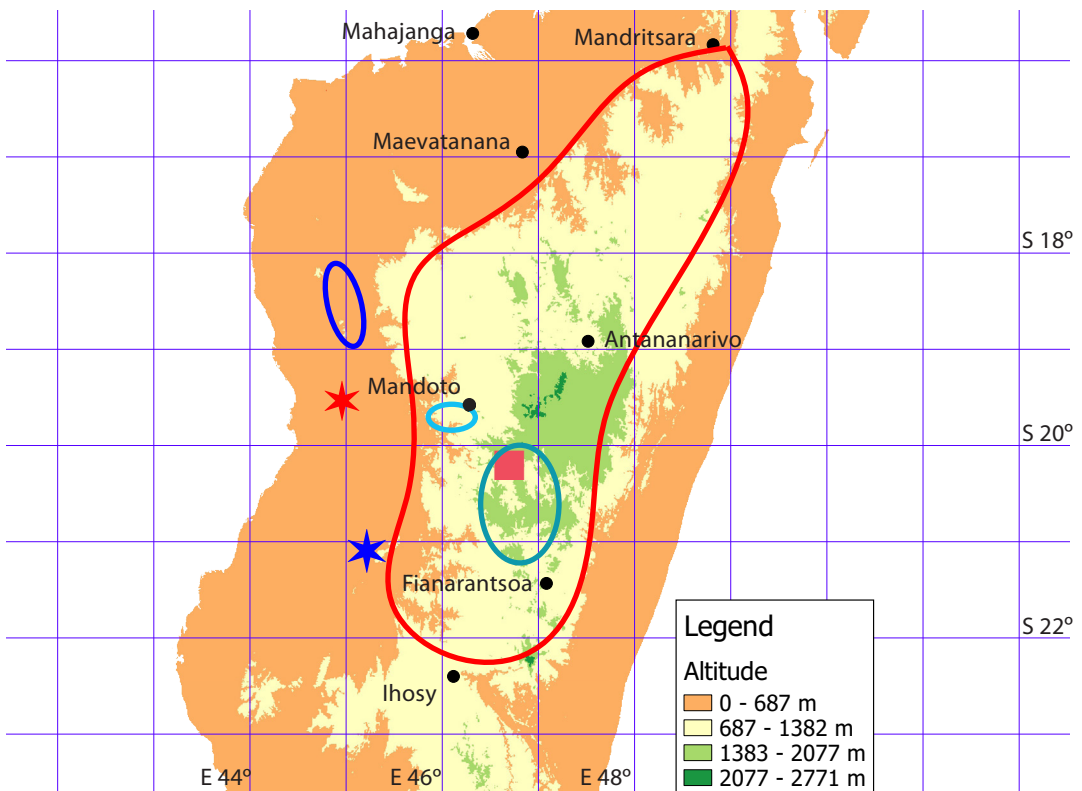


Pachypodium enigmaticum – a new species in the *Densiflorum* complex

Since 2003, we have made eight trips to Madagascar to search for different localities of *Pachypodium*. One of the main purposes was to understand the variability of *Pachypodium densiflorum* Baker, and to explore its distribution, which covers a vast area mainly in the central highlands (Fig. 1), from Ihosy in the south nearly to the Makay Mountains in the southwest and up to Maevatanana–Mahajanga in the northwest as well as the Mandritsara area in the northeast. Northern populations are known as var. *brevicalyx* H. Perrier. The latter are different from plants in the central mountain range of Itremo and another form that occurs at the southern limits towards Ihosy where it nearly meets *P. horombense* Poiss.

In 2003, we purchased plants of *P. densiflorum* with a flat stem and glabrous leaves, but without known natural origin from the nursery of Alfred Razafindratsira and we brought ten of these plants to the Czech Republic (CITES export permit MG Madagascar 0423C-EV11/MG03, 18.1.2003, CITES import to Czech Republic OMOB/2835/03/5). Alfred was given these plants some years ago by some collector and he believed in their natural origin. To our great surprise several of these plants flowered in early autumn and produced extraordinarily big yellow flowers up to 62 mm in diameter with a long, thin corolla tube. These flowers were different from all those we knew so far and its taxonomical position, without known distribution was a mystery to us. We also speculated about the possibility of a hybrid origin as we



1. Distributions of *Pachypodium* species discussed in the text, in central Madagascar:

— *P. densiflorum* sensu lato, — *P. enigmaticum*, * *P. rosulatum* ssp. *bicolor*, — *P. brevicaule*, ■ *P. eburneum*, * *P. rosulatum* ssp. *makayense*, — *P. rosulatum* ssp. *bemarahense*. Map by Petr Pavelka & Tim Harvey.



