with *Bixa*, *Cochlospermum*, and the Malagasy endemic *Diegodendron*. It contains two genera: *Dialyceras* with 3 species and *Rhopalocarpus* with 15 species.

Description (from Schatz 2001)

Hermaphrodite trees with simple hairs, and copious mucilage, particularly evident in cut fruits. Leaves alternate, simple, entire, deciduous, penninerved or palmatinerved to distinctly triplinerved, lateral stipules fused into a single sheath, caducous or rarely persistent. Inflorescences axillary or terminal few-flowered, umbelliform cymes or panicles, flowers large, regular, usually 4-merous; sepals 4, free, imbricate in pairs, strongly concave, caducous; petals 4, free, alternating with the sepals, imbricate, early caducous; stamens numerous, in 2-4 whorls, inserted around the base of the gynophore, filaments free or irregularly connivent at their base, very narrowed at their apex, anthers bilocular, separated completely from each other, introrse longitudinally dehiscent; ovary superior, borne on a distinct gynophore at the apex of which is an annular or crown-like nectary disc, comprised of 2-4 (-5) carpels completely fused into a 2-4 (-5)-locular compound ovary, or of 4 entirely free carpels, style simple, terminal or gynobasic, bent at its middle, stigma slightly dilated-capitate; ovules 2-9 per locule or carpel. Fruit or individual mericarps large, somewhat fleshy but becoming dry, indehiscent, with usually only 1 seed per locule or carpel developing, enveloped in a sticky, translucent, glutinous resin; seeds with either smooth or ruminate endosperm.

Key to genera of Sphaeroseplaceae

1. Gynoecium consisting of 4 entirely free ovaries; common style gynobasic; fruit of separate sessile mericarps, ovoid pyriform to fusiform, the apex long attentuate to cuspidate; leaves penninerved ……..……..…….*Dialyceras*

1’. Gynoecium consisting of a compound ovary with 2-4 completely fused carpels; style terminal; fruit more or less globose (single-seeded) or with 2-4 rounded lobes (multiple-seeded); leaves penninerved to often palmatinerved or distinctly triplinerved ……..*Rhopalocarpus*

Dialyceras Capuron, Adansonia, n.s., 2: 262. 1962.

Medium to large trees. Leaves alternate, simple, entire and slightly undulate, penninerved, sometimes coriaceous and discolorous. Inflorescences usually terminal, often solitary or 2-3-flowered; sepals 4, densely silky outside; petals 4, delicate, white; stamens ca. 90; gynophore small, surrounded by the annular nectary disc; carpels usually 4, alternating with the petals, entirely separate from one another, densely pubescent, common style gynobasic; ovules 7-9 per carpel in 2 rows. Fruit comprised of 1-4 individual, sessile, indehiscent, single-seeded mericarps, ovoid-pyriform to fusiform, the apex long attenuate to acuminate, sometimes slightly curved, yellow, finely wrinkled-verrucose; seed with non-ruminate endosperm.

Dialyceras is distributed in humid evergreen forest below 500 m elevation from Betampona RNI to Antsirabe-Nord. It can be recognized by its penninerved leaves, and gynoecium of separate carpels, the fruit consisting of a cluster of 1-4 individual, sessile, indehiscent, single-seeded, ovoid-pyriform to fusiform mericarps.

Key to the species of *Dialyceras*
(from Schatz *et al*. 1999)

1. Largest leaves up to 4 cm long, membranaceous; mericarps (partial fruits) rounded and swollen below, the distal half abruptly attenuate-cuspidate ..... *D. parvifolium*

1'. Largest leaves at least 5.5 cm long, coriaceous; mericarps (partial fruits) weakly swollen below, tapering gradually to the acute to acuminate distal half 2

2. Leaves only slightly darker above than below (in dried material), lateral and tertiary veins evident and slightly raised on upper surface; fruiting pedicels glabrous, fruits narrowly ovoid, straight to weakly curved..... *D. coriaceum*

2'. Leaves distinctly bicolored (in dried material), upper surface of at least some leaves dark brownish green with a reddish to purplish tint, lower surface and margin above khaki-tan, lateral and tertiary veins obscure on upper surface, hardly if at all raised; fruiting pedicels densely golden pubescent, fruits narrowly fusiform, curved..... *D. discolor*

Rhopalocarpus Bojer, Proces-Verbaux Soc. Hist. l'Ile Nat. Maurice: 149. 1846.

Small to large trees. Leaves alternate, simple, entire and sometimes undulate, penninerved, palmatinerved from the base and penninerved above, or distinctly bi- to triplinerved, sometimes coriaceous, stipules rarely persistent. Inflorescences axillary or terminal, umbelliform cymes or panicles, usually many-flowered, occasionally only 2-5-flowered; sepals 4, the outer 2 usually tightly enclosing the flower in bud; petals 4, delicate, usually white, sometimes reflexed at anthesis, caducous; stamens 25-160, in 2 to many whorls; gynophore well developed, the nectary disc annular or crown-like; ovary compound, consisting of 2-4 (-5) fused carpels and 2-4 (-5) separate locules, style terminal; 2-6 collateral ovules per locule. Fruit a large, somewhat fleshy to woody, indehiscent berry, with 1-4 locules, each with usually a single seed, globose (single-seeded) or irregularly 2-4 lobed (multi-seeded), somewhat fleshy at first but becoming dry, yellow to red, the surface smooth, or more often irregularly verrucose or covered by pyramidal excrescences and thus resembling lychees; seed with either smooth or ruminate endosperm.

Rhopalocarpus is distributed throughout Madagascar in both humid to subhumid evergreen and dry to subarid deciduous forest, usually below 500 m elevation, but to 1,400 m elevation on the western edge of the central plateau. Leaf venation varies remarkably within the genus from penninerved to strongly triplinerved, each species distinguishable by vegetative characters. It can be recognized by its usually many-flowered inflorescences, the large flowers with caducous petals and many stamens, and fruits exuding a sticky resin when cut.

Key to the species of *Rhopalocarpus*
(from Schatz *et al*. 1999)

1. Leaves penninerved, with a single primary vein originating from the base 2

1'. Leaves palmatinerved, or dipli- or triplinerved, with 2 or 3 evident primary veins originating at the base 8

2. Leaves with an evident small mucron at the apex, densely pubsescent below, soft to the touch ..... *R. excelsus*

2'. Leaves without a mucron (occasionally present in *R. alternifolius*), glabrous below (to sparsely pubescent in some material of *R. similis*) 3

3. Leaves with a broad, thickened midrib tinged dark purplish in dry material; fruits covered with sharp conical to pyramidal spines ..... *R. lucidus*

3'. Leaves with a midrib not evidently thickened, greenish, not tinged dark purplish; fruits smooth to rough, but lacking sharp spines..... 4

4. Leaves strongly discolorous, evidently darker above than below in dried material, glabrescent or sparsely pubescent; pedicels densely pubescent..... *R. similis*

4'. Leaves similar in color above and below, glabrous; pedicels glabrous..... 5

5. Largest leaf blade less than 7 cm long (rarely to 10 cm), margins strongly undulate (plants from Ankarana, N of Vohémar, Antsiranana)..... *R. undulatus*

5'. Largest leaf blade at least 8.5 cm long, usually much larger, margins flat to moderately undulate 6

6. Leaves with numerous, closely spaced, weakly differentiated secondary veins and ± equally strong parallel intersecondary veins (calophyllous venation); fruits smooth ..... *R. alternifolius*

6'. Leaves with widely spaced, well differentiated secondary veins, intersecondary veins smaller; fruits rough..... 7

7. Largest leaf blade to 14.5 cm long, coriaceous, tending to be longitudinally plicate along the arched midrib, often folded adaxially in dried material, secondary veins weakly raised on lower surface ..... R. coriaceus

7'. Largest leaf blade at least 16 cm long, strongly coriaceous, flat, rarely if ever folded in dry material, secondary veins strongly raised on lower surface ..... *R. crassinervius*

8. Leaves with 2 primary veins, one usually more prominent..... *R. binervius*

8'. Leaves with 3 primary veins (midrib and 2 laterals) 9

9. Leaves palmatinerved, the two basal lateral veins extending to ½ (-2/3) the length of the blade, with evident penninerved secondary veins developing along the central primary vein 10

9' Leaves triplinerved, the 2 basal lateral veins extending nearly to the apex, penninerved secondary veins absent 12

10. Leaves pubescent below, soft to the touch, tertiary venation obscure on upper surface ..... *R. triplinervius*

10'. Leaves glabrous below, tertiary venation evident on upper surface..... 11

11. Leaves chartaceous to subcoriaceous, light greenish-gold in dry material, secondary veins purplish to blackish in dry material ..... *R. suarezensis*

11'. Leaves strongly coriaceous, reddish brown in dry material, veins same color as the lamina ..... *R. thouarsianus*

12. Longest petioles at least 3 cm, usually 4-11 cm long, largest leaf blade at least 12 cm long, stipules 10 mm long, broadly triangular, subpersistent ..... *R. longipetiolatus*

12'. Longest petiole less than 1.7 cm long, largest leaf blade less than 11 cm long, stipules to 8 mm long, early caducous 13

13. Leaf margins strongly undulate, lateral primary veins on lower surface equal in size to central one (or nearly so), usually sunken on the upper surface, tissue between primary veins raised corrugate above, tertiary venation usually evident on upper surface (rarely obscure) 14

13'. Leaf margins flat, not undulate, lateral primary veins on lower surface smaller than central one, only weakly sunken on upper surface, tissue between primary veins flat, not corrugate, tertiary venation obscure on upper surface ..... *R. macrorhamnifolius*

14. Largest leaf blade less than 4.5(-5) cm long, petiole less than 5 mm long..... *R. parvifolius*

14'. Largest leaf blade at least (6-)7 cm long, usually much larger, petiole 5-10 mm long ..... *R. louvelii*

SELECTED PHOTOS OF SPHAEROSEPALACEAE

***Dialyceras coriaceum*, Fampanambo - photo Pete Lowry**

***Dialyceras parvifolium*, Ambanizana - photo George Schatz**

***Rhopalocarpus longipetiolatus*, Cap Est – photo George Schatz**

***Rhopalocarpus lucidus*, Andrevo – photo George Schatz**

***Rhopalocarpus undulatus* leaf, Montagne des Français – photo Fidisoa Ratovoson**

***Rhopalocarpus thouasianus*, Tampolo – photo George Schatz**

***Rhopalocarpus coriaceus*, Mandena – photo Pete Lowry**

***Rhopalocarpus coriaceus,* Vohemar – photo David Rabehevitra**

***Rhopalocarpus crassinervius,* Nosy Varika – photo David Rabehevitra**

***Rhopalocarpus crassinervius*, regneration after cutting, Manombo – photo Fidisoa Ratovoson**

RISK OF EXTINCTION DATASHEETS

Dialyceras coriaceum (Capuron) J. F. Leroy

Risk of Extinction: Endangered (A3c)

Vernacular names: Lombiro madini-dravina

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in new conservation sites

Description:
Large tree with smooth bark. Leaves medium with pinnate venation and both secondary and tertiary veins evident, coriaceous. Inflorescence terminal (axillary), 1-3 flowered. Flower large, 4 sepals, 4 white petals that fall quickly, many stamens. Fruit consisting of 1-4 separate, very large, fleshy, ovoid fruitlets (mericarps), straight or only slightly curved; pedicel hairless.

Habitat:
• Vegetation type: low elevation evergeen forest
• Bioclimate: humid
• Geology: basement rock, alluvial and lake deposits, lava
• Altitude: 20 - 750 m

Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of bees visiting flowers of other *Dialyceras* species)
• Seed dispersal: probably lemurs (on basis of fruit characteristics and information from George Modeste (pers. comm., 1999)

Uses:
None reported

Distribution:

Observations of study population(s)
• Location: Ambanizana (15°37’36’’S, 49°50’07’’E)
• Regeneration observed: Yes
• Tolerant to disturbance: No
• Density: 3 mature individual per ha.
• Abundance: 1000 - 2,500 mature individuals

Predicted future decline:
• because of habitat loss: 50 - 80% (cause of loss = shifting cultivation)
• because of exploitation or poor regeneration: unknown, but poor regeneration possible if animal seed dispersers become rare because of hunting.

