

Remarks on the genus *Sphecodes* Latreille, 1804, *pinguiculus* Pérez, 1903 species-group (Hymenoptera Apidae) from Italy: a reply to the article of Schwarz & Gusenleitner (2012)

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ABSTRACT

The present paper is a reply to the article by Schwarz & Gusenleitner (2012) and deals with the taxonomy of the genus *Sphecodes* Latreille, 1804, *pinguiculus* Pérez, 1903 species-group. Particularly, this study, after a critical revision of the morphological characters used to the identification of the species of the genus *Sphecodes* from Italy, confirms the results of Nobile & Turrisi (2004) and allows the revalidation of all species which they described; therefore are considered valid species the following taxa: *S. campadellii* Nobile et Turrisi, 2004, *S. combai* Nobile et Turrisi, 2004, *S. banaszaki* Nobile et Turrisi, 2004, *S. marcellinoi* Nobile et Turrisi, 2004, *S. walteri* Nobile et Turrisi, 2004, *S. iosephi* Nobile et Turrisi, 2004, *S. tomarchioi* Nobile et Turrisi, 2004.

KEY WORDS

Sphecodes; *pinguiculus* species-group; taxonomic discussion; species revalidated.

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INTRODUCTION

The identification of the species of the cleptoparasitic genus *Sphecodes* Latreille, 1804 is somewhat problematic (Meyer, 1919; Bogusch & Straka, 2012) and, to facilitate the identification, several Authors have been recognized the usefulness of the morphology of the antennomeres. Whereas the females have the antennomeres normally shaped, instead the males have mostly antennomeres ventrally gibbous. In more detail, the gibbous process is always placed distally on antennomere, whereas proximally, beginning from the base, it is present a variously shaped and more or less deep notch (anular, half-moon like, etc.) covered by short, bristly and white setae, which form sensillar plates. At low magnification, these sensillar plates resemble white spots, defined differently by several Authors: “reticulatio subtilis grisea”

(Thomson, 1872); “graaktigt rotfalt” (Aurivillius, 1903); “svobepletter” (Jørgensen, 1921); “pilose facets” (Mitchell, 1960); “flagellar sensilla” (Ågren & Svensson, 1982); “Haarfleck” (Hagens, 1882; Meyer, 1919; Blüthgen, 1923; Warncke, 1992); “white setae” (Nobile & Turrisi, 2004); “felt-like pubescence” (Bogusch & Straka, 2012). It is noteworthy that on each antennomere, it exists a complementarities, e.g. if the notched area is relatively small, conversely, the gibbous area is wider, and vice versa. These peculiar morphological features of antennomeres are constant within a species but show distinct patterns among different *Sphecodes* species, thus providing good characters for identification, as confirmed by careful investigation of antennae of eleven Swedish *Sphecodes* species carried out by Ågren & Svensson (1982), who pointed out as following indicated:

a) on antenna of both males and females there are about ten diverse types of sensillar structures;

b) some sensilla are erect, hair-like, short and white (e.g., sensilla trichodea, etc.), whereas, some other are flattened, not evidently protruding above cuticle (e.g., sensilla placodea, etc.);

c) in the males, on the ventral surface of flagellomeres, the erected sensilla (Haarfleck, etc.) are placed basally, covering the notched area, whereas, the flattened sensilla cover the distal, gibbous area of the same flagellomeres;

d) in the females, the differently shaped sensilla are mixed up, covering uniformly the flagellomeres.

Based solely on the morphology of the male antenna of some *Sphecodes*-species, Ågren & Svensson (1982) provided a key for their identification. Utilizing these antennal characters, as well as other ones, Warncke (1992) provided a key to the male of the West Palaearctic *Sphecodes*-species. However, in the species belonging to the *S. pinguiculus* species-group, the antennal flagellum of males, at least beginning from the third flagellomere, is uniformly covered by sensilla thus, without the characteristic sequence of notch-gibbous areas. Nobile & Turrisi (2004) have been recorded *S. pinguiculus* and additionally have described seven new Italian species of *Sphecodes*, having a similar antennal morphology of the former species. Based on antennal morphology and other commonly shared features, Nobile & Turrisi (2004) proposed the institution of the *S. pinguiculus* species-group, providing a comprehensive key to species. Recently, these newly described species have been synonymised by Schwarz & Gusenleitner (2012), on the basis of the examination of type material.

