



Pycnandra longiflora (Sapotaceae) a species believed to be extinct, rediscovered in New Caledonia

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Pycnandra longiflora (Sapotaceae) belongs to the largest endemic genus in New Caledonia. It is only known from the type collection made in 1861–67 at the obscure locality “Gatope”. Relocation of this species has been of high priority for more than a decade, but without success. *Pycnandra longiflora* was therefore recently declared extinct. However, a population was recently discovered near a mining site at Onajiele, in the Ouazangou-Taom massif, and it is revealed that *P. longiflora* has the most spectacular flowers in the entire genus, being large and bicoloured in red and yellow. A thorough description is here outlined and we propose a preliminary IUCN status as Critically Endangered.

Key words: Extinct species, rediscovering, extended description, prospection

Sapotaceae was the first plant family to be treated for Flore de Nouvelle-Calédonie et Dépendances with 80 recognized species at that time (Aubréville 1967). Identification of genera and species has been highly problematic due to doubtful generic limitations and insufficient material for proper species description. In the 1990s several putative new species were tentatively proposed, which were believed to be threatened with extinction, including “*Leptostylis* sp.1 V.6850” and “*Planchonella* sp.1 V.6585” (Jaffré *et al.* 1998). Other species were considered doubtful since they were only known from the type collections made in the 1860s, including *Planchonella vieillardii* (Baill.) Dubard (1912: 58) from Gatope, *Leptostylis micrantha* Beauvisage (1901: 88) from Art Island, and *L. longiflora* Benth in Bentham & Hooker (1876: 659), also from Gatope (Bouchet *et al.* 1995). Revision of the family for New Caledonia was clearly needed, a work we embarked on more than a decade ago, resulting in a new generic classification (Bartish *et al.* 2005; Swenson *et al.* 2007a, 2008, 2013, 2015) as well as 42 new species endemic for New Caledonia (Swenson *et al.* 2007b, 2009, 2010a, 2010b, 2010c, 2012, 2016; Munzinger & Swenson 2009, 2015; Munzinger 2015).

Leptostylis Benth was revised by Vink (1957), who described three new species, accepted seven in total, and selected *L. longiflora* as the type of the genus, despite it being only known from the type collection. The type was collected in 1861–67 at Gatope by Émile Deplanche (1824–1874), a French naval surgeon and botanist (Morat 2010). *Leptostylis* is readily identified by its opposite leaves and four sepals, but the group is nested within *Pycnandra* and was relegated to subgeneric level to maintain monophyly (Swenson & Munzinger 2009; Swenson *et al.* 2015). Nevertheless, subgenus *Leptostylis* was in urgent need of revision in order to sort out several taxonomic problems and to enable transfer of the recognised species to *Pycnandra*. We therefore undertook extensive fieldwork in New Caledonia and in particular Dominique Fleurot intensively searched the maquis vegetation in the Gatope Peninsula near Koné in the hope of relocating *P. longiflora*. All in all, 413 individuals of *Pycnandra* were found, but all belonged to another species, *P. filipes* subsp. *filipes* (Benth) Munzinger & Swenson (2015: 97). Unable to relocate *P. longiflora*, we eventually considered the species to be extinct (Munzinger & Swenson 2015; Swenson & Munzinger 2016), a conclusion that we here fortunately can reject.

Our publications alerted an amateur botanist, Rosa Scopetra, in November 2015 that a species she had followed for years could possibly be the presumed extinct species *Pycnandra longiflora*. Recently, she sent pictures and specimens with flowers and fruits to one of us (JM in Montpellier), material easily confirmed as the plant unseen for 150 years –*Pycnandra longiflora*. We were at once astonished by the spectacular bicoloured flowers with red tubes and yellow corolla lobes that matched the type collection from which the colour cannot be deduced (Fig. 1). Without doubt, *P. longiflora* has the largest and the most beautiful flowers in the entire genus. With this unexpected rediscovery it is possible to complete the description of a very rare species and change the proposed IUCN status from Extinct to Critically Endangered.

Material and methods

We used herbarium specimens [*Munzinger leg. Scopetra 7519, 7522*], flowers and fruits preserved in alcohol, images, and field observations (including individuals counted) by Rosa Scopetra. We apply IUCN criteria (IUCN 2012) for evaluating threat status, using ‘Geocat’ software online (Bachman *et al.* 2011) to calculate extent of occurrence (EOO) and area of occupancy (AOO). A topographic image of the population’s distribution was made with the software ArcGIS © by using georeferenced individuals” (excluding the type locality).