Distribution attributes for total population
• Extent of occurrence: 11,973 km²
• Area of occupancy: 6,752 km²
• Number of subpopulations: 6

Representation in protected areas:
• Number of subpopulations: 1
• Protected areas: Zahamena AP

Specimens examined: Antsiranana: Ambohitsara, J. Déquaire 1. Toamasina: Ambodiatafana, SF(R.Capuron) 18257 ; Fampanambo, SF(R.Capuron) 18290 ; Andratambe, SF(R. Capuron) 9158 ; Fampanambo, George E. Schatz et al. 3848 ; Ankirindro, George E. Schatz et al. 3875 ; Soanierana Ivongo, Armand Randrianasolo, R. Randrianaivo & F. Rakotonasolo 591 ; Zahamena AP, Fidy Ratovoson et al. 700.

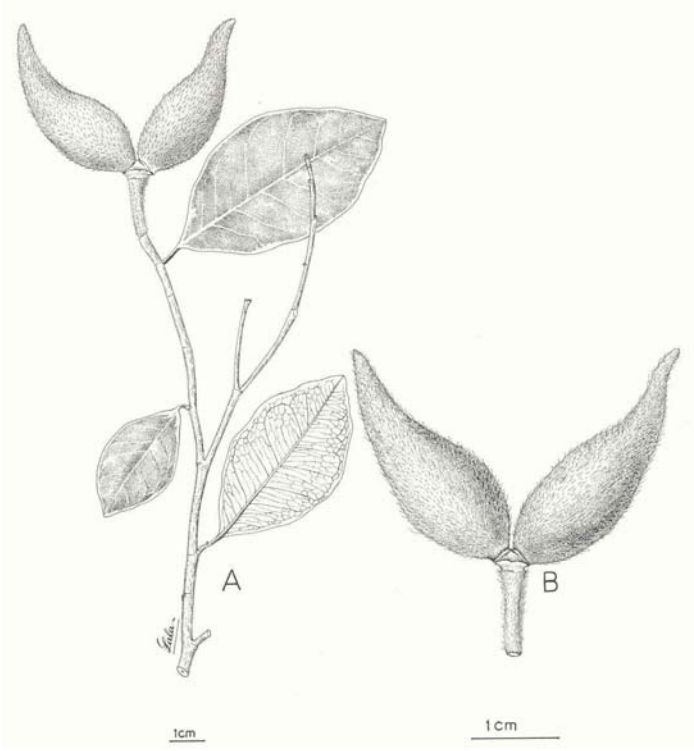
Dialyceras discolor J. F. Leroy

Vernacular names: Lombiro, Tsimandrasala

Risk of Extinction: **Critically Endangered** **(A3c)**

Conservation recommendations: inclusion of populations in new conservation sites

Description:
Large tree. Leaves medium, venation pinnate, secondary and tertiary veins barely evident, lower and upper surfaces colored differently in dried material. Inflorescence terminal (axillary) with 1 - 3 flowers. Flowers large, with 4 sepals, 4 petals that fall quickly, many stamens. Fruit consisting of 1-4 separate, large, fleshy, pear-shaped, curved fruitlets (mericarps); pedicel with golden hairs.



Habitat:
- Vegetation type: low elevation evergreen forest
- Bioclimate: humid
- Geology: basement rock, alluvial and lake deposits, lava
- Altitude: 120 - 230 m

Biology:
- Pollination: probably insect (on basis of flower characteristics also observations of bees visiting the flowers of other *Dialyceras* species)
- Seed dispersal: probably lemurs (on basis of fruit characteristics and observations of consumers of fruits of other *Dialyceras* species)

Uses:
None reported

Distribution:

Observations of study population(s)
- Location: Ambodigavo (14°52’05’’S, 50°05’44’’E)
- Regeneration observed: Yes
- Tolerant to disturbance: No
- Density: 10 mature individual per ha.
- Abundance: 1,000 - 2,500 mature individuals

Predicted future decline:
- because of habitat loss: >80% (cause of loss = shifting cultivation)
- because of exploitation or poor regeneration: unknown, but poor regeneration possible if animal seed dispersers become rare because of hunting.

Distribution attributes for population
- Extent of occurrence: 1,955 km²
- Area of occupancy: 1,112 km²
- Number of subpopulations: 4

Representation in protected areas:
- Number of subpopulations: 0
- Protected areas: None

Specimens examined: **Antsiranana**: Marohambihy, SF 7777 ; Antalaha, Barot s.n. ; Antsirabe-Nord, SF(R. Capuron) 27592 ; Ambodigavo, SF 13851 ; Ambodigavo, SF(R-305) 24-R-305 ; Ambatoasana, F. Randriantafika et al. 43.

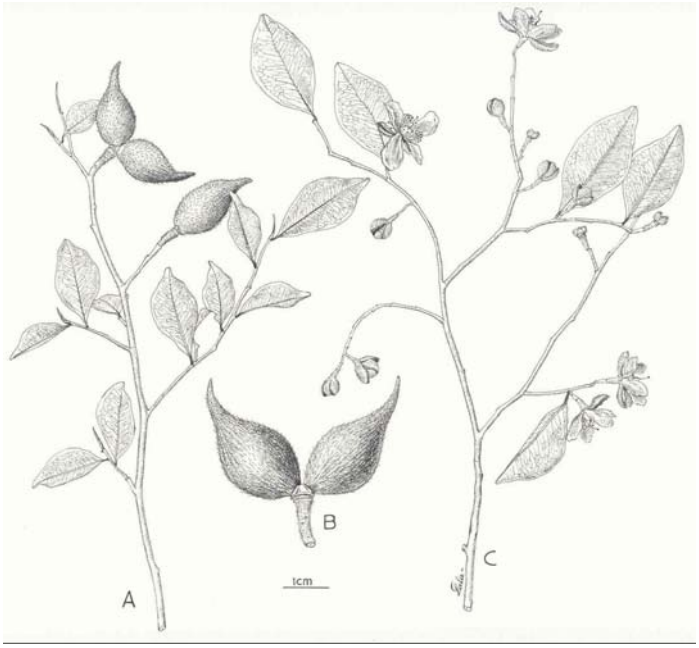
Dialyceras parvifolium Capuron

Risk of Extinction: Endangered (A3c)

Vernacular names: Hafatrakora, Lombiro Madini-dravina, Lombiro Fotsy, Fanavy

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in protected areas

Description:
Large tree. Leaves small, venation pinnate, secondary and tertiary veins barely evident, papery. Inflorescence terminal (axillary) with 1 - 3 flowers. Flowers large, with 4 sepals, 4 white petals that quickly fall, many stamens. Fruit consisting of 1-4 separate, large, fleshy, pear-shaped, abruptly pointed , hairy, fruitlets (mericarps).



Habitat:
• Vegetation type: low elevation evergreen forest
• Bioclimate: humid
• Geology: basement rock, alluvial and lake deposits
• Altitude: 5 - 340 m

Biology:
• Pollination: probably insect (bees (*Apis mellifera*) seen visiting flowers in Betampona RN).
• Seed dispersal: probably lemurs (Iambana Bernard (pers. comm.) reports that the fruits of this species are eaten by V. *variegata* and *Eulemur fulvus* at Betampona RN).

Uses:
Timber

Distribution:

Observations of study population(s)
• Location: Betampona RN (17.55.55S, 49.12.12E)
• Regeneration observed: Yes
• Tolerant to disturbance: No
• Density: 3 mature individual per ha.
• Abundance: 2,500 – 10,000 mature individuals

Predicted future decline:
• because of habitat loss: 50-80% (cause of habitat loss = shifting cultivation)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 4,457 km²
• Area of occupancy: 2,517 km²
• Number of subpopulations: 5

Representation in protected areas:
• Number of subpopulations: 2
• Protected areas: Betampona RN, Masoala PN

Specimens examined: Toamasina : Ambanizana, G.E. Schatz & G. Modeste 3082 ; Ambanizana, Justin Rabe 209, Farankaraina, SF(R. Capuron) 16523, Betampona RN, SF(R. Capuron) 18126, Fampanambo, SF(Capuron) 18299 ; Farankaraina SF, SF(R. Capuron) 18329 ; Farankaraina SF, SF(R. Capuron) 8654 ; Farankaraina SF, Service Forestier 16431 ; Betampona RN, RN(Razanaparany) 9126 ; Betampona RN, RN(Rakotoniania) 2227 ; Andranobe, N. Vasey & R. Behasy 218 ; Andranobe, N. Vasey & N. Velo 264 ; Andranobe, N. Vasey & R. Behasy 372 ; Betampona RN, Fidy Ratovoson et al. 46.

Rhopalocarpus alternifolius (Baker) Capuron

Vernacular names: Andrengitra, Fanavimaintso, Hafotrakora, Lombiro, Mantaditra

Description:
Large tree. Leaves medium, venation pinnate, with densely packed and almost parallel secondary veins, coriaceous. Inflorescence a many-flowered panicle. Flower with 4 sepals, 4 white petals, many stamens. Fruit large, woody/fleshy, globose/lobed, with smooth surface.

Habitat:
• Vegetation type: low elevation evergreen forest, dry deciduous forest
• Bioclimate: humid, subhumid
• Geology: basement rock, mesozoic limestone, lava
• Altitude: 3 - 1,000 m

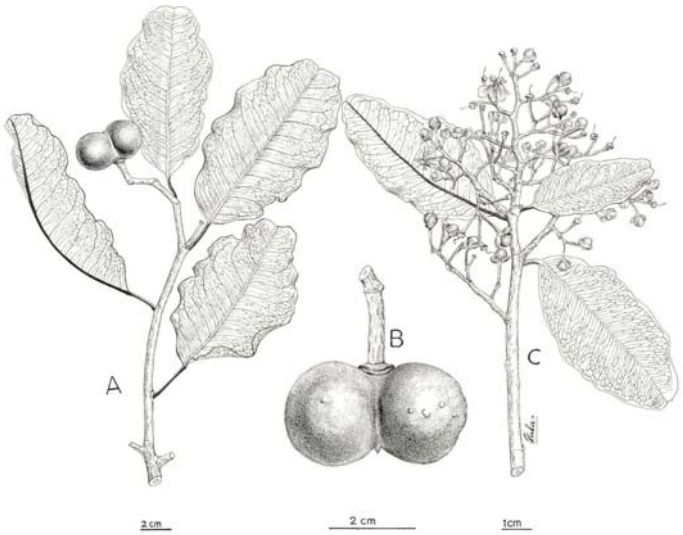
Biology:
• Pollination: probably insect (on basis of flower characteristics also bees seen visiting the flowers of *R. parvifolius* and *Rhopalocarpus suarezensis*)
• Seed dispersal: probably lemurs (Iambana Bernard (pers. comm.) reports that the fruits of this species are eaten by V. *variegata* and *Eulemur fulvus* at Betampona RN)

Uses:
Timber

Distribution:

Risk of extinction: Least Concern (although the population of this species is predicted to decline it has several large and apparently secure sub-populations within protected areas).

Conservation recommendations: good management of protected areas



Observations of study population(s)
• Location: Betampona RN (17.55.55S, 49.12.11E)
• Regeneration observed: Yes
• Tolerant to disturbance: no
• Density: 2 mature individual per ha.
• Abundance: 2,500 – 10,000 mature individuals

Predicted future decline:
• because of habitat loss: 30-50 % (cause of loss = tavy)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 76962 km²
• Area of occupancy: 38067 km²
• Number of subpopulations: 12

Representation in protected areas:
• Number of subpopulations: 6
• Protected areas: Ankarana RS, Betampona RN, Mananara Nord BR, Manongarivo RS, Masoala PN, Montagne d'Ambre PN.

