

# *Phelypaea boissieri* f. *lutea* (Orobanchaceae), a peculiar new form from Turkey and typification of the name of this species

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## Abstract

The genus *Phelypaea* includes three holoparasite species with one of the most intense red flowers among all plants worldwide. So far, there are few references to other colour taxa of this genus. We describe a new yellow-coloured form, *Phelypaea boissieri* f. *lutea*, from Hakkari province in the Cilo Mountains of SE Turkey, found at an altitude of 2,470 m. In typical *P. boissieri*, here typified by us, the flowers are deeply red, and stems, calyx and scales are red to brown, or rarely pale-brown, whereas in the entire population of f. *lutea* the corolla, calyx, and scales are yellow to orange with black folds in the corolla, while only the stem is brownish.

## Keywords

Forma nova, lectotype, Orobanchaceae, *Phelypaea*, SE Turkey, synonyms, typification

## Introduction

The genus *Phelypaea* L. ( $\equiv$  *Diphelypaea* Nicolson, nom. illeg.) (Orobanchaceae) includes three holoparasite species: *P. coccinea* (M. Bieb.) Poir., *P. boissieri* (Reut.) Stapf, and *P. tournefortii* Desf., whose parasitise Asteraceae hosts. *P. coccinea* occurs in the

Caucasus and Crimea, and is a parasite of *Psephellus* Cass. and *Centaurea* L., rarely *Klasea* Cass., while *P. tournefortii* occurs in the Caucasus and Turkey, and is a parasite of *Tanacetum* L. (Sánchez Pedraja et al. 2016; Piowarczyk et al. 2019). Meanwhile, *P. boissieri* shows a different distribution; it occurs in the Balkans (Albania, Greece, North Macedonia), and Western Asia (Turkey, Iraq and Iran), and parasitises *Centaurea* and occasionally *Cousinia* Cass. in Iraq (Sánchez Pedraja et al. 2016; Piowarczyk et al. 2019). *P. boissieri* is molecularly, morphologically and regarding host preferences similar to *P. coccinea* (Piowarczyk et al. 2019, 2021). The morphological features that separate *P. boissieri* and *P. coccinea* are as follows: corolla - tube short and cup-shaped; corolla - lobes broadly obovateorbicular to orbicular, overlapping; anthers - hairy (Stapf 1915; Nicolson 1975; Cullen 2010); however, sometimes apparently intermediate features are also observed (Piowarczyk et al. 2019). Therefore, further research into the variability of *P. boissieri* and the inclusion of more samples for molecular analysis are required (Piowarczyk et al. 2021).

Species from the genus *Phelypaea* are achlorophyllous and possess one of the most intense red flowers among all plants worldwide. A recent study on *P. tournefortii* showed that anthocyanins were found in unprecedented large quantities in the flowers, as well as large amounts of polyphenols, especially eukovoside (Piowarczyk et al. 2020).

So far, there have been few references to colour forms other than red in the genus *Phelypaea* in the literature. One of them is *P. coccinea* f. *aurantiaca* Beck in Engl., Pflanzentr. 96: 261 (1930), which was described from Karabakh in the Caucasus based on material collected by Radde as having an orange corolla (“aurantiaco”). Another non-red colour form is *P. helenae* Popl., described from Alushta in Crimea (“corolla orange-yellow”) and, according to Novopokrovsky and Tzvelev (1958: 28), it is synonymous with the species mentioned before and does not constitute a different species (but rather a case of polychromism) with regard to *P. coccinea* (“corolla bright-red”), and both yellow and red forms occur together in Crimea. In *P. coccinea*, sometimes the corolla in the lower-side is orangish or yellow, with the upper side in the typical red color preserved (Piowarczyk et al. 2019). Within one population, there may be individuals with a corolla which is red on both sides, as well as with one yellow-orange side.

In this paper, we typify *P. boissieri* and indicate its synonyms, and besides, describe a new yellowish-coloured form from Turkey.

### Typification of *Phelypaea boissieri*

*Phelypaea boissieri* (Reut.) Stapf in Bull. Misc. Inform. Kew 1915, 6: 291 (1915 [17 Aug 1915]).

**Basionym:** *Anoplanganthus biebersteinii* var. *boissieri* Reut. in DC., Prodr. 11: 42 (1847 [25 Nov 1847]).

**Type:** lectotype (here designated): 1. “*Orobanche* / Cadmus [Mount Cadmus / Topçambaba Dağı / Baba Dağı / Baba Dagh, Aydin Province? or, more likely, mont Honaz / mont Cadmus / Honaz Dağı, Denizli Province?] ad or. Denisleh [to the east

Denizli Jun" [m. Boissier]. – 2. "*A. coccineus*". – 3. "Syntypes / *Anoplanganthus biebersteinii* / var. *boissieri* Reut." (G-Boiss G00150150 [Fig. 1, the sheet contains four specimens, the lectotype is formed by the three specimens of a single gathering, located in the lower left of the sheet]).