Pycnandra longiflora (Benth.) Munzinger & Swenson, Austral. Syst. Bot. 28: 101 (2015) (Fig. 1)



FIGURE 1. *Pycnandra longiflora*, A. Habit of open maquis, B. Flowering branch, C. Fruits with long persistent styles, D. Seeds from one- or 2-seeded (arrow) fruits. Pictures A–C from Rosa Scopetra, D from Jérôme Munzinger.

Expanded description

Slender shrub usually 1.7 m tall (to rarely 4 m tall), with grey–brownish branches. Leaves opposite, subsessile, obovate, narrowly obovate or suborbicular, small, glabrous, coriaceous, 1.3–4.0(–7.5) x 0.9–3.5(–4.0) cm; base round to cordate; secondary venation usually of 5 pairs; tertiary veins indistinguishable. Flowers axillary and solitary; pedicels filiform, ~12 mm long, glabrous. Sepals ~3 mm long, ovate, glabrous. Corolla tubular, red, 30–32 mm long; corolla lobes 6–8, pale yellow, oblong, 6–7 mm long. Stamens inserted slightly below the tube orifice, exserted; filaments filiform, ~12 mm long; anthers 2.5–3.5 mm long. Gynoecium conical, pubescent around the base; ovary 1.5 x 1.0 mm; style filiform, up to 50 mm long in flowering specimens, well exserted and available for pollinators, glabrous, of the same colour as the corolla lobes and filaments. Fruit pyriform, widest at the base, 20–25 x 8–10 mm (slightly flattened and 15 mm wide if containing two seeds), black when mature, glabrous, with a 35–50 mm long persistent style; seeds usually 1, 17–21 x 8–10 mm, ovoid; testa pale brown, thin (0.5 mm), usually with reddish dots; seed scar oval to narrowly ovate, 15–20 % of seed circumference and 100% of the seed length, with nearly parallel margins; cotyledons plano-convex, cream, smooth, endosperm absent.

Ecology

Pycnandra longiflora occurs on hypermagnesium brown soils in quite open maquis, between 55 and 140 m elevation (Fig. 1A). The shape of the flowers, with long tube and well-exposed stamens and style, indicates that it is probably bird pollinated (Faegri & Van Der Pijl 1979).

Conservation status

The newly revealed locality of *Pycnandra longiflora* is near Onajiele in the Ouazangou-Taom massif. The species occurs at two adjacent sites and has a calculated EOO of 0.6 km² and AOO of 8 km². One hundred and seventy six individuals have been counted in this very limited area that easily could be ruined by a single fire, forest clearance, or an enlargement of the truck access to the mining concession (Fig. 2). Thus, following the IUCN terminology and recommendations, *P. longiflora* occurs on a single location and is therefore best assigned a preliminary IUCN status as Critically Endangered [CR B1ab(iii)+2ab(iii)].