Specimens examined: Madagascar : R. Baron 2412. **Antsiranana**: Masoala PN, R. Bernard et al. 42 ; Manongarivo RS, SF(R. Capuron) 11507 **;** Ankarana RS, SF(R. Capuron) 18997 ; Ankorefo, SF(R. Capuron) 11346 ; Ankarana RS, SF(Rakotosihanaka,J.) 10667 ; Ankarana RS, SF(Rakotosihanaka,J.) 10705 ; Les Roussettes SF, SF(R-152) 205-R-152 ;Tsihomanaomby massif, C. Birkinshaw et al. 730 . **Toamasina** ; Ambanizana, G.E. Schatz & G. Modeste 3070 ; Betampona RN, SF(R. Capuron) 18133 ; Fampanambo, SF(R. Capuron) 18293 ; Menagisy, SF(Goyeneche) 12359 ; Tampolo STF, SF(Zavan P.) 16016 ; Betampona, RN(Rajanoparamy) 9047 ; Manahar, H. Humblot 201 ; Betampona RN, B. Iambana & Arsène 226

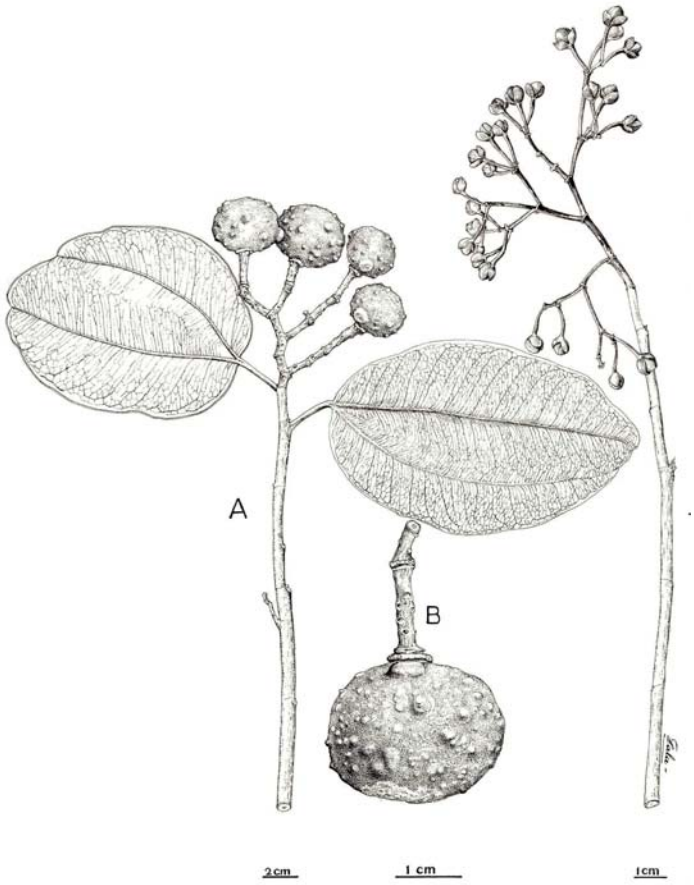
Rhopalocarpus binervius Capuron

Vernacular names: Lombiry

Risk of Extinction: Endangered (A3c)

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in protected areas

Description:
Large tree. Leaves medium, asymmetrical, with two primary veins, coriaceous. Inflorescence a many-flowered panicle. Flower with 4 sepals, 4 white petals, many stamens. Fruit large, woody/fleshy, globose/lobed, surface smooth/warty.

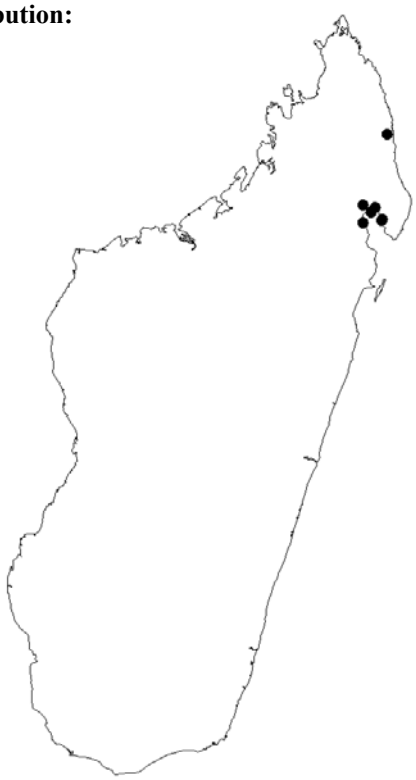


Habitat:
- Vegetation type: low elevation evergreen forest
- Bioclimate: humid
- Geology: basement rocks, lake and alluvial deposits
- Altitude: 20 - 330 m

Biology:
- Pollination: probably insect (on basis of flower characteristics also bees seen visiting the flowers of *R. parvifolius* and *Rhopalocarpus suarezensis*)
- Seed dispersal: probably lemurs based (on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
Timber

Distribution:



Observations of study population(s)
- Location: Ambanizana (15°38’48’’S, 49°57’57’’E)
- Regeneration observed: No
- Tolerant to disturbance: No
- Density: 0.1 mature individual per ha.
- Abundance: <50

Predicted future decline:
- because of habitat loss: 50-80% (because of shifting cultivation and creation of crop plantations)
- because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
- Extent of occurrence: 3,358 km²
- Area of occupancy: 2,128 km²
- Number of subpopulations: 6

Representation in protected areas:
- Number of subpopulations: 1
- Protected areas: Nosy Mangabe RS

Specimens examined: Antsiranana: Tsihomanaomby, Porter P. Lowry II et al. 5180 . **Toamasina** : Nosy Mangabe RS, G.E. Schatz, W.J. Kress, M. Andrianifihanana & S. Love 3244 ; Masoala Peninsula, Michelle L. Zjhra & James Hutcheon 393 ; Masoala Peninsula, Michelle L. Zjhra & James Hutcheon 394 ; Rantabe, SF(R. Capuron) 9172 ; Fampanambo, SF(R. Capuron) 18285 ; Farankaraina SF, SF(Lehimoha) 15942 ; Fampanambo, George E. Schatz et al. 3849 ; Ambanizana, Fidy Ratovoson et al. 90

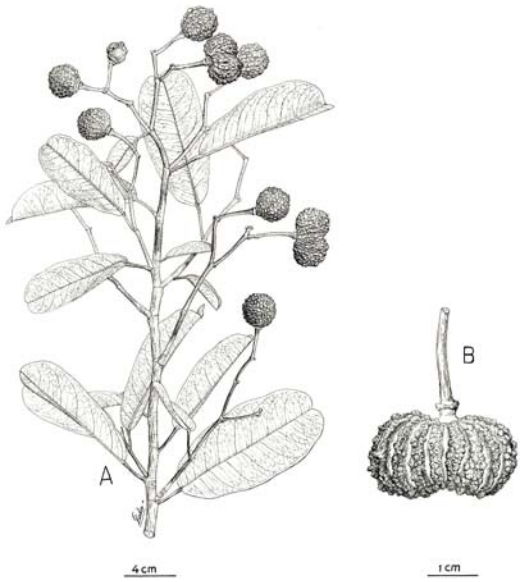
Rhopalocarpus coriaceus (Scott Elliot) Capuron

Risk of Extinction: Endangered (A3c)

Vernacular names: Hazondandy, Mantaditra, Tavia, Tsilavombinanto

Conservation recommendations: a) good management of protected areas; b) inclusion of populations in new conservation sites

Description:
Large tree. Leaves medium, venation pinnate with widely spaced secondary veins, often folded longitudinally when dry, coriaceous. Inflorescence a many-flowered panicle. Flower with 4 sepals, 4 white petals, many stamens. Fruits large/very large, woody/fleshy, globose/lobed, with warty surface.



Habitat:
• Vegetation type: littoral forest, low elevation humd forest
• Bioclimate: humid
• Geology: alluvial and lake deposits, basement rock, lavas, unconsolidated sand,
• Altitude: 5 - 900 m

Biology:
• Pollination: probably insect (based on flower characteristics and observations of bees visiting flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs based (on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses: timber, leaves used as food for silkworms.

Distribution:

Observations of study population(s)	Andohaela PN (25°00'58''S, 46°38'14''E)	Mandena SF (24°57'26''S, 47°01'34''E)
• Regen. observed:	Yes	No
• Tolerant to disturb.:	No	No
• Density (mature individuals per ha.)	3	6
• Abundance (mat. inds.)	>10,000	2,500 10,000
	Tampolo STF (Rahoivelo, 1995)	Sainte Luce (Razafimizanilala, 1996)
• Regen. observed:	-	-
• Tolerant to disturb.:	-	-
• Density (mature individual per ha.)	0.75	9
• Abundance (mat. inds.)	1000-2,500	>10,000

Predicted future decline:
• because of habitat: loss: >80% (cause of loss = shifting cultivation and fire)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population:
• Extent of occurrence: 38,020 km²
• Area of occupancy: 4,365 km²
• Number of subpopulations: 17

Representation in protected areas:
• Number of subpopulations: 3
• Protected areas: Andohahela PN, Masoala PN

Specimens examined: Fianarantsoa: Mahatsinjo, SF(Girard) 15294 ; Lopary, SF(R. Capuron) 23660 ; Mahabo, Johny Rabenantoandro, G. McPherson & Ratiana 643 ; Mahabo, C. Birkinshaw 1166 . **Toamasina**: Antalavia, G.E. Schatz, et al. 1919 ; Ambila-Lemaitso SF, SF 9714 ; Ambila-Lemaitso SF, SF(R.Capuron) 22752 ; Ambila-Lemaitso SF, SF 8292 ; Ambila-Lemaitso SF, SF 9652 ; Tampina, SF(Dumazer) s.n. ; Ambila Lemaitso , C. Birkinshaw et al. 743 ; Ambila-Lemaitso, N. Mamisoa Andrianjafy, F.Y. Razafindrakoto & Victor 103 . **Toliara**: Ste. Luce (Manafiafy), Nicolas Dumetz 634 ; Mandena, R.E. Gereau & N. Dumetz 3274 ; Petriky Forest, R.E. Gereau 3366 ; Mandena, James L. Zarucchi et al. 7605 ; Mandena, James L. Zarucchi et al. 7498 ; Petriky, G. McPherson 14354 ; Petriky, G. McPherson, et al. 14759 ; Mandena, G. McPherson, et al. 14886 ; Petriky, N. Dumetz 647 ; Petriky Forest, G. McPherson, et al. 14128 ; Petriky, R. Rabevohitra 2109 ; Ste. Luce (Manafiafy), P.B. Phillipson, R.A. Clement & G. Rafamantanantsoa 3955 ; Mandena SF, SF(Ranjatoson,E.) 3355 ; Ambinanibe, SF(R.Capuron) 20528 ; Sainte Luce (Manafiafy), A. Randrianasolo 351 ; Mandena SF, A. Randrianasolo 549 ; Ambinanibe, P. Boiteau 2520 ; Vinany-Be, SF(R. Capuron) 11773 ; Zafitsinana, J.H. McWhirter & R. Capuron 186 ; Fort-Dauphin, Y. Cloisel 168 ; Ipetaka, SF 1537 ; Fort-Dauphin, G.F. Scott-Elliot 2818 ; Andohahela RN, RN(Tsilizy) 8352 ; Andohahela RN, H. Humbert 14075bis ; Petriky, L. Allorge 970 ; Fort-Dauphin, R. Decary 4322 ; Amihana, H. Ravololonanahary et al. 94 ; Ambatorongorongo, J. Rabenantoandro et al. 131 ; Petriky, Fidy Ratovoson & F. Randriantafika 119 ; Mandena SF, Faly Randriantafika et al. 67 ; Mandena, J. Rabenantoandro et al. 253 ; Sainte Luce, L. Faliniaina et al. 1 ; Mandena STF, S.G. Razafimandimbison 217 ; Petriky, F. Rakotonasolo et al. 142 ; Sainte Luce, P. Hoffman et al. 200 ; Petriky, R. Randrianaivo et al. 910.