2. The habitat of *Pachypodium enigmaticum* in the Mandoto area does not look very attractive from a botanical perspective. Photo by Petr Pavelka.

have seen several individuals of *P. densiflorum* × *P. brevicaulis* hybrids occurring in nature. Our speculations continued until 2007, when we spent another three weeks searching in the western boundary of *P. densiflorum* distribution and we finally found a single population which had the same flower type. Thus we proved that Alfred Razafindratsira's plants are of natural origin (Fig. 2) and belong to a new species, which we name here as *Pachypodium enigmaticum* Pavelka, Prokeš, Vlk, Lavranos Židek, & Ramavovololona sp. nov. The specific epithet *enigmaticum* was chosen to indicate that this plant remained a mystery whilst in cultivation at Alfred's nursery, a problem that was only solved after long and painstaking field work. Since then, we have visited the locality five times and so far we know only one locality and have information about a second population, not far from the type locality.

Description

Pachypodium enigmaticum
Pavelka, Prokeš, Vlk, Lavranos,
Židek, & Ramavovololona sp. nov.

Stem under fused branches, invisible, succulent, very short, 3–5 cm wide; visible trunk or the main body of the plant 10–15 cm high, 10–40 cm wide with a grey, smooth, often



3. Adult specimens of *Pachypodium enigmaticum*—this one is about about 35cm in diameter—are usually almost flat. Photo Petr Pavelka.



4. Only with considerable age do branches become obvious on plants. Photo by Petr Pavelka.

shiny bark that is greenish on young growth (Fig. 3). Very old specimens grow like a shrub and can reach 40 cm tall and wide (Fig. 4). **Branches** very short, 2–5 cm long, rarely to 10–15 cm, with paired slightly curved spines 5–10 mm long. **Leaves** confined to apex of the branches, sessile, slightly pubescent when young, the hairs hardly visible to the naked eye in mature leaves, or sometimes glabrous from the juvenile stage,



5. *Pachypodium enigmaticum* has glabrous, shiny leaves. Photo by Petr Pavelka.

mostly shiny, ovate to obovate to narrowly ovate, up to 60 mm long, rounded or slightly acuminate at the apex (Fig. 5). **Inflorescence** shortly pedunculate, 5–20 cm long, 1–7 flowered (Fig. 6). **Peduncle** glaucous, pubescent, **pedicels** 2–10 mm long, pubescent. **Bracts** sometimes longer than the pedicel, narrowly obovate, acuminate, non-persistent. **Flowers:** **sepals** glaucous, connate at the base for about 0.5 mm, about 10 mm



6 & 7. *Pachypodium enigmaticum* is characterized by its pure yellow flower (to 62 mm wide), exserted stigma and long corolla tube. Photos by Evelyn Durst.



8. *Pachypodium enigmaticum* with fruit. Photo by Petr Pavelka.

long, ovate to oblong, acuminate; **corolla** bright yellow, 20–35 mm long, slightly pubescent, narrow, only the uppermost part that includes the stamens wide and funnel-shaped, sometimes with white band along the fused, basal part of the lobes, with an evident furrow inside of the tube where the lobes are fused; lobes broadly obovate, rounded, but vaguely emarginate at the apex, 20–25 mm long, the largest flower observed 62 mm in diameter (Figs. 6 & 7). **Stamens**, exserted by 2–3 mm above the corolla tube, anthers triangular, pubescent inside at the base, where they cohere with the pistil head. **Pistil** 10–15 mm long. **Fruit** consists of 2 separate

mericarps, erect, green, turning reddish when mature, fusiform, about 10–14 cm long, slightly pubescent (Fig. 8). **Seeds** pale brown, elliptic to ovate, 4.0–5.0 mm long and 2.0–2.5 mm wide. **Flowering time** June–July.

Taxonomy according to Lüthy (2004):

