One name change and three new species of *Pelargonium*, section *Hoarea* (Geraniaceae) from the Western Cape Province

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ABSTRACT

A new name, *Pelargonium flavidum* E.M. Marais, is designated for *Pelargonium sulphureum* R. Knuth (1912), non (*Sweet*) Steudel. (1841). Another three species of section *Hoarea* (*Sweet*) DC., *Pelargonium palidoafavum* E.M. Marais, *Pelargonium weberi* E.M. Marais and *Pelargonium sabulosum* E.M. Marais, all with yellow flowers and simple, ovate leaves are newly described. All four species treated here are tuberous species, occurring in the Western Cape and sharing similarities with regard to floral colour, spathulate petals, five very short fertile stamens concealed in the floral sheath and simple leaves. Three of them have prostrate leaves and only *P. sabulosum* has patent to erect petals. An illustration and a distribution map of each species are provided as well as a key for the identification of the seven species of section *Hoarea* with yellow flowers, short stamens and simple to trifoliolate, ovate laminae.

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1. Introduction

Section *Hoarea* (*Sweet*) DC., comprising about 85 species, is the largest section of *Pelargonium* L’Hér. and is characterized by a more or less turnip-shaped tuber covered by flaking periderms and apically a very short stem from which the scape and leaves emerge. About half the species in this section have cream-coloured to yellow flowers. The four species treated here have cream-coloured, pale yellow or yellow flowers, spathulate to narrowly spathulate petals, short stamens concealed in the floral sheath, simple to trifoliolate or auriculate leaves and ovate laminae. Species with stamens shorter than the sepals and concealed within the floral sheath represent about one third of the species in the section (Marais, 1994). Section *Hoarea* occurs in the winter rainfall area along the western and southern coasts of southern Africa (Marais, 1994). *Pelargonium aestivale* E.M. Marais is the only described species occurring in the summer rainfall area of southern Africa (Marais, 1994). The four species treated here occur in the Western Cape Province. *Pelargonium palidoafavum* E.M. Marais occurs along the Olifantsrivier and in the Cederberge, *Pelargonium sabulosum* E.M. Marais along the west coast, *Pelargonium flavidum* E.M. Marais in the Hex River valley around De Doorns and to the east near Ladismith and *Pelargonium weberi* E.M. Marais along the southern coast from Infanta to Plettenberg Bay.

Knuth (1912) described *Pelargonium sulphureum* as a new species, but since the name *P. sulphureum* (*Sweet*) Steudel (1841) was already used in another context, *P. sulphureum* R. Knuth is a later homonym and the name is replaced by *P. flavidum* E.M. Marais. In the original description Knuth (1912) cited only one specimen and this specimen is without leaves. *P. palidoafavum*, *P. weberi* and *P. sabulosum* are described as new species. The first two species have simple to trifoliolate prostrate leaves and the latter has simple to deeply incised leaves with long patent to erect petals, an atypical characteristic for section *Hoarea*. The yellow flowers with short stamens concealed in the floral sheath and the mainly simple leaves are shared with *Pelargonium ladysmithianum* R. Knuth, *P. aestivale* and *Pelargonium nervifolium* Jacq. The distribution areas of these species are isolated from each other, although the distribution area of *P. flavidum* may overlap with that of *P. ladysmithianum*. Both the latter species occur in small populations and are so far not known from the same locality. A key to identify the seven species is provided.

2. Material and methods

Morphological data were gathered from field studies, plants grown in the Botanical Garden of the University of Stellenbosch and herbarium specimens. Since species of section *Hoarea* usually flower after the leaves have died, herbarium specimens are often without leaves. Complete herbarium specimens were prepared from plants collected in the field and grown in the garden. Leaves and flowers were collected at different stages. Collections from the following herbaria (abbreviated according to Holmgren et al., 1990) were also studied: BOL, K, NBG and STEU.
3. A new name for *P. sulphureum* R. Knuth

3.1. *P. flavidum* E.M. Marais, nom. nov.