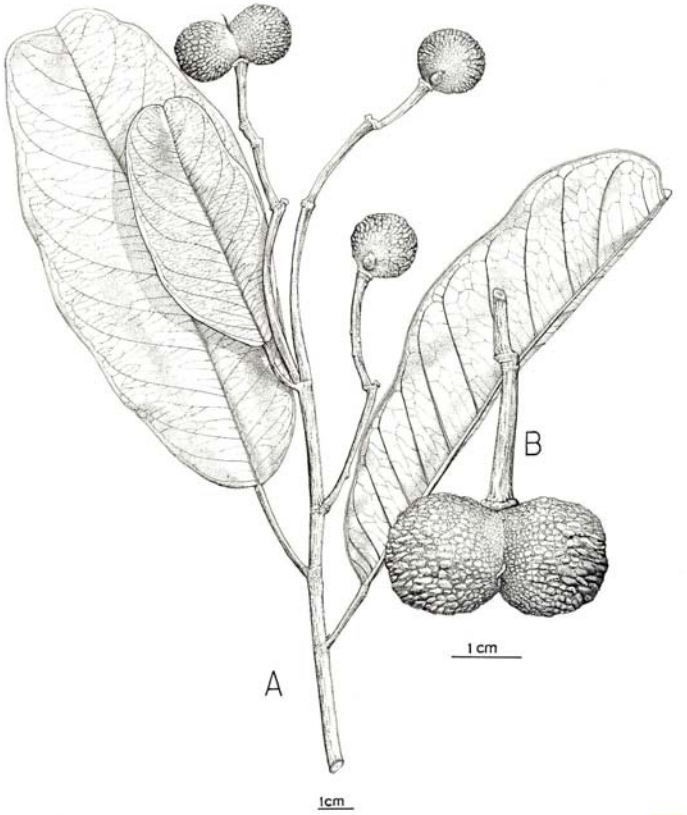
Rhopalocarpus crassinervus (Capuron) Schatz, Lowry & Wolf

Risk of Extinction: Endangered (A3c)

Vernacular names: Havoha, Taviaberavina, Tavia, Tsivakimbinanto

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in protected areas

Description:
Large tree. Leaves medium, venation pinnate with raised widely-spaced secondary veins, often folded longitudinally when dry, very coriaceous. Flower with 4 sepals, 4 white petals, many stamens. Inflorescence a many-flowered panicle. Fruits large/very large, woody/fleshy, globose/lobed, with warty surface.



Habitat:
• Vegetation type: low elevation humid forest, mid elevation humid forest
• Bioclimate: humid
• Geology: basement rocks, lake and alluvial deposits, lavas, unconsolidated sands
• Altitude: 50 - 1,000 m

Biology:
• Pollination: probably insect (on basis of flower characteristics also observations of bees visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (Tranga François (pers. comm.) reports that the fruits of this species are eaten by lemurs at Manombo RS).

Uses:
None reported.

Distribution:

Observations of study population(s)
• Location: Manombo RS (27°01’39’’S, 47°43’50’’E)
• Regeneration observed: Yes
• Tolerant to disturbance: No
• Density: 10 mature individuals per ha.
• Abundance: 1000 - 2,500 mature individuals per ha.

Predicted future decline:
• because of habitat loss: 50-80% (cause of loss = shifting cultivation)
• because of exploitation or poor regeneration: unknown, but poor regeneration possible if animal seed dispersers become rare because of hunting.

Distribution attributes for population
• Extent of occurrence: 28,577 km²
• Area of occupancy: 2,875 km²
• Number of subpopulations: 7

Representation in protected areas:
• Number of subpopulations: 2 (3*)
• Protected areas: Betampona RN, Ranomafana PN (Manombo RS*)
* seen but not collected from this site

Specimens examined: Fianarantsoa: Ivakoana SF, SF(Razafimamonjy) 13416 ; Ranomafana PN, SF(Rahaova) 13422 ; Amboafandrana, SF(Rasoja,G.) 13425 ; Belambo, SF 15253 ; Mananjary, R. Decary 13713 ; Belambo, Service Forestier 16045 . **Toamasina**: Betampona RN, RN(Rakotoniania) 2204

Rhopalocarpus excelsus Capuron

Vernacular names: Lombiro

Risk of Extinction: Endangered (A3c)

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in protected areas

Description:
Very large tree with buttress. Leaves medium/large, venation pinnate, hairy below, apex with muron. Flower with 4 sepals, 4 white petals, many stamens. Inflorescence a many-flowered panicle. Fruits large, woody/fleshy, globose/lobed, with warty surface.

Habitat:
- Vegetation type: low elevation evergreen forest
- Bioclimate: humid
- Geology: basement rocks, lava, lake and alluvial deposits
- Altitude: 100 - 400 m

Biology:
- Pollination: probably insect (on basis of flower characteristics also observations of bees visiting the flowers of other *Rhopalocarpus* species)
- Seed dispersal: probably lemurs (Iambana Bernard (pers. comm.) reports that the fruits of this species are eaten by V. *variegata* and *Eulemur fulvus* at Betampona RN)

Uses:
Timber.

Distribution:

Observations of study population(s)
- Location 1: Betampona RN (17°55'55''S, 49°12'12''E)
- Regeneration observed: No
- Tolerant to disturbance: No
- Density: 4 mature individual per ha.
- Abundance: 2,500 - 10,000 mature individuals

Predicted future decline:
- because of habitat loss: 50-80% (cause of loss = shifting cultivation)
- because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
- Extent of occurrence: 13,772km²
- Area of occupancy: 9,445 km²
- Number of subpopulations: 7

Representation in protected areas:
- Number of subpopulations: 2
- Protected areas: Ambatovaky RS, Betampona RN

Specimens examined: Antsiranana: Tsihomanaomby massif, C. Birkinshaw et al. 729 . **Toamasina**: Vohilava, SF(R.Capuron) 9156 ; Fampanambo, SF(R.Capuron) 18280 ; Betampona RN, M. Andrianarisata 113 ; Manompana, SF (R. Capuron) 22824 ; Ambatovaky RS, RN(Ratoto) 10343 ; Ankirindro, George E. Schatz et al. 3881

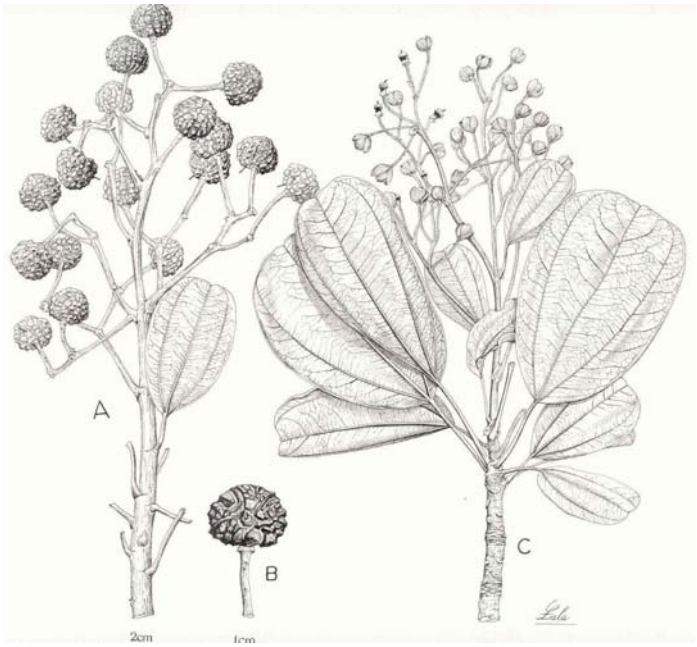
Rhopalocarpus longipetiolatus Hemsley

Vernacular names: Lombiro beravina

Risk of Extinction: Endangered (A3c)

Conservation recommendations: a) good management of protected areas; b) inclusion of additional populations in protected areas

Description:
Medium trees. Stipules large and somewhat persistent. Leaves medium, with three primary veins, coriaceous; petiole to 12 cm long. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large/very large, woody/fleshy, globose, surface with large warts.



Habitat:
- Vegetation type: low elevation evergreen forest
- Bioclimate: humid
- Geology: lavas, lake and alluvial deposits
- Altitude: 0 - 50 m

Biology:
- Pollination: probably insect (on basis of flower characteristics also bees seen visiting the flowers of *R. parvifolius* and *Rhopalocarpus suarezensis*)
- Seed dispersal: probably lemurs based (on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
None reported.

Distribution:

Observations of study population(s)
- Location 1: Ambodiagavo (27°01’39’’S, 50°05’11’’E)
- Regeneration observed: Yes
- Tolerant to disturbance: No
- Density: 15 mature individual per ha.
- Abundance: 2,500 - 10,000 mature individuals per ha.
- Location 2: Cap Est (15°16’27’’S, 50°28’29’’E)
- Regeneration observed: Yes
- Tolerant to disturbance: No
- Density: 3 mature individual per ha.
- Abundance: 2,500 - 10,000 mature individuals per ha.

Predicted future decline:
- because of habitat loss: 50-80% (cause of lossd = shifting cultivation)
- because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
- Extent of occurrence: 593 km²
- Area of occupancy: 399 km²
- Number of subpopulations: 4

Representation in protected areas:
- Number of subpopulations: 1
- Protected areas: Masoala PN

Specimens examined: Antsiranana: Masoala PN, G. Rahajasoa, R. Bernard & J. Rabe 428 ; Masoala PN, G. Rahajasoa, R. Bernard & J. Rabe 508 ; Cap-EstG. Rahajasoa 326 ; Cap Est, SF(R. Capuron) 27761 ; Cap Est, George E. Schatz et al. 3784 ; Cap Est, George E. Schatz et al. 3789 ; Masoala PN, Roger Bernard 299 ; Masoala PN, Fidy Ratovoson et al. 84 ; Beankoraka, J. Rabe 156 ; Ambohitralalana, Chris Birkinshaw 832 . **Toamasina**: Navana, SF(R. Capuron) 8883ter ; Fampanambo, George E. Schatz et al. 3837

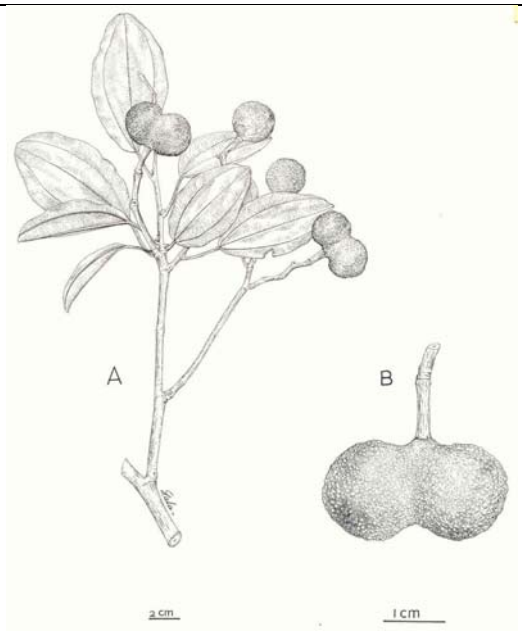
Rhopalocarpus louvelii (Danguy) Capuron

Risk of extinction: Least Concern (although the population of this species is predicted to decline it has several large and apparently secure sub-populations within protected areas).

Vernacular names:
Andriambavinaveotra, Hafotrakora, Havoha lahy, Lombiro, Lombiry, Mantaditra, Tavia, Tsimandoasala

Conservation recommendations: good management of protected areas

Description:
Medium to large trees. Leaves medium, with three primary veins (lateral equal in width to central), tertiary veins evident above, margin undulate, coriaceous. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large/very large, woody/fleshy, globose/lobed, surface smooth or weakly warty.



Habitat:
• Vegetation type: low elevation evergreen forest, mid-elevation humid forest, dry deciduous forest, littoral forest
• Bioclimate: humid, subhumid, dry
• Geology: basement rock, lake and alluvial deposits, lavas, sandstone, tertiary limestone
• Altitude: 10 - 1,500 m

Biology:
• Pollination: probably insect (on basis of flower characteristics also observations of bees seen visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (Tranga François (pers. comm.) reports that the fruits of this species are eaten by lemurs at Manombo RS).

Uses: None reported.