**Isolectotypes:** idem (G-Boiss G00150150 [Fig. 1, the isolectotype is a single specimen in the upper right corner]); "*Anoplanganthus biebersteinii* var. *boissieri* Reut. / Cadmus supra Denisleh [Denizli], ad *Centaurea* / *Boissier*, [6 Jun 1842] (JE000000021 – hb. Haussknecht [two specimens of a single gathering]); "Herb. E. Boissier / *Anoplanganthus Biebersteinii* Reut. /  $\beta$  *Boissieri* Reut. / Mesogis [Messogis Mountains / Mesogis Mountains, Aydın Dağları (ancient Lydia), near Aydın / Güzelhisar / Tralles, Aydın Province] et Cadmus [Mount Cadmus / Topçambaba Dağı / Baba Dağı / Baba Dagħ, Aydın Province? or mont Honaz / mont Cadmus / Honaz Dağı, Denizli Province?] / Jun. 1842" (P02970934 - Boissier 1842 [the three specimens of a single gathering on the lower right corner close to Boissier's label]); idem (P02970938 – hb. E. Cosson [the two specimens of a single gathering on the upper left corner close to Boissier's label]).

**Isosyntypes:** 1. "Caria [Karia], *C. Pinard*, 1843". – 2. "Syntypes / *Anoplanganthus biebersteinii* / var. *boissieri* Reut." (G-Boiss G00150149 [two specimens of a single gathering, which are attached to its host-plant]); 1. "Caria [Karia], *C. Pinard*, 1843". – 2. "*A. Biebersteinii*". – 3. "*Anoplanganthus Biebersteinii* Reut. / in DC. prod. 11 p. 42 / *Phelipaea biebersteinii* Fisch. / *Anoplon* — C.A. Mey. / *Orobancha coccinea* Pers. / *Lathraea phelipaea*  $\beta$  Linn. / —  $\beta$ . *Boissieri* Reut. in DC. prod.". – 4. "Syntypes / *Anoplanganthus biebersteinii* / var. *boissieri* Reut." (G00096074 - hb. Reuter-Barbey [Fig. 2, three specimens of a single gathering, two of them are attached to their host-plant]).

**Homotypic synonyms:** *Diphelypaea boissieri* (Reut.) Nicolson in Taxon, 24 (5–6): 654 (1975), nom. illeg.

*Phelypaea coccinea* var. *boissieri* (Reut.) Beck in Engl., Pflanzenr. 96: 43 (1930)

*Diphelypaea coccinea* var. *boissieri* (Reut.) Uhlich in Kochia 9: 83 (2015), nom. illeg.

**Heterotypic synonyms:** *Anoplanganthus coccineus* var. *nigrovittatus* Boiss., Fl. Orient. 4(2): 494 (1879 [Apr-May 1879]) ["*A. coccineus*  $\gamma$  *nigrovittatus*"] (Stapf 1915: 290, 293). *Ind. loc.*: "Hab. in graminosis montis Pir Omar Gudrum [Chiya-i Piromar / Chiyā-i Pīrōmar / Jabal Biru Mar / Jabal Bīrū Mār / Pīr `Umar, Bīrūmā / Piromar / Pīrōmar, Iraqi Kurdistan, Iraq] 5–6000' (*Hausk!*)". *Lectotype* (designated here, or perhaps holotype): 1. "711 / *Anoplanganthus Biebersteinii* Reuter / fl sanguin., vitta nigra lata / In gramin. 5-6000' / Haussknecht, It. Orient, Pir Omar Gudrum. Jun. — 1867". – 2. "*A. coccineus*  $\gamma$  *vittatus*". – 3. "*Anoplanganthus coccineus*  $\gamma$  *vittatus*" (G-BOIS G00768924 - n° SIB 436114/1 (Stapf 1915: 293) [five specimens of a single gathering]).

*Phelypaea coccinea* var. *boissieri* f. *septemfida* Gilli in Feddes Repert. 46: 47 (1939) ["Calyx irregulariter septemfidus"]. *Ind. loc.*: "Nord-Iran [Iran / Persia]: Nördlich vom Kendewan-Paß [Kendavan Pass / Gardaneh-ye Kandovān, 36°9'0"N, 51°18'0"E, Māzandarān, Alborz / Alburz / Elburz / Elborz Mountains] an einem Abhang unweit des Tunnelbaues, 1800 m; 8.VII.1936."