In the present paper, the distinctive characters of the seven species of *Sphecodes* described by Nobile & Turrisi (2004) are confirmed and pointed out, demonstrating the inconsistency of the synonymies by Schwarz & Gusenleitner (2012) and thus confirming the validity of these species.

MATERIALS AND METHODS

The present paper is based on primary type material of the seven species described by Nobile & Turrisi (2004), preserved in the collection of Zoologische Staatssammlung München (Germany).

RESULTS

In the following, we point out the results of the reexamination of each species of the *S. pinguiculus* species-group described by Nobile & Turrisi (2004), which confirm their validity.

Sphecodes banaszaki Nobile et Turrisi, 2004

Sphecodes banaszaki, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 120 (Italia).

Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 74.

From the comparison between *S. marginatus* Hagens, 1882 and *S. banaszaki* Nobile et Turrisi, 2004 (the latter retained synonym of *S. marginatus* by Schwarz & Gusenleitner, 2012), and the descriptions provided by Hagens (1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. banaszaki* has the flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, sensilla), without the characteristic sequence of alternate notch and gibbous areas, as also pointed out by the same Schwarz & Gusenleitner (2012: fig. 1); conversely, in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- the male genital capsule of *S. banaszaki* has the membranous area of the gonostylus wide and quadrangular shaped (Nobile & Turrisi, 2004: fig. 3; Schwarz & Gusenleitner, 2012: figs. 7a–d), thus, quite different from *S. marginatus*, which has a less wide and triangular shaped membranous area (Hagens, 1882: fig. 18; Warncke, 1992: fig. 32; Bogusch & Straka, 2012: figs. 165, 166). Moreover, the apex of the sclerified part of the gonostylus of *S. banaszaki* is more robust and more developed than *S. marginatus*.

These strong differences between *S. banaszaki* and *S. marginatus*, affecting important features of head and metasoma, and clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S.*

banaszaki belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* Hagens, 1882 species-group (Bogusch & Straka, 2012).

S. banaszaki is deeply different from *S. marginatus*, and taking also into account the differences with the other species of the same group, *S. banaszaki* Nobile et Turrisi, 2004 is valid species.

Sphecodes campadellii Nobile et Turrisi, 2004
Sphecodes campadellii, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 118 (Italia).
Sphecodes geoffrellus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 74.

From the comparison between *S. geoffrellus* (Kirby, 1802) and *S. campadellii* (the latter retained synonym of *S. geoffrellus* by Schwarz & Gusenleitner, 2012) and the descriptions provided by Hagens (1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. campadellii* has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead *S. geoffrellus* has each of the median flagellomeres covered for at most 3/4 of the surface by a white spot of sensilla alternate with evident gibbous areas.

Moreover, *S. campadellii* belongs to the *S. pinguiculus* species-group, whereas *S. geoffrellus* belongs to a different group.

S. campadellii is deeply different from *S. geoffrellus*, and taking also into account the differences with the other species of the same group, *S. campadellii* Nobile et Turrisi, 2004 is valid species.

Sphecodes combai Nobile et Turrisi, 2004
Sphecodes combai, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 119 (Italia).
Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 75.

From the comparison between *S. marginatus* and *S. combai* (the latter retained synonym of *S.*

marginatus by Schwarz & Gusenleitner 2012) and the descriptions by Hagens (1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. combai* has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead, in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- *S. combai* has the first metasomal tergite polished and shiny, due to the absence of microsculpture, with fine, superficial and scattered punctures (distance between punctures 1.0-3.0x puncture diameter); instead *S. banaszaki* (= *S. marginatus* ?) has the first metasomal tergite dull, due to the presence of microsculpture, with coarse, deep and dense punctures (distance between punctures 1.0-1.5x puncture diameter) (Nobile & Turrisi, 2004; Schwarz & Gusenleitner, 2012: fig. 4).

These strong differences between *S. combai* and *S. marginatus*, affecting important features of head and metasoma and clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S. combai* belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* species-group (Bogusch & Straka, 2012).

S. combai is deeply different from *S. marginatus*, and taking also into account the differences with the other species of the same group, *S. combai* Nobile et Turrisi, 2004 is valid species.

Sphecodes marcellinoi Nobile et Turrisi, 2004
Sphecodes marcellinoi, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 121 (Italia).
Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 75.