Distribution:

Observations of study population(s)	Manombo RS (27°01’39’’S, 47°43’50’’E)	Mangerivola RS (18°’11’00’’S, 48°55’00’’E)
• Regen. observed:	Yes	Yes
• Tolerant to disturb.:	No	No
• Density (mature individual per ha.)	3	15
• Abundance (mat. inds.)	250 – 1,000	-

Predicted future decline:
• because of habitat loss: 50-80% (cause of loss = shifting cultivation)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 255,473 km²
• Area of occupancy: 52,729 km²
• Number of subpopulations: 34

Representation in protected areas:
• Number of subpopulations: 12 (13*)
• Protected areas: Andohahela PN, Anjanaharibe Sud RS, Mananara Nord RB, Manombo RS, Masoala PN, Nosy Manga Be RS, Zahamena AP (Mangerivola RN*). * seen but not collected from this site

Specimens examined: Antananarivo: Porter P. Lowry II et al. 5169 . **Antsiranana**: Ambanja, SF(R. Capuron) 11393 ; Antsahabeminko, SF 111-R-152 ; Antsirabe-Nord, SF(R. Capuron) 27563 ; Ambatosoratra, Herbier de la Station agricole de l'Alaotra 3244 ; Anjanaharibe-Sud RS, Desiré Ravelonarivo et al. 336 ; Anjanaharibe-Sud RS, Desiré Ravelonarivo et al. 355 ; Cap Est, , George E. Schatz et al. 3785. **Fianarantsoa**: Manombo RS, SF(Bora,Fl.) 13977 ; Manombo SF, SF(Andriantsiferana,H.) 12938 ; Vohitrakora, SF 16064 ; Evato, Service Forestier 15246 Analavory, SF(L.-J. Ratsirahonana) 16069 ; Amporoforo, SF 13913 . Foret de Manombo, Raymond Rabevohitra, J.Rabenantoandro & R.Razakamalala 4132 **Mahajanga**: Berivotra, SF(R. Capuron) 18530bis ; Ambondro Ampasy, SF(Bora,F.) 10395 ; Analarezy, SF(R-187) 30046 . **Toamasina**: Ambatosoratra, G. Cours 3244 ; Nosy Mangabe RS, G. E. Schatz & Al Gentry 2156 ; Ambanizana, G.E. Schatz & G. Modeste 3039 ; Nosy MangabeBetsy Carlson 55 ; Nosy Mangabe RS, G. E. Schatz & Al Gentry 2156 ; Ambanizana, G.E. Schatz & G. Modeste 3039 ; Nosy Mangabe, Betsy Carlson 55 ; Sahavary, G.E. Schatz, et al. 1897 ; Antalavia, A. Gentry & G. E. Schatz 62181 ; Mananara-Nord RB, SF(R. Capuron) 18201 ; Fampanambo, SF(R. Capuron) 18296 ; Lohariandava, SF 689-R-182 ; Farankaraina SF, SF(R. Capuron) 18332 ; Zahamena RN, SF 26287 ; Zahamena RN, RN(Ramanantsoavina) 2801 ; Andriantantely, SF 87-R-233 ; Ambila-Lemaitso, Louvel 232 ; Amboditavolo, SF(R. Capuron) 9007 ; Tenina, SF(R.Capuron) 8928 ; Navana, SF(R.Capuron) 8883bis ; Farankaraina SF, SF 17723 ; Andranobe, N. Vasey & R. Behasy 111 ; Manaka Est, SF(Rabevohitra) 29469 ; Ambodiforaha, J. Rabe et al. 81 ; Ambanizana, Justin Rabe 201 ; Zahamena AP, Stéphan R. Rakotonandrasana et al. 395 ; Rantabe, N. Mamisoa Andrianjafy, F.Y. Razafindrakoto & R. Jaovita 65 ; Sahalangina, N. Mamisoa Andrianjafy, L.R. Andriamiarisoa et Razafindradafa 124 ; Zahamena AP, N.M. Andrianjafy et al. 279 ; Antanambao, Gordon McPherson, J. Rabenantoandro & R. Razakamalala 18968 ; Antanambao-Ambodimanga, Raymond Rabevohitra et al. 4363 . **Toliara**: Analalava, G. McPherson 14287 ; Andohahela RN, B. Randriamampionona 1030

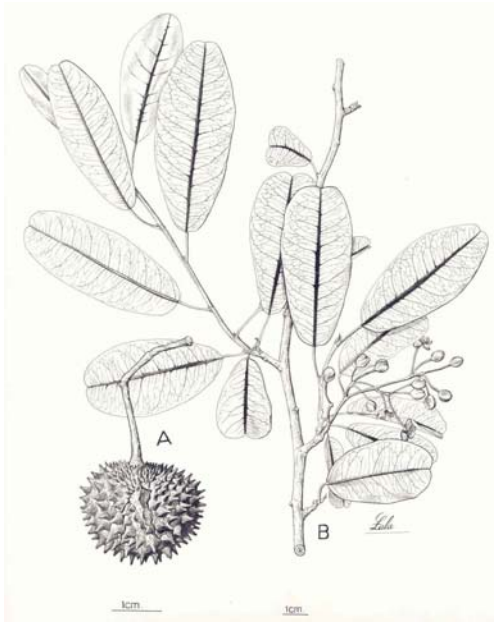
Rhopalocarpus lucidus Bojer

Risk of extinction: Least Concern (although the population of this species is predicted to decline it can tolerat some disturbance of its habitat and has several large and apparently secure sub-populations within protected areas).

Vernacular names: Hafopotsy, Hafotravoa, Hazondrengitra, Hazondrengitsy, Hazondrenitra, Kosy, Masondrenetsa, Raingitralahy, Renditra be, Rengitra, Ringitra, Sely, Talafotsy, Tandria, Tsihonga, Tsiongaka, Tsiangoke, Tsongona, Vony

Conservation recommendations: good management of protected areas

Description:
Shrubs or small trees. Leaves medium, with pinnate venation, midrib thickened and purplish when dry, coriaceous. Inflorescence a many-flowered panicle Flowers with 4 sepals, 4 white petals, many stamens. Fruits large, woody/fleshy, globose (or two lobed), surface with conical spines.



Habitat:
• Vegetation type: dry deciduous forest, dry deciduous thicket, evergreen sclerophyllous woodland
• Bioclimate: subarid, dry
• Geology: alluvial and lake deposits, basement rocks, lava, mesozoic limestone, sandstone, tertiary limestone, unsolidated sands
• Altitude: 15 - 800 m

Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of bees visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably birds (*Coua cristata* seen eating fruits)

Uses: Timber, firewood, wood used to make charcoal, wood used to construct handles for tools, bark used for rope.

Distribution:

Observations of study population(s)
• Location: Andohaela PN (25°00’11’’S, 46°37’14’’E)
• Regeneration observed: Yes
• Tolerant to disturbance: Yes
• Density: 47 mature individual per ha.
• Abundance: > 10,000

Predicted future decline:
• because of habitat loss: <30% (this species is tolerant of disturbance)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 381,954 km²
• Area of occupancy: 24,354 km²
• Number of subpopulations: 80

Representation in protected areas:
• Number of subpopulations: 11
• Protected areas: Andohaela PN, Ankarafantsika RN Andranomena RS, Baie de Baly, Bemaraha RN, Beza Mahafaly RN, Isalo PN, Namoroka RN,

Specimens examined:. **Fianarantsoa**: Isalo PN, SF(Razafindramonjy,C.) 14379 ; Isalo H. Jacquemin 348 ; Bevato, G. Cours 5091 ; Isalo PN, A.-M. Homolle 1479 ; Ambalabe, H. Humbert 19348 ; Isalo PN, H. Humbert 28659 ; Isalo PN, H. Humbert 19490 . **Mahajanga**: Bemaraha RN, J. Villiers, J. Klackenberg & F. Badré 4984 Amborovy, SF(Bertrand) 3114 ; Tsimembo, SF(Martin,R.) 8257 ; Sambiravo, SF(Razanajatovo,B.) 3615 **;** Mangabe, P.J. Rakotomalaza, J. Raharilala, F. Vognono, C. Rasolomanana, S. Randrianasolo & T. Rakotomamonjy 387 ; Berivotra, B. Descoings 3480 ; Ankarafantsika RN, SF(Capuron) 190 ; Antonibe, SF(Ravelo,J.M.) 15084 ; Ambilomavo, SF(Rakotoniaina,J.B.) 14531 ; Ambalafary, SF(Rabearivo & Randriambololona) 19064 ; Andoharano, SF(Razafimahandry) 14926 ; Berivotra, SF(R. Capuron) 24286 ; Tandra, SF(Razafimahandry) 19608 ; Ambodimanary, SF(Fatidra,A.) 12772 ; Morarano, SF(Randrianasolo,A.) 10266 ; Ambalatsingy, SF(Fatidra,A.) 10772 ; Mahajanga, A. Randrianasolo 518 ; Ambararatakely, SF 16321 ; Tongay, SF 16377 ; Bemaraha RN, J. Léandri 389 ; Marohogo , H.J. Lam & A.D.J. Meeuse 6116 ; Majunga, Ch. d'Alleizette 1367 ; Ampazony, J.& M. Peltier 5385 ; Namoroka RN, H. Perrier de la Bâthie 1146 ; Namoroka RN, RN(Randriamiera) 8001 ; Namoroka RN, RN(Randriamiera) 7757 ; Sambiravo, SF 4308 ; Namoroka RN, RN(Rakotovao) 3842 ; Mariarano, SF 9995 ; Namoroka RN, RN(Randrianasolo) 2164 ; Namoroka RN, SF(Randriamiera) 17069 ; Andranomavo, , A. Rakotozafy 1978 ; Ambondro-Ampasy, SF(Augustin Fatidra) 9-R-130 ; Anjiamangirana, R. Ranaivojaona et al. 318 ;Mahajanga: F. Ratovoson et al. 486 . **Toliara**: Beza Mahafaly, Linda Sussman 390 [Andrevo], L.J. Dorr, L.C. Barnett, A. Rakotozafy, M.R. Cheek & N. Razafimalala 4125 ; Andohahela RN, A. Randriamanantena & J. Durbin 52 ; AnalafalyLinda Sussman 115 ; Andohahela RN, N. Dumetz 1408 ; [Tsivonoakely], James S. Miller & A. Randrianasolo 6115 ; Beza Mahafaly, Linda Sussman 309 ; Beza Mahafaly, Linda Sussman 314 ; Andohahela RN, 50 - 200 m, 24.50S 46.33E, 02 Mars 1993, Beberonn Randriamampionona 148 ; Beza Mahafaly RS, Pete Phillipson 1699 ; Antanimora, P.B. Phillipson, R.A. Clement & G. Rafamantanantsoa 3992 ; Beraketa, W.G. D'Arcy & A. Rakotozafy 15331 ; Manombo Atsimo, P.B. Phillipson 2882 ; [Andrevo], G.E. Schatz & J.S. Miller 2472 ; Andohahela RN, S.T. Malcomber & A.J.M. Leeuwenberg 1096 ; Sakaraha SF, SF(Ralaihova) 3382 ; Andohahela RN, Beberonn Randriamampionona 306 ; Andohahela RN, Beberonn Randriamampionona 506 ; Beza-Mahafaly RS, Melissa Luckow 4197 ; Bevia, R. Decary 9449 ; Bekily, SF(R.Capuron) 314 ; Jafaro, SF(Ngoloka,E.) 5333 ; Tanambao, SF(Dimisy) 12293 ; Fotadrevo, SF(Ralaiarison,J.J.) 12783 ; Vohipary, SF(Marson) 12905 ; Betsipotika SF, SF(Rakotomahefa G.) 13048 ; Ranopiso, SF(Lamarque,P.) 10271 ; Bevilany, SF(R.Capuron) 11847 ; Tsimafana, SF(Ravelosaona) 7798 ; Befasy, SF(Valitera,D.) 16631 ; Betsako, SF(Rakotondravony) 5023 ; Andohahela RN, Michèle Andrianarisata et al. 99 ; Mahatsara, SF 21371 ; Morondava, J. Rahantamalala 208 ; Filanjara, Service Forestier 21bis-R-276 ; Andohahela RN, P.J. Rakotomalaza 594 ; Befandriana-Sud, R. Decary 16167 ; Antanimora, J.& M. Peltier 2870 ; Ankazoabo, Ph. Morat 2509 ; Andohahela RN, J. Léandri & P. Saboureau 4249 ; Andohahela RN, J. Léandri & P. Saboureau 4421 ; Andohahela RN, J. Léandri & P. Saboureau 4412 ; Ankilizato, M. Keraudren-Aymonin & G. Aymonin 25851 ; Morondava, M. Keraudren-Aymonin & G. Aymonin 25902 ; Sakoa, J.-L. Guillaumet 2494bis ; Anjamala, F. Chauvet 383 ; Antanimora, F. Chauvet 312 ; Imanombo, Ch. Alluaud 22 ; Bekily, P. Boiteau 388 ; Ifotaka, J. Bosser 4410 ;Toliara:, A. Aubréville s.n. ; Rokay, E. Basse s.n. ; Manambolo, H. Humbert 6801 ; Isomono, H. Humbert 12822 ; Ampanihy, H. Humbert & C.F. Swingle 5547 ; Andranomena RS, B. Du Puy & D. Du Puy MB246 ; Ampasimpolaka, R. Decary 2838 ; Antanimora, R. Decary 4390 ; Vohitsiombe, R. Decary 4571 ; Antanimora, R. Decary 8861? ; Ampilira, R. Decary 9375 ; Ampandrandava, A. Seyrig 22 ; Ampandrandava, A. Seyrig 262 ; Lambomakandro, SF(5R224) 8298 ; Andohahela RN, RN(Rakotoson) 7928 ; Ankazoabo, SF 4131 ; Manave, SF 9570 ; Filanjara, SF 12827 ; Befasy, SF 43-R-19 ; Andohahela RN, RN(Rakotoson) 10770 ; Belo sur Tsiribihina, Service Forestier 14128 ; Ankazomanga, SF 13502 ; Marofany, SF(R-226) 11153 ; Ianandranto, SF 12387 ; Imanombo, Bosser, J. 3774 ; Andohahela RN, SF(Rakotoson) 17046 ; Ifaty, A. Rakotozafy 1596 ; AmpandrandavaHerbier du Jardin Botanique de Tananarive 6060 ; Tsiandevenana, Bosser 4602 ; Imanombo, Bosser 3794 ; Marofihitsa, SF(Rabevohitra) 32854 ; Ejeda, SF(J.J. Ralaiarison) 32-R-242 ; Ampanihy, Bernardi 11442 ; Andohahela RN, Sylvain Eboroke et Limby 983 ; Andohahela RN, Rolland Laha 70 ; Tsimelahy, H. Ravololonanahary et al. 89 ; Andohahela RN, Rolland Laha 228 ; Andohahela PN, Fidy Ratovoson et al. 94 ; Benato, SF(Valitera) 27-R-190 ; Filanjara, SF(Tsimagna) 21-R-276 ; Kirindy RS, SF(J. P. Abraham) 30876 ; Kirindy, R. Randriamarosoa et al. 359 ; Ifaty, Rakotozafy, A. 1596bis ; Toliara, Michèle Andrianarisata, B. Lewis, G.M. Rahajasoa, P.J. Rakotomalaza, M. Randriambololona, J. McDonagh, A. Ramisamihantanirina, et B. Randriamampionona 99