A deciduous geophyte 90–130 mm tall when in flower. *Tuber*: a turnip-shaped, elongated or moniliform root, 40–60 mm long and 10–20 mm in diameter, dark brown (black–brown) in colour. *Leaves*: radical, simple; lamina ovate to broadly ovate, 25–43 × 15–25 mm, apex obtuse, base cuneate to truncate, margin entire, adaxially covered with patent to appressed stiff hairs, sparsely interspersed with glandular hairs, abaxially sparsely covered with very long glandular hairs and appressed non-glandular hairs, margins ciliate with distally appressed coarse hairs; petiole 30–40 mm long, prostrate, dark green, densely hirsute with appressed non-glandular hairs interspersed with long and short glandular hairs; stipules 10–15 mm long, subulate, adnate to petiole, apices free, hirsute. *Inflorescence*: scape 15–50 mm long, branched, bearing 2–4 pseudo-umbellets with 3–6 flowers each; peduncles 15–60 mm long, 1 mm in diameter, pale reddish green, densely covered with large-headed glandular hairs, interspersed with appressed curly hairs; bracts subulate, 3–5 mm long, abaxially hirsute with appressed hairs interspersed with large headed glandular hairs, margins ciliate. *Pedicel ca.* 0.5 mm long. *Hypanthium* 20–27 mm long, 2.7–3.5 times the length of the sepals, reddish green, densely covered with long large-headed glandular hairs and appressed curly hairs. *Sepals*: 5, posterior one erect, others reflexed, 6–10 mm long, 1.5–2 mm wide, linear-lanceolate, reddish green in centre with green membrane-like margins, abaxially densely covered with glandular hairs and short appressed non-glandular hairs. *Petals*: 5, pale yellow or cream-coloured, spathulate to ligulate, patent, flowers bell-shaped during anthesis; posterior two petals slightly curved backwards, with V-shaped dark pink markings or sometimes blotches, 16–21 × 4.5–6 mm, length/width ratio 3–3.5, apices rounded; anterior three 14–18 × 4–5 mm, apices rounded. *Stamens*: 10, staminal column ca. 2.5 mm long, smooth, white; perfect stamens 5, concealed in the floral sheath, posterior one 3–4 mm long, lateral two 4–5 mm long, anterior two 5.5–6 mm long, shorter than the sepals, anthers 1.5–1.8 mm long, dark pink, pollen orange. *Gynoecium*: ovary 2.5 mm long; style 0.5–1 mm long; stigma with 5 recurved branches, 1 mm long, dark pink. *Fruit*: bases of mericarps 5 mm long, with glandular hairs, tails 20 mm long (Fig. 1).

3.2. Diagnostic features and affinities

*P. flavidum* has yellow flowers (hence the new specific epithet) with five fertile stamens concealed in the floral sheath and simple prostrate...
leaves. Knuth (1912) described this species as *P. sulphureum* because of the intense yellow colour of the flower, but none of the specimens studied have intense yellow flowers. The spathulate petals and the very short fertile stamens are similar to those of *Pelargonium pinnatum* (L.) L’Hér. and resemble about a third (ca. 30 species) of the species of section *Hoarea*. *P. flavidum* resembles *P. ladysmithianum* with regard to the colour and structure of the flowers as well as the delicate simple prostrate leaves. They differ with regard to the indumentum on the leaves, scape, peduncles and hypanthia. *P. flavidum* has large-headed glandular hairs, interspersed with appressed curly hairs on the hypanthia (Fig. 2a) and *P. ladysmithianum* has long and short glandular hairs with small glandular heads and very long patent non-glandular hairs (visible to the naked eye; Fig. 2b). The leaves of *P. flavidum* are adaxially covered with patent to appressed stiff hairs, sparsely interspersed with glandular hairs and the margins are ciliate with distally appressed coarse hairs and in *P. ladysmithianum* the leaves are covered with short and long glandular hairs and non-glandular hairs and the margins are ciliate with long patent hairs which are visible to the naked eye. The leaves of *P. ladysmithianum* become papery–membranaceous when dry, a characteristic not present in *P. flavidum*.