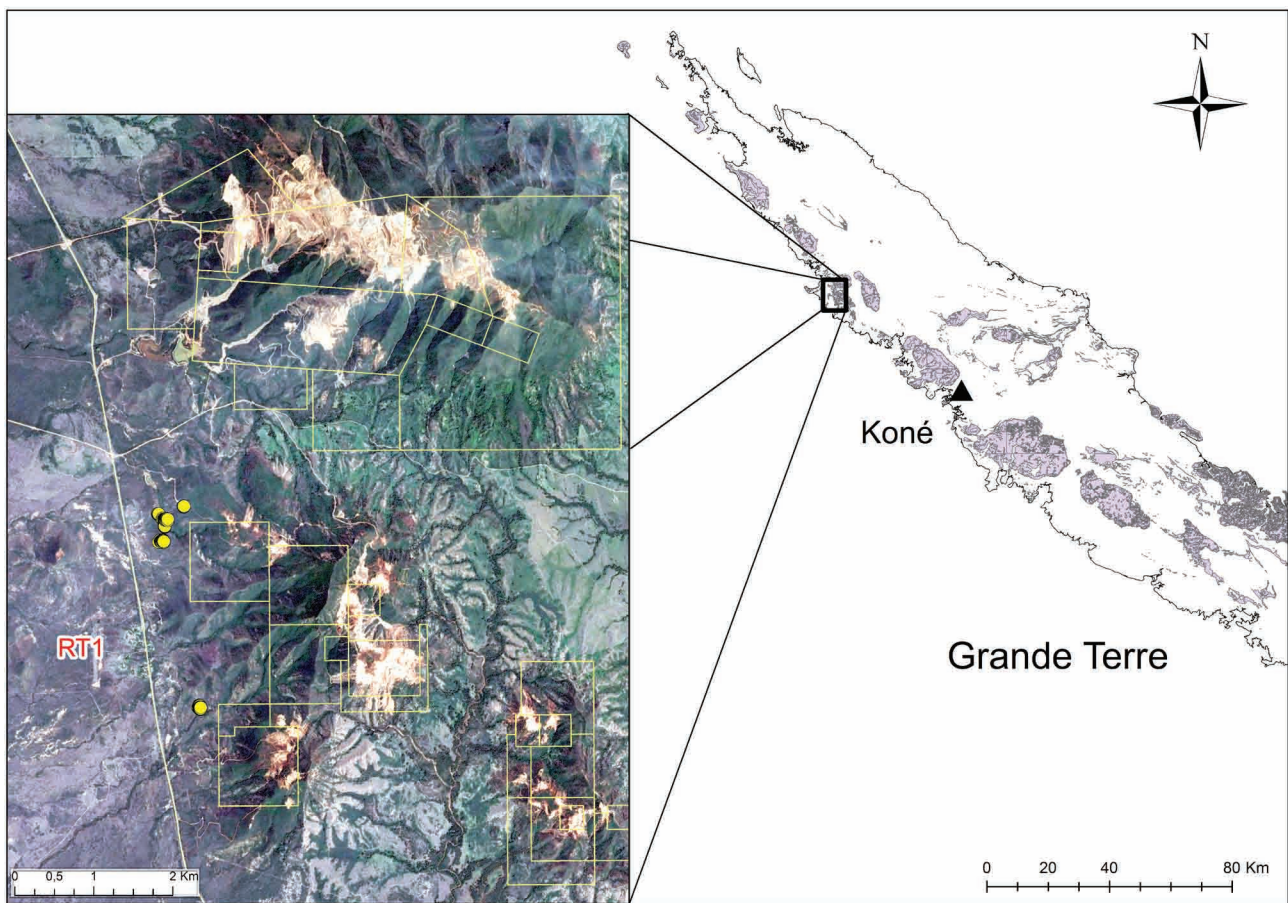


FIGURE 2. Distribution of *Pycnandra longiflora* based on GPS recorded individuals. Image © 2016 CNES / Astrium provided by GoogleEarth, lines are Cadastre Minier provided by DIMENC.

What does this discovery teach us about Vieillard's collections?

An important early explorer in New Caledonia was Eugène Vieillard (1819–1896) and many types are based on his collections (more than 150 species have the epithet “*vieillardii*”). However, his numbering system was awkward and Morat (2010) finds it “special and irrational”, and he indeed used a system in which he numbered the species as he perceived them instead of giving each collection a unique number. This has caused much confusion for his successors, a problem scientists still struggle with. The worst case known was found in *Sorthocalyx* (Sapindaceae), where three different species of the same genus were mixed in a “single type collection” (Pierre *et al.* 2014). In addition, Vieillard used only a few locality names, such as Canala, Gatope, Balade and Wagap, which were military posts and probably represent very vague areas and not the real villages having these names (MacKee & MacKee 1981). Therefore, we assume that Deplanche used “Gatope” in the same meaning as Vieillard and most likely referred to the North-Western quarter of the main island, Grande Terre. Thus, if a taxon is sought

in a location such as Canala, Balade, Gatope or Wagap, following information provided by Vieillard, we suspect that a much larger area of the coast and mountains should be surveyed.