Rhopalocarpus macrorhamnifolius Capuron

Vernacular names: Hafotrakora, Fanondambo, Havoha, Lombiro, Sary

Description:
Like *R. louvelii* but lateral primary veins smaller than central, tertiary veins not evident above, and margin not undulate.

Habitat:
• Vegetation type: low elevation evergreen forest, mid-elevation evergreen forest
• Bioclimate: humid
• Geology: basement rocks, lake and alluvial deposits, lavas
• Altitude: 10 - 1170 m

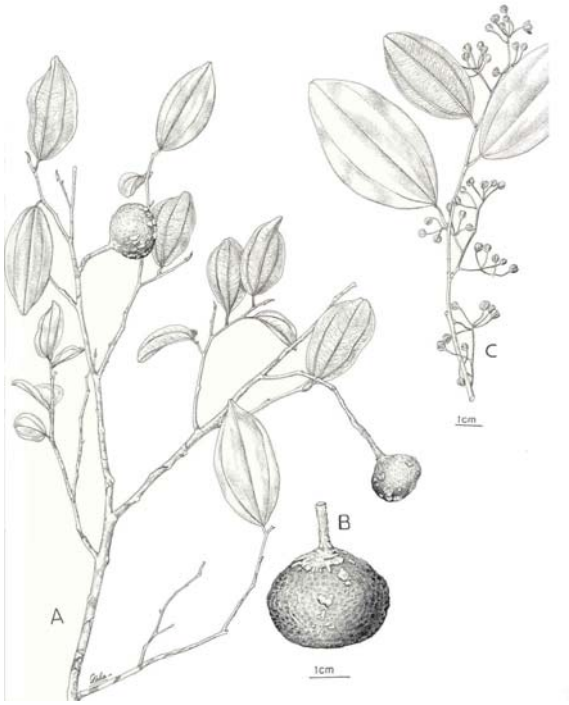
Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of bees visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (Iambana Bernard (pers. comm.) reports that the fruits of this species are eaten by V. *variegata* and *Eulemur fulvus* at Betampona RN).

Uses:
Timber

Distribution:

Risk of extinction: Least Concern (although the population of this species is predicted to decline it has several large and apparently secure sub-populations within protected areas).

Conservation recommendations: good management of protected areas



Observations of study population(s)
• Location: Betampona RN (17°55’55’’S, 49°12’11’’E)
• Regeneration observed: Yes
• Tolerant to disturbance: No
• Density: 4 mature individual per ha.
• Abundance: 2,500 - 10,000 mature individuals

Predicted future decline:
• because of habitat loss: 50-80% (cause of loss = shifting cultivation)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 58,570 km²
• Area of occupancy: 32,360 km²
• Number of subpopulations: 18

Representation in protected areas
• Number of subpopulations: 7
• Protected areas: Andohaela PN, Anjanaharibe Sud RS, Betampona RN, Masoala PN, Marojejy RN, Zahamena PN.

Specimens examined: Antsiranana: Marojejy RN, Marion Nicoll 663 ; Marojejy RN, F. Rasoavimbahoaka 477 ; Anjanaharibe-Sud RS, Desiré Ravelonarivo et al. 449 ; Anjanaharibe-Sud RS, Desiré Ravelonarivo et al. 458 ; Ambodigavo, Fidy Ratovoson et al. 82 ; Fanambana, R. Randrianaivo et al. 588 . **Toamasina**: Ambanizana, G.E. Schatz & G. Modeste 3051 ; Betampona RN, RN(Rakotoniaina) 2630 ; Betampona RN, SF(R. Capuron) 18097 ; Fampanambo, SF(R. Capuron) 18283 ; Farankaraina SF, SF(R. Capuron) 18346 ; Tampolo SF, SF(R. Capuron) 22812 ; Soanierano-Ivongo, SF(Pasquine-Galan,B.) 11054 ; Tanambao, SF(R. Capuron) 9184 ; Tampolo SF, SF 15900 ; Tampolo SF, SF(R-107) 15609 ; Betampona RN, RN(Razanaparany) 8743 ; Betampona RN, RN(Rakotoniaina) 2203 ; Betampona RN, SF(Razanaparany) 17552 ; Tampolo STF, Service Agricole 1051 ; Ambodiriana, SF(Razanaparany) 8743 ; Ankirindro, George E. Schatz et al. 3912 ; Betampona RN, B. Iambana & Arsène 242 ; Zahamena PN, Fidy Ratovoson et al. 159 ; Beanana, N. Mamisoa Andrianjafy, R. Jaovita & R. Raharison 69 ; Ankirindro, G.E. Schatz & P. Antilahimena 4015 . Zahamena AP, N.M. Andrianjafy et al. 339 ; Zahamena AP, A. Rakotondrafara et al. 223 ; **Toliara**: Andohahela RN, Rolland Laha 176 ; Andohahela RN, R. Ranaivojaona et al. 119

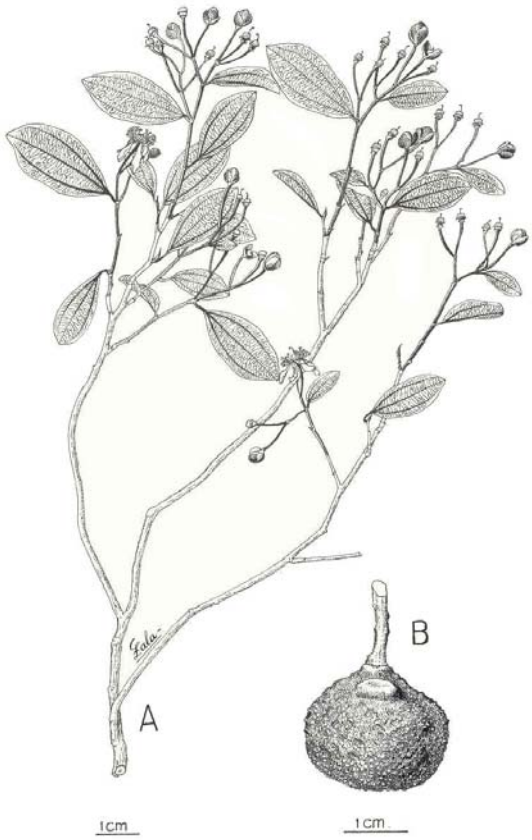
Rhopalocarpus parvifolius (Capuron) Schatz, Lowry & Wolf

Risk of extinction: Critically Endangered (A3c, B1ab, C1)

Vernacular names: Tavialahy, Havoha

Conservation recommendations: a) inclusion of populations in new conservation sites; b) ex-situ conservation.

Description:
Like *R. louvelii* but leaves small with petiole less than 5 mm long.



Habitat:
• Vegetation type: littoral forest
• Bioclimate: humid
• Geology: unconsolidated sands
• Altitude: 10 m

Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of bees visiting flowers at Ambila Lemaintso)
• Seed dispersal: probably lemurs (based on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
Timber.

Distribution:

Observations of study population(s)
• Location: SF Ambila Lemaitso (18°52'15''S, 49°08'11''E)
• Regeneration observed: Yes
• Tolerant to disturbance: No
• Density: 1 mature individual per ha.
• Abundance: 50 - 250 mature individuals

Predicted future decline:
• because of habitat loss: >80% (because of fire and shifting cultivation)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 36 km²
• Area of occupancy: 27 km²
• Number of subpopulations: 3

Representation in protected areas:
• Number of subpopulations: 0
• Protected areas: None

Specimens examined: Toamasina: Ambila-Lemaitso SF, SF(Lemanivo) 1624 ; Ambila-Lemaitso SF, SF(Ecol.Forest.) 1795 ; Ambila-Lemaitso SF, SF 19005 ; Ambila-Lemaitso SF, SF 15316 ; Ambila-Lemaitso SF, SF 9715 ; Ambila-Lemaitso SF, SF 19243 ; Ambila-Lemaitso SF(R. Capuron) 8569 ; Ambila-Lemaitso STF, SF 17996 ; Andavakimenarana, Fidy Ratovoson et al. 22 ; Vohibola forest, Richard Razakamalala 290 .

Rhopalocarpus similis Hemsley

Vernacular names: Bemanefoka, Fanazava, Hafotrakanga, Hazondringitra, Lombirohazo, Raingitra, Raingitravavy, Rengitra, Ringitra Talafotsy, Taolandambo

Description:
Small to large trees. Leaves small/medium, with pinnate venation, upper and lower surfaces coloured differently when dry, fine network of secondary veins evident on both surfaces. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens; stalk hairy. Fruits large, woody/fleshy, globose/lobed, surface with short conical spines.

Habitat:
• Vegetation type: dry deciduous forest, dry decidous thicket, mid-elevation humid forest
• Bioclimate: subarid, dry, subhumid
• Geology: alluvial and lake deposits, basement rocks, lavas, mesozoic limestone, sandstone, unconsolidated sands
• Altitude: 5 - 1200 m

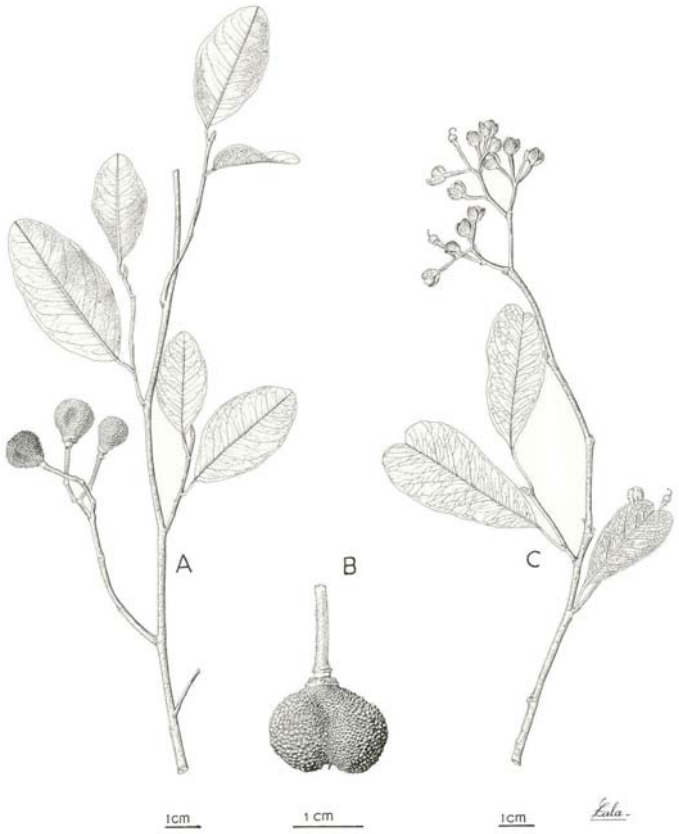
Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of insects visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (based on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
None reported.