Subgenus *Nesopodium* J. Lüthy

Section *Gymnopus* K. Schumann

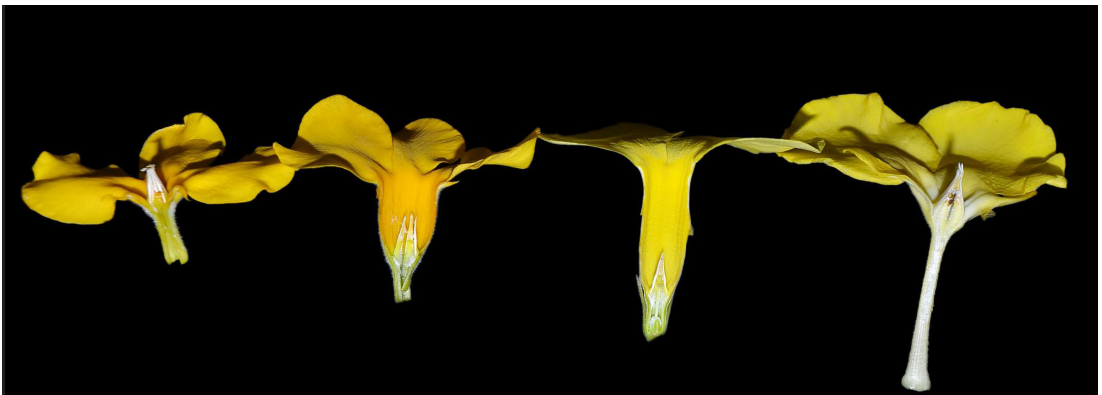
Series *Densiflora* J. Lüthy

Holotype: PRC 455060, collected by Alfred Razafindratsira (without number) 2003.

Distribution: Endemic to Madagascar, Mandoto area, altitude 920 m, in quartzitic rocks.

Discussion

The widespread and morphologically variable *P. densiflorum* is characterized by flowers with exserted stamens and a short corolla tube. Flower colour is highly variable, from yellow in the northern populations, orange in the central area of Itremo and again yellow towards the southern limit, around Ambalavao. Flower size can reach about 30–35 mm in the northern populations, 20–30 mm in the Itremo, and around 20 mm in the south. Leaves are less pubescent in the north and elliptical or narrowly obovate, obovate and densely pubescent or hairy in the central parts in the Itremo, obovate and hairy in the south. More pubescent plants occur mainly in higher and colder altitudes. The yellow flower and its structure of *P. enigmaticum* with exserted stamens is most closely related to a yellow flowering *P. densiflorum* form occurring north of Antananarivo in Maevatanana area and near Brieville which is known as var. *brevicalyx*, but the latter has half-sized flower with a short corolla tube. Seeds also resemble those of *P. densiflorum*.



9. Comparison of flowers, from left to right: *Pachypodium densiflorum* v. *brevicalyx*, *P. eburneum*, *P. gracilius*, *P. enigmaticum*. Photo by Vítězslav Vlk, image corrections by Robert Lízler.

The main reason we decided to describe the new species as *Pachypodium enigmaticum* is its unusual flower structure. Comparing to other shrubby *Pachypodium* species the flower is much bigger and it has a different shape (Fig. 9). The widest flower reached 62 mm in diameter. Petals are broadly rounded, alternating, bright yellow. The corolla tube is extremely thin (usually 3 mm) and long (up to 35 mm). Five stamens bear anthers at the bottom side and they cover the pistil with sticky stigmas. Pollen is accessible by pollinators only through narrow spaces between stamens. Its flowering time is also different from other *Pachypodium*. *P. enigmaticum* flowers in nature in June–July while *P. densiflorum*, and *P. brevicaule* flower from October till December.

The *P. enigmaticum* locality resembles those of *P. brevicaule* and, especially, young plants look similar both in stem shape and glabrous leaves (Fig. 10). The visible stems of both species are in fact fused branches which constitute the main body, and the real stem is hidden underneath. They both flower yellow, but *P. brevicaule* has smaller flowers (to 30 mm), a broader corolla tube with sexual organs are placed at the bottom, unlike the exerted stamens from the tube in *P. enigmaticum*.

When comparing other flowers of *Pachypodium* species we did not find any common features which would suggest close relationship to the new *P. enigmaticum*. It is very interesting that there are

populations of *P. densiflorum* with typical orange flowers within 10 km from *P. enigmaticum*. In nature we did not find any hybrids which is most possibly caused by different flowering time, habitats and flower structure and therefore by different pollinators. The area of *P. enigmaticum* is also interesting as there are other endemic species within 50–100 km such as *P. rosulatum* ssp. *bicolor* (Lavranos & Rapanarivo) Lüthy and *P. rosulatum* ssp. *makayense* (Lavranos) Lüthy. Recently described *P. rosulatum* ssp. *bemarabense* Lüthy & Lavranos and *P. eburneum* Lavranos & Rapanarivo do not grow much further and it is very possible that this area with difficult access may hide other surprises.

Acknowledgement

We would like to thank to Alfred Razafindrarsira for much useful information about natural habitats, so we could explore places which we would have never found without his help. Also we are grateful he was able to preserve plants in his collection, though he considered them *P. densiflorum*, and obtained CITES export permit so we had the opportunity to study *P. enigmaticum* in cultivation.

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10. *Pachypodium enigmaticum* on quartzitic rock in its typical grassland surroundings. Photo Petr Pavelka.