From the comparison between *S. marginatus* and *S. marcellinoi* (the latter retained synonym of *S. marginatus* by Schwarz & Gusenleitner, 2012)

and the descriptions provided by Hagens (1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. marcellinoi* has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead, in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- *S. marcellinoi* has a slightly arcuate clypeus, nearly straight; conversely, *S. walteri* (= *S. marginatus* ?) has a strongly arcuate clypeus;

- *S. marcellinoi* has fine, superficial and scattered punctuation on frons (distance between punctures about 2.0x puncture diameter); instead *S. banaszaki* (= *S. marginatus* ?) has coarse, deep and dense punctuation on frons (distance between punctures less than puncture diameter) (Nobile & Turrisi, 2004; Schwarz & Gusenleitner, 2012: fig. 2).

These strong differences between *S. marcellinoi* and *S. marginatus*, affecting important features of head and metasoma, clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S. marcellinoi* belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* species-group (Bogusch & Straka, 2012).

S. marcellinoi is deeply different from *S. marginatus*, and taking also into account the differences with the other species of the same group, *S. marcellinoi* Nobile et Turrisi, 2004 is valid species.

***Sphecodes walteri* Nobile et Turrisi, 2004**

Sphecodes walteri, Nobile & Turrisi, 2004. Entomofauna, 25, (8): 122 (Italia).

Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 75.

From the comparison between *S. marginatus* Hagens, 1882 and *S. walteri* (the latter retained synonym of *S. marginatus* by Schwarz & Gusenleitner, 2012) and the descriptions provided by Hagens

(1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. walteri*, has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- *S. walteri* has the clypeus strongly arcuate; instead, *S. marcellinoi* (= *S. marginatus* ?) has the clypeus slightly arcuate, nearly straight;

- *S. walteri* has irregular, coarse, deep and moderately dense punctuation on frons (distance between punctures 1.0–2.0x puncture diameter); instead *S. marcellinoi* (= *S. marginatus* ?) has nearly regular, fine, superficial and scattered punctuation on frons (distance between punctures about 2.0x puncture diameter).

These strong differences between *S. walteri* and *S. marginatus*, affecting important features of the head and clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S. walteri* belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* species-group (Bogusch & Straka, 2012).

S. walteri is deeply different from *S. marginatus*, and taking also into account the differences with the other species of the same group, *S. walteri* Nobile et Turrisi, 2004 is valid species.

***Sphecodes iosephi* Nobile et Turrisi, 2004**

Sphecodes iosephi, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 123 (Italia).

Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 75.

From the comparison between *S. marginatus* and *S. iosephi* (the latter retained synonym of *S. marginatus* by Schwarz & Gusenleitner, 2012) and the descriptions provided by Hagens (1882) and Meyer (1919), as well as the identification keys pro-

vided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. iosephi* has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead, in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- *S. iosephi* has irregular, coarse, deep and very dense punctuation on frons (distance between punctures about equal to puncture diameter); moreover, the vertex is punctate-carinulate, with punctuation coarse, deep and dense; instead, in *S. marcellinoi* (= *S. marginatus* ?) the frons and vertex have punctuation, with nearly regular, fine, superficial and scattered punctuation (distance between punctures about 2.0x puncture diameter);

- in *S. iosephi* the first metasomal tergite bears fine, superficial and scattered punctuation (distance between punctures 1.0-3.0x puncture diameter); instead *S. banaszaki* (= *S. marginatus* ?), has the first metasomal tergite bearing coarse, deep and dense punctures (distance between punctures 1.0-1.5x puncture diameter) (Nobile & Turrisi, 2004; Schwarz & Gusenleitner, 2012: fig. 4);

- *S. iosephi* has a stout genital capsule and the sclerified part of the gonostylus extends very slightly beyond the membranous part (Nobile & Turrisi, 2004: fig. 6; Schwarz & Gusenleitner, 2012: figs. 10a-10d); instead *S. banaszaki* (= *S. marginatus* ?) has the sclerified part of the gonostylus well extended beyond the membranous part (Nobile & Turrisi, 2004: fig. 3; Schwarz & Gusenleitner, 2012: figs. 7a-7d).

These strong differences between *S. iosephi* and *S. marginatus*, affecting important features of head and metasoma, clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S. iosephi* belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* species-group (Bogusch & Straka, 2012).

S. iosephi is deeply different from *S. marginatus*, and taking also into account the differences

with the other species of the same group, *S. iosephi* Nobile et Turrisi, 2004 is valid species.