Distribution:

Risk of extinction: Least Concern

Conservation Recommendations: good management of protected areas



Observations of study population(s)
• Location: -
• Regeneration observed: -
• Tolerant to disturbance: Yes
• Density: -
• Abundance: -

Predicted future decline:
• because of habitat loss: <30% (tolerant to some disturbance)
• because of exploitation or poor regeneration: unknown, but poor regeneration possible if animal seed dispersers become rare because of hunting.

Distribution attributes for population
• Extent of occurrence: 327,236 km²
• Area of occupancy: 16,952 km²
• Number of subpopulations: 63

Representation in protected areas:
• Number of subpopulations: 7
• Protected areas: Ankarafantsika PN, Baie de Baly, Isalo PN, Namoraka RN, Zombitsy PN

Specimens examined: Antananarivo: Analandraisoa, SF(R. Capuron) 6727 ; Babetville, SF(Capuron) 11985 ; Ambohiby, SF(R. Capuron) s.n. ; Andilamena, J. Bosser 16496 ; Ambohimandroso, J. Rabenantoandro et al. 74 . **Fianarantsoa**: Ivohibe, B. Descoings 3783 ; Kitranga, SF(Poulaine) 5163 ; Kitranga, SF(R. Capuron) 11615 ; Ihosy SF, SF(L. Bégué) 7639 ; Kitranga, SF(Rakotonirina,J.B.) 13455 ; Isalo PN, SF(R. Capuron) 18585 ; Maintinandry, SF 5954 ; Mangona, SF 14094 ; Isalo PN, Keraudren(A. Razafindrakoto) 1103 ; Isalo PN, J. Léandri & P. Saboureau 3957 Antolohomiady, P. Boiteau 2106 ; Isalo PN, SF 14344 ; Isalo PN, SF(C. Razafindramonjy) 79-R-141 ; **Mahajanga**, Ampijoroa SF, A. Gentry & G. E. Schatz 62113 ;: Ampijoroa SF, A. Gentry & G. E. Schatz 62122 ; Ampijoroa SF, Marion Nicoll 383 ; Ampijoroa SF, Pete Phillipson 1933 ; Port Bergé Vaovao, G. E. Schatz, A. Rakotozafy, W. D'Arcy & J. Randrianasolo 1597 ; Mahajanga, L.J. Dorr 3831 ; Namatsia, SF(Le-Graet,J.) 8072 ; Antsanitia SF, SF(Bertrand) 3111 ; Mahamavo, , SF(Randriantompoina,A.) 3583 ; Mahajanga: A. Gentry 11553 ; Mahajanga: A. Gentry 11759 ; Ampijoroa SF, P.J. Rakotomalaza et al. 640 ; Amborovy, SF 1830 ; Besalampy, SF(Adanimaroboria) 5356 ; Ambalafotaka, SF(Rakotoniaina,J.B.) 14525 ; Ambalavelona, SF(Rabearivo & Randriambololona) 19063 ; Ampasindava, SF(Laoza,G.) 19143 ; Ambohimitsinjo, SF(Naha,J.D.) 19482 ; Analobe, SF(Rakotondradaora,E.) 19493 ; Maroboaly, SF(Rabearivo) 19671 ; Bemiha, SF(R. Capuron) 6887 ; Ampijoroa SF, SF(Ecol.Forest.) 7341 ; Ambiky, SF(Laoza,G.) 16514 ; Antetikirija, SF(Bora,Fl.) 10406 ; Ampijoroa SF, SF(Ecol.Forest.) 16846 ; Ampijoroa SF, A. Randrianasolo 530 ; Ampandra, SF(R-153) 16372 ; Andrafia, SF 15808 ; Analabé, SF 15769 ; Soalala, SF(Randriamiera) 17415 ; Marokoloy, Service Forestier 9579 ; Mangabory, SF 4010 ; Ampasindava, SF 105-R-281 ; Ankarafantsika RN, P. Boiteau 1048 ; Amborovy, J.& M. Peltier 5300 ; Bemiha, J. Léandri, R. Capuron & A. Razafindrakoto 2271 ; Majunga, R. Decary 908 ; Caïman, H. Humbert 7157 ; Majunga, H. Humbert & H. Perrier de la Bâthie 2029 ; Ankobakobaka, SF(553 R 187) 30021 ; Ambato-Boeni, SF 14587 ; Namoroka RN, RN(Randriamiera) 8559 ; Ampijoroa , Service Forestier 14146 ; Mangoboka, SF 19361 ; Ambavaranobe, SF(Sajy Casimir no. 183-RN) 25931 ; Ankarafantsika RN, SF 2278 ; Ankarafantsika RN, RN(Ramamonjisoa) 2583 ; Ankarafantsika RN, RN(Tsilizy) 2975 ; Ankarafantsika RN, RN(Harizo) 1032 ; Ampijoroa SF, SF 4972 ; Ankarafantsika RN, RN(Ramamonjisoa) 2081 ; Ambarijeby, ; Service Forestier 19461 ; Antsoa, SF 19363 ; Soalala, A. Rakotozafy 1915 ; Ampijoroa SF, A. Rakotozafy 1992 ; Tsaramandroso, Institut Scientifique de Madagascar 2975 ; Mahamavo, SF(Randriantompoina) 13-R-114 ; Mahajanga: SF(Therezien Yvees) 25313 ; Tsarajomoka, SF(Rakotoarimanana) 25995 ; Ankarafantsika RN, RN(Ranjokiny) 12293 ; Ankarafantsika RN, SF(Rabevohitra) 34801 ; Ampijoroa SF, SF(Comtet) 34365 ; Ampijoroa SF, SF(Rabevohitra) 34500 ; Ampijoroa SF, SF(Rabevohitra) 34504 ; Antsanitia, SF 26970 ; Antsanitia STF, R. Randrianaivo et al. 377 ; Ampijoroa STF, R. Randrianaivo et al. 391 ; Anjiamangirana, R. Ranaivojaona et al. 321 ; Ankarafantsika RN, R. Randrianaivo et al. 621 ; Mahajanga: F. Ratovoson et al. 485 . **Toamasina**: Andilamena, J. Bosser 16492 ; Analamanatrika, G. Cours 2182 ; Analamanatrika, Herbier de la Station Agricole de l'Alaotra 2182 ; Analamanatrika, A.-M. Homolle 2182 ; Tsarahonenana, SF 15715 ; Mahatsara, SF(Rabevohitra) 34671. **Toliara,** Zombitsy, P.B. Phillipson & J.R. Milijaona 3646 ; Zombitsy, SF(Randrianasolo,I.V.) 3410 ; Zombitsy, Thomas B. Croat 30739 ; Herea, SF(Poupon,J.) 15347 ; Analavelona, SF(Randrianasolo,IV) 5261 ; Ambohimahavelona, SF(L. Bégué) 12563 ; Lambomakondro, SF 4573 ; Ankoratsaka, SF 13812 ; Sakaraha, J. Bosser 9084 ; Ankinany, R. Decary 15962 Fiherenana, H. Humbert & C.F. Swingle 5066 ; Zombitsy, J. Léandri 3584 ; Besely, Ph. Morat 3872 ; Zombitsy, Thomas B. Croat 30690 ; Mitia, SF(Ranaivoson) 25-R-224 ; Zombitsy, R. Randrianaivo et al. 309

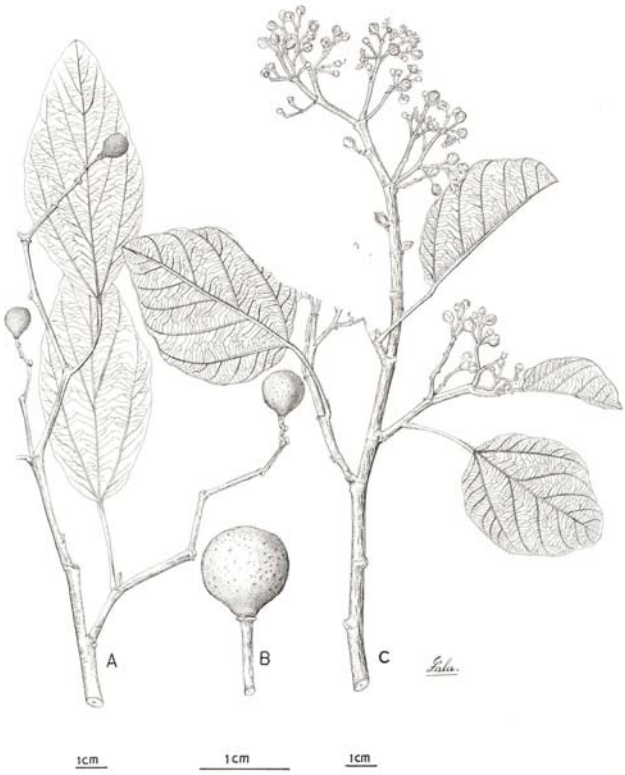
Rhopalocarpus suarezensis Capuron ex Bosser

Vernacular names: Hafompotsy, Lombiroala, Selivato

Risk of extinction: Critically Endangered (A3c)

Conservation recommendations: inclusion of populations in new conservation sites

Description:
Medium to large trees. Leaves medium, with three primary veins, tertiary veins evident above, golden with blackish venation when dry, papery. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large, woody/fleshy, globose, with smooth surface.



Habitat:
- Vegetation type: dry decidous forest
- Bioclimate: dry
- Geology: alluvial and lake deposits, lavas, mesozoic limestone, sandstones, unconsolidated sands
- Altitude: 20 - 250 m

Biology:
- Pollination: probably insect (on basis of flower characteristics also bees seen visiting its flowers)
- Seed dispersal: probably lemurs (based on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
timber, wood used to make handles for tools.

Distribution:

Observations of study population(s)	Orangea (12°12’55’’S, 49°21’25’’E)	Baie de Courrier (12°30’28’’S, 49°23’18’’E)
• Regen. observed:	Yes	Yes
• Tolerant to disturb.:	No	No
• Density (mature individual per ha.)	45	35
• Abundance (mature indivs.)	>10,000	>10,000

Predicted future decline:
- because of habitat loss: >80% (cause of loss = fire and shifting cultivation)
- because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
- Extent of occurrence: 498 km²
- Area of occupancy: 0 km² (remaining fragments of vegetation too small to be included on maps used for analysis)
- Number of subpopulations: 8

Representation in protected areas:
- Number of subpopulations: 0
- Protected areas: None

Specimens examined: Antsiranana: Baie de Courrier, SF(R. Capuron) 20138 , Orangea, SF(R. Capuron) 23271 ; Orangea, SF(R. Capuron) 20934 ; Andrakaka, SF(R. Capuron) 23283 ; Ambongoabo, SF(R. Capuron) 24453 ; Orangea, G. Cours, avec le Professeur Humbert 5403 ; Orangea, H. Humbert & G. Cours 32289 ; Ankingameloka, SF(R. Capuron) 24463bis ; Ambongoabo, SF(R. Capuron) 24648 ; Namakia, SF 9-R-143 ; Ankotekona, , SF(R. Capuron) 24463 ; Antsiranana: A. Rakotozafy 1546bis ; Ramena, Fidy Ratovoson & F. Randriantafika 30 ; Windsor Castle, F. Randriantafika et al. 20 ; Cap d'Ambre, Rakotozafy, A. 1546 (MO).

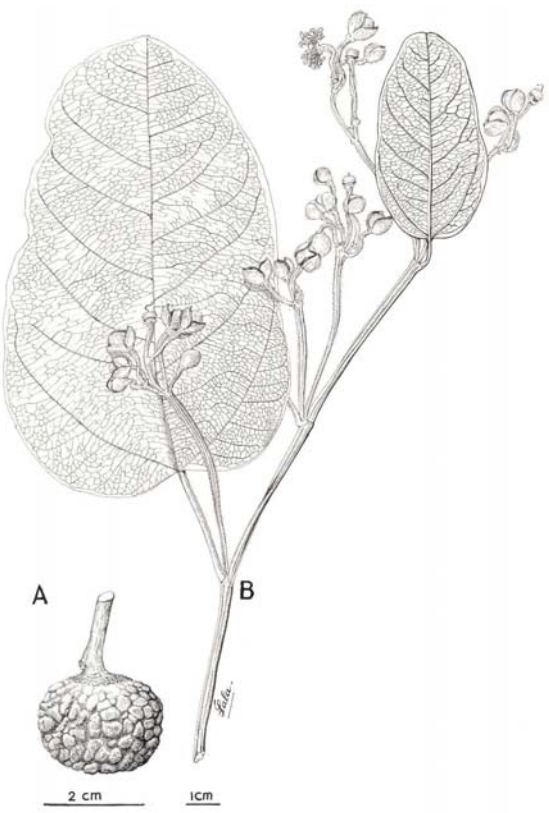
Rhopalocarpus thouarsianus Baill.