The species typified here was described by Reuter, with the rank of var., on the basis of collections made in western Anatolia (Turkey): Mount Cadmus by Boissier



**Figure 1.** Lectotype and isolectotype (G00150150 - G-Boiss) of *Phelypaea boissieri*.





Figure 2. Isosyntype (G00096074 - hb. Reuter-Barbey) of *Phelypaea boissieri*.

and Caria by Pinard (Reuter 1847: 42). Later, Boissier (1879: 494) included it within his *Anoplanganthus coccineus*, which would be the origin of future confusions between the two species. In addition, he described two new varieties, the var. *peduncularis* (*P. tournefortii* Desf.) and the var. *nigrovittatus* (*P. boissieri* (Reut.) Stapf). Stapf (1915) raised the variety of Reuter to the rank of species and clarified the differences between the three taxa, so that nowadays we believe that they form this genus. Beck (1930), in a monograph on the family, preferred to continue treating our species with the rank of var. within *P. coccinea*, but created some confusion when giving the distribution of this species where he included the var. described by Reuter. Finally, Cullen (2010) complements the description of *P. boissieri*, giving good illustrations with analysis, providing a new key for the three species, and indicating the distribution of the species treated here.

### A new form of *Phelypaea boissieri*

*Phelypaea boissieri* f. *lutea* Ü. Subaşı, R. Piwowarczyk, Ó. Sánchez Pedraja, f. nov.  
Figure 3

**Diagnosis.** This new taxon is very similar to typical *Phelypaea boissieri*, and is compliant with morphometric characteristics in the description of the plant after Reuter (1847: 42, sub *Anoplanganthus biebersteinii* var. *boissieri*), Stapf (1915), Nicolson (1975), Cullen (2010) but differs significantly in color and, usually, a higher stem. In typical *P. boissieri*, flowers are deeply red, and stem, calyx and scales are red to brown, or rarely pale-brown, whereas in the f. *lutea* corolla, calyx, and scales are yellow to orange with black folds in the corolla, with only the stem being brownish (Fig. 3).

**Type.** TURKEY. C10 Hakkâri: Merkez district, Kırıkdağ village, Gümüşlü location (Kurdish: Spixane). Cilo Mountains, subalpine grasslands and meadows, ca. 2,470 m alt., 10 June 2021, Ü. Subaşı s.n. (holotype and isotypes ANK!).

**Distribution and ecology.** This taxon is known exclusively from the type locality. The Cilo (Glacial) Mountains (Cilo (Buzul) Dağı) are part of the Hakkâri Dağları range and include the third highest peak of Turkey with an altitude of 4,135 meters. Turkey's Eastern Anatolia Region, the easternmost extension of the Southeast Taurus Mountains, is located within the borders of Hakkari province. The locality of *P. boissieri* f. *lutea* is located in Hakkari province, Kırıkdağ village, Gümüşlü location (Kurdish: Spixane). This area is located around Mt Uludoruk (Reşko 4,135 m), at an altitude of approximately 2,470 meters. In this area dominated by high mountain steppe plants, the bedrock consists mainly of tectonic deposits and limestone. It is approximately 20 km from any settlements. Parasitising *Centaurea*, probably *C. persica* Boiss. (new host-plant). Phenology - flowering end of June to July, fruiting July to August. The population size is small, over a dozen individuals. The number of individuals counted in the area is fewer than 100. The entire population in this locality is formed by higher plants than the type with yellow corolla. In the future, research into the cause, phytochemical composition, ecological importance and adaptation, and





**Figure 3.** Habitat and general habit of *Phelypaea boissieri* f. *lutea* at 2,470 m alt. in Cilo Mountains, Hakkari province, SE Turkey. Phot. Ü. Subaşı.

also into pollinators of typical red *Phelypaea* individuals and yellow-orange ones could shed new light on this topic.

**Etymology.** The form name originated from the yellow to orange colouring of plants.

**Note.** There are also photos of a yellow flower belonging to *P. boissieri* in Internet sources [<https://www.flickr.com/photos/camerar/2887571252/> and <http://www.agacclar.net/forum/1296397-post1573.htm>]. The photos, respectively, were taken in SE Turkey by Karen Nichols in 26 June 2008, possibly in the same Hakkari province, but no more detailed location data is available, and Hakkari-Mergan-Yaylası (Mergan Plateau) by Güngör Salman in 16 June 2014 [<http://www.agacclar.net/forum/1296397->

post1573.htm], as well as from Yüksekova/Hakkari by Leoš Smutný in 13 May 2014 [<https://www.inaturalist.org/observations/71616618>]. We are also aware of a near mention (“Yüksekova [Gever / Gawar], 1950 m, 23 v 1966, *Eiselt*!”) (Gilli 1982: 2, sub *P. coccinea*); this record probably corresponds to the same f. previously described.

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