3.3. Geographical distribution and ecology

*P. flavidum* is known from a limited distribution area in the Hex River valley around De Doorns and as far east as Ladismith (Fig. 3), an area with an annual precipitation of 200–400 mm mainly during winter months. Although only four collections of each of the species could be traced, it seems that *P. flavidum* occurs more to the west and *P. ladysmithianum* more to the east (from the Huisrivier Mountains near Ladismith to De Rust with also an annual precipitation of 200–400 mm). Although these two species seem to be parapatric, they were, up to now, not found in the same locality. Leaves of both species appear after the first winter rains and last until flowering time, usually dying as the flowers appear or sometimes even before that. Flowering time of both *P. flavidum* and *P. ladysmithianum* is from September to October.

3.4. Additional specimens examined


4. Description of new species

4.1. *P. pallidoavidum* E.M. Marais, sp. nov.

Type: South Africa, Western Cape Province, Clanwilliam (3218): Melkboomfontein near Clanwilliam, (–BB), 9 Aug 1986, Marais 208 (NBG, holo.; BOL; K!; MO; PRE1).

A deciduous geophyte 110–300 mm tall when in flower. *Tuber*: a turnip-shaped or elongated root, covered with flaking dark brown periderms, 15–40 mm long and 12–40 mm in diameter. *Leaves*: radical, simple, seldom auriculate or trilobate, green, petiolate; lamina ovate, 18–105 × 15–80 mm, apex acute to rounded, base cuneate to truncate, margin entire, seldom crenate, adaxially sparsely hirsute with appressed coarse hairs, abaxially sparsely hirsute with short appressed hairs, often restricted along main veins, margins sparsely ciliate with appressed coarse hairs; petiole 17–100 mm long, 1.5–3 mm in diameter, prostrate, green, hirsute with appressed hairs; stipules membranous, 7–11 mm long, 2 mm wide, subulate, apices attenuate, adnate to petiole, ciliate. *Infloroscence*: scape 10–60(–140) mm long, branched, bearing 2–8 pseudo-umbelllets with 4–12 flowers each; peduncles 35–150 mm long, 1.5 mm in diameter, green to reddish brown, densely covered with long small-headed glandular hairs and long appressed curly hairs; bracts patent, lanceolate, attenuate, 5–6 mm long, 1–2 mm wide, abaxially densely hirsute with long appressed hairs. *Pedice*: ca. 0.5 mm long. *Hypanthium* (20–)27–50 mm long, 3.5–5.5 times the length of the sepals, pale green, densely covered with appressed curly hairs interspersed with long, small-headed glandular hairs. *Sepals* 5, posterior one erect, others recurved, 7–11 mm long, 1–3.5 mm wide, lanceolate, apices acute, pale greenish brown, indumentum abaxially as on
hypanthium. Petals 5, cream-coloured, pale yellow or yellow, spatulate to narrowly spatulate, patent, flower bell-shaped during anthesis; posterior two slightly curved backwards, with dark pink feather-like markings, 18–30 × 6–8 mm, length/width ratio 4.5–12, apices rounded to emarginate; anterior three 17–27 × 2–5 mm, apices rounded. Stamens 10, staminal column ca.1.5 mm long, smooth, white; perfect stamens 5, white, concealed in the floral sheath, posterior one 2–3 mm long, lateral two 3–4 mm long, anterior two 5–7 mm long, shorter than the sepals; anthers 1.5 mm long, pink, pollen orange. Gynoecium: ovary 2.5–5 mm long; style filiform, 0.5–1.5 mm long; stigma branches recurved, 1–2 mm long, adaxially dark red. Fruit: bases of mericarps 7 mm long, with glandular hairs, tails 27–33 mm long. 2n = 22 (Gibby et al., 1996; P. sp. no1.)(Fig. 4).