Conclusion

Pycnandra longiflora is not extinct and grows less than 600 metres from the main road (RT1) of “Grande-Terre”, close to an accessible track (Figure 2). This is a very important locality of native vegetation as a new species of Myrtaceae, *Eugenia plurinervia* Snow, Munzinger & Callm. (2016: 212), also occurs here. Several other rare species such as *Planchonella minutiflora* Munzinger & Swenson (2009: 182), *Croton cordatulus* Airy Shaw (1978: 387), *Euodia tietaensis* (Guillaumin) T.G. Hartley (2001: 56) are also present, which clearly indicates that the place has high conservation value. The rediscovery of this *P. longiflora* supports continuing botanical surveys in New Caledonia, to provide sound data for conservation assessments.

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References

- Airy Shaw, H.K. (1978) Notes on Malesian and other Asiatic Euphorbiaceae. *Kew Bulletin* 32: 361–418.
<http://dx.doi.org/10.2307/4117108>
- Aubréville, A. (1967) Sapotacées. In: Aubréville A. (Ed.) *Flore de la Nouvelle-Calédonie et Dépendances* 1. Muséum National d’Histoire Naturelle. Paris, pp. 1–168.
- Bachman, S.P., Moat, J., Hill, A.W., de la Torre, J. & Scott, B. (2011) Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. In: Smith, V. & Penev, L. (Eds.) *e-Infrastructures for data publishing in biodiversity science*. *ZooKeys* 150: 117–126.
<http://dx.doi.org/10.3897/zookeys.150.2109>
- Bartish, I.V., Swenson, U., Munzinger, J. & Anderberg, A.A. (2005) Phylogenetic relationships among New Caledonian Sapotaceae (Ericales): molecular evidence for generic polyphyly and repeated dispersal. *American Journal of Botany* 92: 667–673.
<http://dx.doi.org/10.3732/ajb.92.4.667>
- Beauvisage, G. (1901) Genera Montrouzieriana, plantarum Novae Caledoniae. *Annales de la Société Botanique de Lyon* 26: 1–96.
- Bentham, G. & Hooker, J.D. (1876) *Genera Plantarum ad exemplaria imprimis in herbariis Kewensibus seivata definita*. Reeve & Co., London.
- Bouchet, P., Jaffré, T. & Veillon, J.M. (1995) Plant extinction in New Caledonia: protection of sclerophyll forests urgently needed. *Biodiversity and Conservation* 4: 415–428.
<http://dx.doi.org/10.1007/BF00058425>
- Dubard, M. (1912) Les Sapotacées du groupe des Sideroxylinées. *Annales du Musée Colonial de Marseille, Série 2* 10: 1–90.
- Faegri, K. & Van Der Pijl, L. (1979) *Principles of pollination ecology*. 3 edn. Pergamon Press, Oxford.
- Hartley, T.G. (2001) On the taxonomy and biogeography of *Euodia* and *Melicope* (Rutaceae). *Allertonia* 8: 1–319.
- IUCN (2012) *IUCN Red List Categories and Criteria: Version 3.1. Second edition*. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK.
- Jaffré, T., Bouchet, P. & Veillon, J.M. (1998) Threatened plants of New Caledonia: Is the system of protected areas adequate? *Biodiversity and Conservation* 7: 109–135.
<http://dx.doi.org/10.1023/A:1008815930865>
- MacKee, M.E. & MacKee, H.S. (1981) E. Vieillard et E. Deplanche, deux grands botanistes collecteurs en Nouvelle-Calédonie. *Histoire et Nature* 17/18: 49–68.
- Morat, P. (2010) Les botanistes récolteurs en Nouvelle-Calédonie de 1774 à 2005. *Adansonia, sér. 3* 32: 159–216.
<http://dx.doi.org/10.5252/a2010n2a1>
- Munzinger, J. (2015) Novitates neocaledonicae I: An additionnal *Planchonella* (Sapotaceae) endemic to Roches de la Ouaième. *Phytotaxa* 201: 71–78.
<http://dx.doi.org/10.11646/phytotaxa.201.1.5>
- Munzinger, J. & Swenson, U. (2009) Three new species of *Planchonella* (Sapotaceae) with a dichotomous and an online key to the genus