***Sphecodes tomarchioi* Nobile et Turrisi 2004**

Sphecodes tomarchioi, Nobile & Turrisi, 2004. Entomofauna, 25 (8): 124 (Italia).

Sphecodes marginatus, Schwarz & Gusenleitner, 2012. Entomofauna, 33 (8): 76.

From the comparison between *S. marginatus* and *S. tomarchioi* (the latter retained synonym of *S. marginatus* by Schwarz & Gusenleitner, 2012) and the descriptions provided by Hagens (1882) and Meyer (1919), as well as the identification keys provided by Warncke (1992) and Bogusch & Straka (2012), it is possible to point out many remarkable differences between the two considered species, the most important being:

- *S. tomarchioi* has flagellomeres, excluding the basal two, uniformly covered by sensilla on the ventral surface (Haarfleck, etc.), without the characteristic sequence of alternate notch and gibbous areas (similarly to that presented by Schwarz & Gusenleitner, 2012: fig. 1); instead, in *S. marginatus*, each flagellomere, excluding the basal three, bears a basal white spot of sensilla alternate with an evident and well protruded distal gibbous area, as also clearly showed by Bogusch & Straka (2012: fig. 122);

- *S. tomarchioi* has irregular, coarse, deep and very dense punctuation on frons and vertex (distance between punctures less than puncture diameter); instead *S. marcellinoi* (= *S. marginatus* ?) has frons and vertex bearing nearly regular, fine, superficial and scattered punctuation (distance between punctures about 2.0x puncture diameter);

- *S. tomarchioi* has the first metasomal tergite bearing fine, superficial and scattered punctuation (distance between punctures 2.0-3.0x puncture diameter); instead *S. banaszaki* (= *S. marginatus* ?) has the first metasomal tergite with coarse, deep and dense punctures (distance between punctures 1.0-1.5x puncture diameter) (Nobile & Turrisi 2004; Schwarz & Gusenleitner, 2012: fig. 4);

- the genital capsule of *S. tomarchioi* (Nobile & Turrisi, 2004: fig. 7; Schwarz & Gusenleitner, 2012: figs. 11a-11d) is significantly differentiated from that of *S. marginatus*, due to the presence of a long, slender and strongly curved toward inner distal process of the sclerified part of gonostylus; instead,

in *S. marginatus* this process is absent, with the distal sclerified part of gonostylus stouter and straight toward apex (Hagens, 1882: fig. 18; Warncke, 1992: fig. 32; Bogusch & Straka, 2012: figs. 165, 166).

These strong differences between *S. tomarchioi* and *S. marginatus*, affecting important features of head and metasoma, clearly not running within intraspecific variation, have been overlooked by Schwarz & Gusenleitner (2012); moreover, while *S. tomarchioi* belongs to the *S. pinguiculus* species-group, *S. marginatus* belongs to the *S. miniatus* species-group (Bogusch & Straka, 2012).

S. tomarchioi is deeply different from *S. marginatus*, and taking also into account the differences with the other species of the same group, *S. tomarchioi* Nobile et Turrisi, 2004 is valid species.

CONCLUSIONS

Schwarz & Gusenleitner (2012) studied and compared the type specimens of all the seven species described by Nobile & Turrisi (2004), taking into account the dimensions of the body, the features of genital capsule and, in some cases, the distal part of the antenna. Schwarz & Gusenleitner (2012) criticized the bad preparation of the genital capsules, as well as the drawings provided by Nobile & Turrisi (2004); moreover, they retained some specimens, namely those belonging to *S. walteri* and *S. iosephi*, too early collected, thus with cuticle of some parts, useful for identification, too soft (the last flagellomeres and some detail of the genital capsule). With regard to the drawings provided by Nobile & Turrisi (2004), we reject the statement by Schwarz & Gusenleitner (2012), because if a strict comparison is made between these drawings and the photographs provided by Schwarz & Gusenleitner (2012) and Bogusch & Straka (2012), it is possible to ascertain not only the substantial adherence of the features showed in the drawings with the photographs, but also the usefulness of these features for identification of the species, and clearly appears the paradox of having a species, namely *S. marginatus* (sensu Schwarz & Gusenleitner, 2012), including the additional six taxa described by Nobile & Turrisi (2004), too variable and definitely without clear diagnostic features, thus introducing an unacceptable

taxonomic treatment of the species concept within *S. pinguiculus* species-group.

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