4.1.1. Diagnostic features and affinities

P. pallidoflavum is a small geophyte with simple, prostrate leaves and relatively large pale yellow flowers (hence the specific epithet), long hypanthia (27–50 mm long) and five fertile stamens concealed in the floral sheath. The spatulate petals and the very short fertile stamens are similar to those of P. pinnatum and about 30 other species of section Hoarea. P. pallidoflavum shares its simple prostrate leaves and yellow flowers with the short stamens with P. aestivale (Karoo, summer rainfall region; 2n = 18; Gibby et al., 1996), P. weberi (southern Cape, Riversdale area; 2n = 44; Albers, pers. comm.), P. nervifolium (Calvinia and Sutherland; 2n = 20; Gibby et al., 1996), P. flavidum (Hex River Valley, species with fragile leaves) and P. ladysmithianum (Little Karoo; species with fragile leaves, becoming papery-membranous when dry; 2n = 20; Gibby et al., 1996; P. sp. no 6). P. pallidoflavum can be identified by its spatulate to narrowly spatulate petals (with the length/width ratio of 4.5–12 for the posterior petals), long small-headed glandular hairs on the scape, peduncle and hypanthia and appressed coarse hairs on the petioles and along margins of the laminae. The laminae are without glandular hairs on both the abaxial and adaxial surfaces.

4.1.2. Geographical distribution and ecology

P. pallidoflavum occurs from the Nardouws Mountain in the north, along the Olifantsrivier and in the Cederberge and as far south as the Twenty Four River Mountains (Fig. 5). This area receives an annual rainfall of 300–600 mm mainly during winter. The species occurs in fynbos on sandstone. Flowering time is from October to December when the leaves are dying.

4.1.3. Additional specimens examined

South Africa, WESTERN CAPE PROVINCE: 3118 (Vanrhynsdorp): Nardouws Pass, near farm Brakvlei (−DD), Marais 323 (STEU). 3219 (Wuppertal): Pakhuis Pass (−AA), Marais 192, 201, 202, 303 (STEU); Elandskloof, Ceres (−CA), Compton 16792 (NBG); Porterville, Dasklip road, 2 km on Grootfontein turnoff (−CC), Marais 180, 295, 311, 312 (STEU). 3319 (Worcester): Twenty Four River Mountains (−AA), Esterhuysen 16609 (BOLx2; Kx2; NBG).

4.2. P. weberi E.M. Marais, sp. nov.

Type: South Africa, Western Cape Province, Riversdale (3421): 3 km S of Riversdale (−AB), 3 Oct 1992, Weber s.n. (NBG, holol.; BOL!, K!, MO!, PRE!).

A deciduous geophyte 90–200 mm tall when in flower. Tuber: a turnip-shaped, elongated or moniliform root, covered with flaking dark brown periderms, 15–20 mm long and 6–18 mm in diameter. Leaves: radical, simple, seldom auriculate or trilobate, green; petiole; lamina ovate, 15–44 × 9–30 mm, apex acute to rounded, base cuneate, margin entire, sometimes serrate, adaxially and abaxially covered with long very small-headed glandular hairs, abaxially appressed stiff hairs.
along main veins, margins ciliate with long and short patent hairs; petiole 20–45 mm long, 1–2 mm in diameter, prostrate, green, densely covered with very long glandular hairs and appressed curly hairs, sparsely interspersed with long soft patent hairs; stipules membranous, 7–10 mm long, 2 mm wide, subulate, almost completely adnate to petiole, ciliate. Inflorescence: scape 20–45 mm long, branched, bearing 2–3 pseudo-umbellets with 2–5 flowers each; peduncles 30–160 mm long, 1.5 mm in diameter, green to reddish brown, densely covered with long small-headed glandular hairs and distally appressed curly hairs; bracts rigid, patent, lanceolate, even in size, 6–7 mm long, 1–2 mm wide, abaxially densely covered with long glandular hairs. Pedicel: ca. 0.5 mm long. Hypanthium 45–58 mm long, 6.5–7.5 times the length of the sepals, reddish brown, densely covered with appressed curly hairs interspersed with long small-headed glandular hairs. Sepals 5, posterior one erect, others patent, 7.5–8.5 mm long, 1.5–3.5 mm wide, lanceolate, apices acute, reddish green in centre with pale green margins, indumentum abaxially as on hypanthium. Petals 5, pale yellow, spathulate, patent, flower bell-shaped during anthesis; posterior two slightly curved backwards, with dark pink feather-like markings, 17–23 × 6–8 mm, length/width ratio 2.5–3, apices emarginate; anterior or three 16–21 × 6–6.5 mm, apices rounded. Stamens 10, staminal column ca.1.5 mm long, smooth, white; perfect stamens 5, white, concealed in the floral sheath, posterior one 2.5–3 mm long, lateral two 4–5 mm long, anterior two 5–6 mm long, shorter than the sepals; anthers 2–2.5 mm long, dark red, pollen orange. Gynoecium: ovary 2.5 mm long; style filiform, 1 mm long; stigma branches recurved, 1–1.5 mm long, adaxially dark red. Fruit: bases of mericarps 6 mm long, without glandular hairs, tails 29 mm long. 2n = 44 (Albers, pers. comm.) (Fig. 6).