- in New Caledonia. *Adansonia sér.* 3 31: 175–189.
<http://dx.doi.org/10.5252/a2009n1a12>
- Munzinger, J. & Swenson, U. (2015) Revision of *Pycnandra* subgenus *Leptostylis* and description of subgenus *Wagapensia* (Sapotaceae), a genus endemic to New Caledonia. *Australian Systematic Botany* 28: 91–110.
<http://dx.doi.org/10.1071/SB15010>
- Pierre, A.-H., Le Moguédec, G., Lowry II, P.P. & Munzinger, J. (2014) Multivariate morphometric analysis and species delimitation in the endemic New Caledonian genus *Storthocalyx* (Sapindaceae). *Botanical Journal of the Linnean Society* 176: 127–146.
<http://dx.doi.org/10.1111/boj.12199>
- Snow, N., Munzinger, J. & Callmender, M.W. (2016) *Novitates neocaledonicae V: Eugenia plurinervia* N. Snow, Munzinger & Callm. (Myrtaceae), a new threatened species with distinct leaves. *Candollea* 71: 195–203.
<http://dx.doi.org/10.15553/c2016v712a7>
- Swenson, U. & Munzinger, J. (2009) Revision of *Pycnandra* subgenus *Pycnandra* (Sapotaceae), a genus endemic to New Caledonia. *Australian Systematic Botany* 22: 437–465.
<http://dx.doi.org/10.1071/SB09029>
- Swenson, U. & Munzinger, J. (2010a) Revision of *Pycnandra* subgenus *Achradotypus* (Sapotaceae), with five new species from New Caledonia. *Australian Systematic Botany* 23: 185–216.
<http://dx.doi.org/10.1071/SB09049>
- Swenson, U. & Munzinger, J. (2010b) Revision of *Pycnandra* subgenus *Sebertia* (Sapotaceae) and a generic key to the family in New Caledonia. *Adansonia sér.* 3 32: 239–249.
<http://dx.doi.org/10.5252/a2010n2a5>
- Swenson, U. & Munzinger, J. (2010c) Taxonomic revision of *Pycnandra* subgenus *Trouettia* (Sapotaceae), with six new species from New Caledonia. *Australian Systematic Botany* 23: 333–370.
<http://dx.doi.org/10.1071/SB10025>
- Swenson, U. & Munzinger, J. (2012) Revision of *Pichonia* (Sapotaceae) in New Caledonia. *Australian Systematic Botany* 25: 31–48.
<http://dx.doi.org/10.1071/SB11027>
- Swenson, U. & Munzinger, J. (2016) Five new species and a systematic synopsis of *Pycnandra* (Sapotaceae), the largest endemic genus in New Caledonia. *Australian Systematic Botany* 29: 1–40.
<http://dx.doi.org/10.1071/SB16001>
- Swenson, U., Bartish, I.V. & Munzinger, J. (2007a) Phylogeny, diagnostic characters, and generic limitation of Australasian Chrysophylloideae (Sapotaceae, Ericales): Evidence from ITS sequence data and morphology. *Cladistics* 23: 201–228.
<http://dx.doi.org/10.1111/j.1096-0031.2006.00141.x>
- Swenson, U., Munzinger, J. & Bartish I.V. (2007b) Molecular phylogeny of *Planchonella* (Sapotaceae) and eight new species from New Caledonia. *Taxon* 56: 329–354.
- Swenson, U., Lowry II, P.P., Munzinger, J., Rydin, C. & Bartish, I.V. (2008) Phylogeny and generic limits in the *Niemeyera* complex of New Caledonian Sapotaceae: evidence of multiple origins of the anisomerous flower. *Molecular Phylogenetics and Evolution* 49: 909–929.
<http://dx.doi.org/10.1016/j.ympev.2008.09.022>
- Swenson, U., Nylinder, S. & Munzinger, J. (2013) Towards a natural classification of Sapotaceae subfamily Chrysophylloideae in Oceania and Southeast Asia based on nuclear sequence data. *Taxon* 62: 746–770.
<http://dx.doi.org/10.12705/624.11>
- Swenson, U., Munzinger, J., Lowry II, P.P., Cronholm, B. & Nylinder, S. (2015) Island life - classification, speciation, and cryptic species of *Pycnandra* (Sapotaceae) in New Caledonia. *Botanical Journal of the Linnean Society* 179: 57–77.
<http://dx.doi.org/10.1111/boj.12308>
- Vink, W. (1957) Revision of the Sapotaceae of the Malaysian area in a wider sense. X. *Leptostylis* Benth. *Nova Guinea, n.s.* 8: 87–98.