Vernacular names: Lombiro, Manondroala, Varoala

Risk of extinction: Critically Endangered (A3c)

Conservation recommendations: inclusion of populations in new conservation sites.

Description:
Small to medium trees. Leaves medium, with three primary veins, tertiary venation evident above, hairless, coriaceous. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large, woody/fleshy, globose/lobed, with warty surface.



Habitat:
• Vegetation type: littoral forest, low elevation evergreen forest
• Bioclimate: humid
• Geology: alluvial and lake deposits, basement rocks, sandstones, unconsolidated sands
• Altitude: 0 - 10 m

Biology:
• Pollination: probably insect (on basis of flower characteristics and observations of bees visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (based on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
Timber, firewood.

Distribution:

Observations of study population(s)
• Location: Tampolo (17°17'S 49°23' 30"E)
• Regeneration observed : Yes
• Tolerant to disturbance : No
• Density: 9 mature individuals per ha.
• Abundance: >10,000 mature individuals

Predicted future decline:
• because of Habitat: loss: >80% (cause of loss = shifting cultivation and fire)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 7,996 km²
• Area of occupancy: 165 km²
• Number of subpopulations: 12

Representation in protected areas:
• Number of subpopulations: 0
• Protected areas: none

Specimens examined: Fianarantsoa: Nosy-Varika, SF 19533 ; Marosangy, SF 13433 . **Toamasina**: Mahavelona, R.D. Noyes, D.K. Harder, E.A. Rakotobe, T.G. Razafindrabeaza & P. Gaone 948 . Mahatsara, SF 34148 ; Tampolo SF, G.E. Schatz, L. Raholivelo, V. Raharimalala & J. Randriamampionona 3634 ; Tampolo SF, Service Agricole 1052 ; Soanierana Ivongo, C. Birkinshaw et al. 322 ; Antetezana SF, SF(Todivelona) 1363 ; Antetezana SF, SF(R. Capuron) 699 ; Tampolo SF, James S. Miller, J. Bradford, F. Rakotonasolo & A. Randrianasolo 8806 ; Tampolo SF, SF(Laisonoa) 10301 ; Antetezana SF, SF(Todivelona) 14497 ; Tampolo SF, Tampolo SF, SF(Zavah,P.) 13081 ; Tampolo SF, SF(Zavah,P.) 12536 ; Mahatsara, SF(Paul,E.) 10590 ; Soanierano-Ivongo, SF(Pasquine-Galan,B.) 11056 ; Menagisy, SF(Goyeneche) 10745 ; Tampolo SF, SF(R-107) 15617 ; Sahavolamenabe, SF(R. Capuron) 23791 ; Foulpointe, H. Humblot s.n. ; Tampolo SF, SF(Paul Zavah) 15901 ; Ambila-Lemaitso SF, SF 9896 ; Tampolo SF, M. Debray 1877 ; Tampolo SF, A. Rakotozafy 1314 ; Tampolo SF, A. Randrianasolo 448 ; Mahatsara, SF(Rabevohitra) 32940 ; Mahatsara, SF(Rabevohitra) 34715 ; Mahatsara, SF(Rabevohitra) 32945 ; Tampolo SF, SF(Rabevohitra) 32658

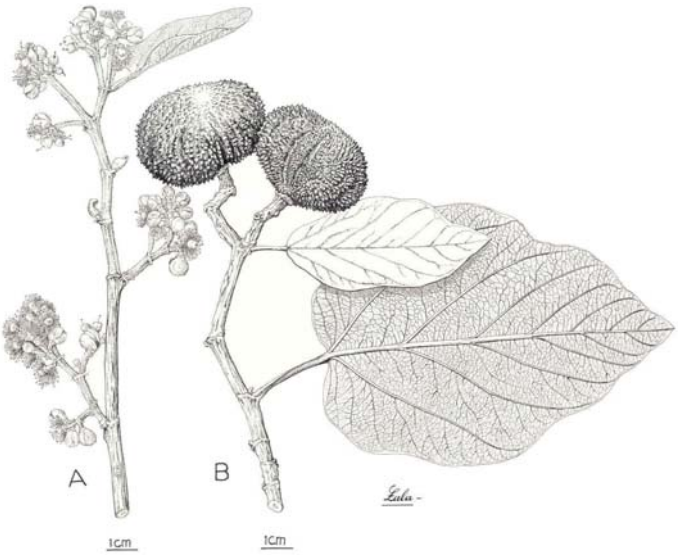
Rhopalocarpus triplinervius Baill.

Vernacular names: Lombiro, Manondroala, Varoala

Risk of extinction: Critically Endangered (A3c)

Conservation recommendations: inclusion of populations in new conservation sites

Description:
Small trees. Leaves medium, with three primary veins, tertiary veins obscure above, with golden hairs below, coriaceous. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large, woody/fleshy, globose/lobed, surface with short spines.

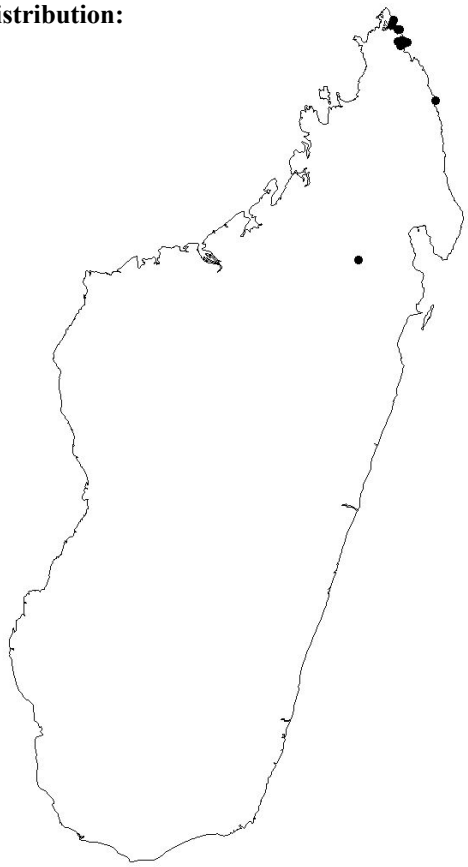


Habitat:
- Vegetation type: dry decidous forest
- Bioclimate: dry, subhumid
- Geology: basement rocks, lavas, mesozoic limestone, sandstone, unconsolidated sands
- Altitude: 100 - 200 m

Biology:
- Pollination: probably insect (on basis of flower characteristics ande observations of bees visiting the flowers of other *Rhopalocarpus* species)
- Seed dispersal: probably lemurs (based on fruit characteristics and observations of lemurs feeding on the fruits of other *Rhopalocarpus* species)

Uses:
Wood used to make handles for tools.

Distribution:



Observations of study population(s)
- Location: Analajanana (12°30’28’’S, 49°23’18’’E)
- Regeneration observed: Yes
- Tolerant to disturbance: No
- Density: 0.3 mature individual per ha.
- Abundance: 50 - 250 mature individuals

Predicted future decline:
- because of habitat loss: >80% (cause of habitat loss = shifting cultivation and fire)
- because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
- Extent of occurrence: 20,460 km²
- Area of occupancy: 607 km²
- Number of subpopulations: 9

Representation in protected areas:
- Number of subpopulations: 0
- Protected areas: none

Specimens examined: Antsiranana: Diego Suarez, D.K. Harder, M.C. Merello, S.G. Razafimandimbison & T.G. Razafindrabaeza, et al. 1672 ; Analafiana, SF(R. Capuron) 27527 ; Sahafary, SF(R. Capuron) 11374 ; Sahafary, SF(R. Capuron) 22009 ; Ambolobozobe, Service Forestier 14004 ; Sahafary, Service Forestier 9425 ; Diégo-Suarez, Ch. BeRNer 2596 ; Ambanilalana, Ch. BeRNer 227 ; Ambolobozobe, SF 15964 ; Ambolobozobe, SF 15835 ; Ivovona, SF(R. Capuron) 22963 ; Antsoha, SF(R. Capuron) 23045 ; Orangea, A. Rakotozafy 1475bis ; Andrafiabe, Fidy Ratovoson et al. 45 ; Orangea, Rakotozafy, A. 1475 . **Mahajanga**: Mandritsara, SF 128-R-301

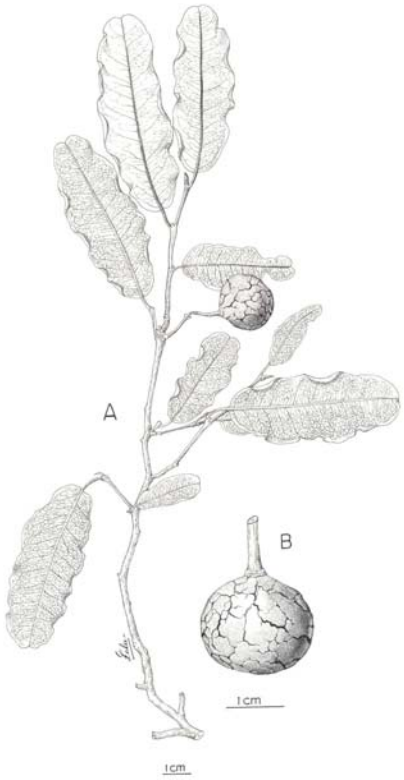
Rhopalocarpus undulatus Capuron

Vernacular names: Andrengitra, Lombiroala

Risk of extinction: Critically Endangered (A3c)

Conservation recommendations: a) good management of protected arfeas; b) inclusion of populations in new conservation sites.

Description:
Medium trees. Leaves small/medium, with pinnate venation, margin strongly undulate. Inflorescence a many-flowered panicle. Flowers with 4 sepals, 4 white petals, many stamens. Fruits large, woody/fleshy, globose/lobed.



Habitat:
• Vegetation type: dry deciduous forest
• Bioclimate: dry
• Geology: lava, unconsolidated sands, lake and alluvial deposits, mesozoic limestone
• Altitude: 10 - 315 m

Biology:
• Pollination: probably insect (on basis of flower characteristics and observation sof bees visiting the flowers of other *Rhopalocarpus* species)
• Seed dispersal: probably lemurs (or possibly birds) based (on fruit characteristics and observations of lemurs (birds) feeding on the fruits of other *Rhopalocarpus* species)

Uses:
Timber.

Distribution:

Observations of study population(s)
Location 1: Forêt d'Ambre (12°25'15"S, 49°11'30"E, Rakotonandrasana 1997)
• Regeneration observed: -
• Tolerant to disturbance: -
• Density: 61 mature individual per ha.
• Abundance: >10,000 mature individuals

Predicted future decline:
• because of habitat loss : >80 % (cause of loss = shifting cultivation and fire)
• because of exploitation or poor regeneration: unknown, but decline possible because of exploitation and poor regeneration resulting from increasing rarity of animal seed dispersers.

Distribution attributes for population
• Extent of occurrence: 4,746 km²
• Area of occupancy: 561 km²
• Number of subpopulations: 7

Representation in protected areas:
• Number of subpopulations: 1
• Protected areas: Ankarana RS

Specimens examined: Antsiranana: Ankarana RS, SF(Rakotosihanaka) 10526 ; Diego-Suarez, E. Ursch 145 ; Ambodivahibe, Service Forestier 15966 ; Ankarana RS, SF 9380 ; Andaingo, SF(R. Capuron) 27431 ; Sakaramy SF, SF(Rabevohitra) 29976 ; Ankarana RS, H. Humbert 32440 ; Sahaka, Gordon McPherson 18857 ; Analabe, J.Rabenantoandro et al. 1293 ; Analabe, J.Rabenantoandro et al. 1303 ; Mahavanona, Fidy Ratovoson et al. 740 ; Mahavanona, Sennen Randrianasolo et al. 405

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