4.2.1. Diagnostic features and affinities

Pelargonium weberi is a small geophyte with simple, prostrate leaves and large pale yellow flowers, long hypanthia (45–58 mm long) and five fertile stamens concealed in the floral sheath. The spathulate petals and the very short stamens are similar to those of P. pinnatum and about 30 other species of section Hoarea. Pelargonium weberi shares its
simple prostrate leaves and the yellow flowers with short stamens with *P. aestivale*, *P. pallidoflavum*, *P. nervifolium*, *P. flavidum* and *P. ladysmithianum*. *P. weberi*, *P. aestivale*, *P. pallidoflavum* and *P. nervifolium*, are robust plants unlike the delicate plants of *P. flavidum* and *P. ladysmithianum*. *P. weberi* can be identified by its spathulate petals (with the length/width ratio of 2.5–3 for the posterior petals), small-headed glandular hairs on the peduncle, scape and laminae, and long soft patent hairs on the petioles and along margins of the laminae. Non-glandular hairs are visible to the naked eye.

4.2.2. Geographical distribution and ecology

*P. weberi* is known from the southern coastal plain of the Western Cape Province, from Infanta in the west to Plettenberg Bay in the east (Fig. 7), an area with an annual rainfall of 500–600 mm occurring throughout the year. Only four collections of this species are known. Flowering time is in October and November when the leaves are dying.

*P. weberi* is named after Wolfgang Weber who has collected several scarce species of section *Hoarea*.

4.2.3. Additional specimens examined


4.3. Pelargonium sabulosum E.M. Marais, sp. nov.

Type: South Africa, Western Cape Province, Vredenburg (3217): Farm Klein Nieuwe Rust, near Trekoskraal (–BB), 8 Aug 2009, Marais 470 (NBG, holo.); BOL!; K!; MO!; PRE!.

A deciduous geophyte 100–200 mm tall when in flower. *Tuber*: a turnip-shaped, moniliform or elongated root, covered with flaking dark brown periderms, 10–35 mm long and 10–25 mm in diameter, dark brown (black-brown) in colour. Leaves: radical, simple, seldom auriculate, green, petiolate, patent-erect; lamina rigid, coriaceous, ovate to elliptic; 26–45(–60) × 15–35 mm, apex obtuse, base varies from truncate to narrowly cuneate, margin irregularly bincrenate, adaxially and abaxially covered with appressed non-glandular hairs, margins inconspicuously ciliate with short appressed hairs; petiole thin, 25–90 mm long, patent, green, hirsute with appressed curly hairs interspersed with coarse appressed non-glandular hairs; stipules 6–15 mm long, subulate, adnate to petiole, apices free, ciliate. *Inflorescence*: scape 25–100 mm long, branched, bearing 2–5 pseudo-umbellets with 2–8 flowers each; peduncles 40–100 mm long, 1 mm in diameter, reddish green, covered with distally appressed curly hairs, interspersed with short and long glandular hairs; bracts subulate, 3–5 mm long, abaxially hirsute. *Pedicel ca.* 0.5 mm long. *Hypanthium* (18–)25–38 mm long; 3–5 times the length of the sepals, reddish green, densely covered with distally appressed curly hairs, interspersed with short and long glandular hairs. *Sepals* 5, posterior one erect, others patent, 6–8 mm long, 1.5–2.5 mm wide, linear-lanceolate, apices subulate, reddish green in centre with green membrane-like margins, abaxially covered with appressed curly hairs, interspersed with long glandular hairs. *Petals* 5, yellow, narrowly spatulate, patent, flower bell-shaped during anthesis; posterior two with dark red blotches and feather-like markings, 17–22 × 3–5.5 mm, length/width ratio 4–7, apices rounded, truncate to emarginate; anterior three 16–20 × 2–4 mm, apices rounded. *Stamens* 10, staminal column 1 mm long, smooth, white; perfect stamens 5, concealed within the floral sheath, posterior one 2–3 mm long, lateral two 3–4 mm long, anterior two 5–6 mm long, shorter than the sepals, white; anthers 1.5–2 mm long, wine-red, pollen orange. *Gynoecium*: ovary 2–3 mm long; style filiform,
0.5–1.5 mm long; stigma branches patent, 1–1.5 mm long, dark pink.

**Fruit:** bases of mericarps 5 mm long, with glandular hairs, tails 22 mm long (Fig. 8).

### 4.3.1. Diagnostic features and affinities

*Pelargonium sabulosum* is a geophyte with simple, patent-erect leaves with thin petioles, yellow flowers with long hypanthia (25–38 mm long) and five fertile stamens, concealed in the floral sheath. The simple leaves with long thin patent to erect petioles and almost coriaceous laminae are atypical for section *Hoarea*. The leaves of *Hoarea* species with broad, simple laminae usually have short, thick petioles and the leaves are rosulate, soft and delicate. The narrowly spatulate petals and the very short fertile stamens are similar to those of *P. pallidoflavum* and *P. weberi*.

### 4.3.2. Geographical distribution and ecology

*P. sabulosum* is known from coastal fynbos areas, from Vredenburg in the north to Bokbaai in the south (Fig. 9), an area with an annual precipitation of 200–400 mm mainly during winter months. Only four collections of this species could be traced. It grows in sandy areas, hence the specific epithet (*sabulosus*, Latin for growing in sandy places) and flowers in November when the leaves have died.

### 4.3.3. Additional specimens examined

5. Key for the identification of species (section Hoarea) with yellow flowers, stamens much shorter than the sepals, leaves ovate, simple, seldom trifoliolate

1a Petioles long, thin, patent to erect, lamina rigid, almost coriaceous
P. sabulosum (West coast)

1b Petioles prostrate, seldom patent to erect, lamina soft and delicate

2a Hypanthium covered with appressed curly hairs interspersed with glandular hairs
P. ladysmithianum (Little Karoo)

2b Hypanthium covered with long and short glandular hairs interspersed with long patent non-glandular hairs. Non-glandular hairs visible to the naked eye

3a Laminae covered with long or short glandular hairs together with non-glandular hairs
P. pallido flavum (Olifantsrivier and Cederberge)

3b Laminae without glandular hairs, margins ciliate with appressed coarse hairs

4a Laminae simple, trifoliate or trifoliate, adaxially and abaxially covered with appressed hairs and very short glandular hairs, abaxial surface usually reddish purple with very prominent veins
P. nervifolium (Calvinia, Sutherland, Karoo Poort and Matjiesfontein)

4b Laminae usually simple, seldom trifoliolate or auriculate, adaxial surface covered with long or short glandular hairs with or without patent non-glandular hairs
5

5a Hypanthium shorter than 30 mm (20–27 mm), laminae simple, very delicate, margins entire
P. flavidum (Hex River Valley)

5b Hypanthium longer than 30 mm (33–60 mm), laminae simple, seldom auriculate or trifoliate, margins entire to serrate

6a Petiole densely hirsute with short appressed hairs and sparsely interspersed with short glandular hairs, laminae hirsute, interspersed with short glandular hairs
P. aestivale (Karoo, summer rainfall area)

6b Petiole densely covered with appressed curly hairs and very long glandular hairs, sparsely interspersed with long soft patent hairs, laminae abaxially covered with long, very small-headed glandular hairs
P. weberi (Southern coastal plain, Infanta to Plettenberg Bay)

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References


Fig. 8. *Pelargonium sabulosum*, Marais 470 (STEU 4448; NBG). (A) Plant with leaves; (B) flowering stems; (C) petals; (D) androecium. Scale bar: 10 mm. Artist: Leigh Voigt.
Fig. 9. Geographical distribution of *Pelargonium sabulosum*.