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# **Notes on two North African *Colletes* LATR. (Hymenoptera: Colletidae), with description of *C. sahariensis* nov.sp.**

Michael KUHLMANN

**A b s t r a c t :** The hitherto unknown female of the rare North African bee species *Colletes elegans* NOSKIEWICZ, 1936 is described for the first time and *C. diodontus* BENOIST, 1958 is recognized as a junior synonym of the former (**syn.nov.**). The Northwest African endemic *C. sahariensis* **nov.sp.** is described. The *C. diodontus* species group is renamed into *C. arabicus* species group.

**Key words :** *Colletes*, solitary bee, taxonomy, synonymy, North Africa

## **Introduction**

The aim of this study is to clarify the taxonomy and nomenclature of two rarely collected *Colletes* species distributed in North Africa. This opportunity arose when Andreas MÜLLER, Zurich, provided information about the possible location of the holotype of *C. diodontus* BENOIST, 1958 that is housed in the museum in Lausanne. The whereabouts of the type specimen were previously unknown, making it impossible to clarify the identity of the species.

The type examination revealed that *C. diodontus* is a synonym of *C. elegans* NOSKIEWICZ, 1936, as NOSKIEWICZ (1962) already suspected. However, in those days he could not verify this due to lack of access to the type specimen. In contrast, WARNCKE (1978) without clarifying that he had apparently never seen the type, interpreted *C. diodontus* as a species that was still undescribed at the time, as shown by accordingly labelled specimens in his collection. Back then, I interpreted these specimens as reliably and correctly identified, and they served as a reference for later determinations. Due to the unexpected synonymy of *C. diodontus* with *C. elegans*, "*C. diodontus*" sensu WARNCKE (1978) now turned out to be a species that has not yet been formally named. As a result, all records of "*C. diodontus*" listed by LHOMME et al. (2020) and KUHLMANN & GOERGEN (2025) represent this new species, that is here described for the first time. Due to the misidentification, it is also necessary to rename the *C. diodontus* species group (KUHLMANN 2014), which is also done in this publication. In the course of the study, it also emerged that the female *C. elegans* had not yet been described, which is now being rectified here.

## **Material and Methods**

Terminology as well as measurements used in the description follows those of MICHENER (2007). Puncture density is expressed as the relationship between puncture diameter (d)

and the space between them (i), such as  $i = 1.5d$  or  $i < d$ . T is used as abbreviation of metasomal tergum and S for a metasomal sternum. Hair is described as ‘erect’ if it protrudes from the body surface, regardless of the angle (opposite: ‘appressed’). Body length is measured from the vertex to the apex of the metasoma.

Images were taken with the Digital Microscope Keyence VHX-5000 (Keyence Deutschland GmbH, Neu-Isenburg, Germany) using the VH-Z20R/Z20T (20x to 200x) zoom lens and the OP-42305 super diffused illumination adapter. Photoshop elements (Adobe Systems Software Ireland Limited, Dublin, Republic of Ireland) was used for image processing.

Missing coordinates on the original specimen labels were identified using Google Earth (Google Earth Pro© 2021, version 7.3.4.8248) and added in square brackets (e.g. [32°50' S, 18°40' E]). The distribution map was created with SimpleMapper (SHORTHOUSE 2010).

Specimens were examined from or are housed in the following collections:

MZLS .....	The Naturéum, State Museum of Natural Sciences, Zoology, Lausanne, Switzerland
NBCL .....	Naturalis Biodiversity Center, Leiden, Netherlands
NHML .....	Natural History Museum, London, UK
OLML.....	Biodiversity Center Linz (Oberösterreichisches Landesmuseum Linz), Austria
OUMN.....	Oxford University Museum of Natural History, Oxford, UK
PCAM.....	private collection A. MÜLLER, Zürich, Switzerland
PCCS .....	private collection C. SCHMID-EGGER, Berlin, Germany
PCTW.....	private collection T.J. WOOD, Leiden, Netherlands
PCWL.....	private collection W.H. LIEBIG, Bad Muskau, Germany
RCMK .....	research collection of M. KUHLMANN, Zoological Museum of Kiel University, Kiel, Germany
SMNH .....	Steinhardt Museum of Natural History, Tel Aviv University, Tel Aviv, Israel
UWNM.....	Museum of Natural History, University of Wrocław, Wrocław, Poland

## ***Colletes* species accounts**

### ***Colletes squamosus* species group**

#### ***Colletes elegans* NOSKIEWICZ, 1936 (Figs 1-11)**

*Colletes elegans* NOSKIEWICZ, 1936: 217-219. Holotype ♂ (Algeria, Ghardaia) (UWNM), examined.  
*Colletes diodontus* BENOIST, 1958: 164-165. Holotype ♂ (Morocco, Boumalne) (MZLS), examined.

#### **Syn. nov.**

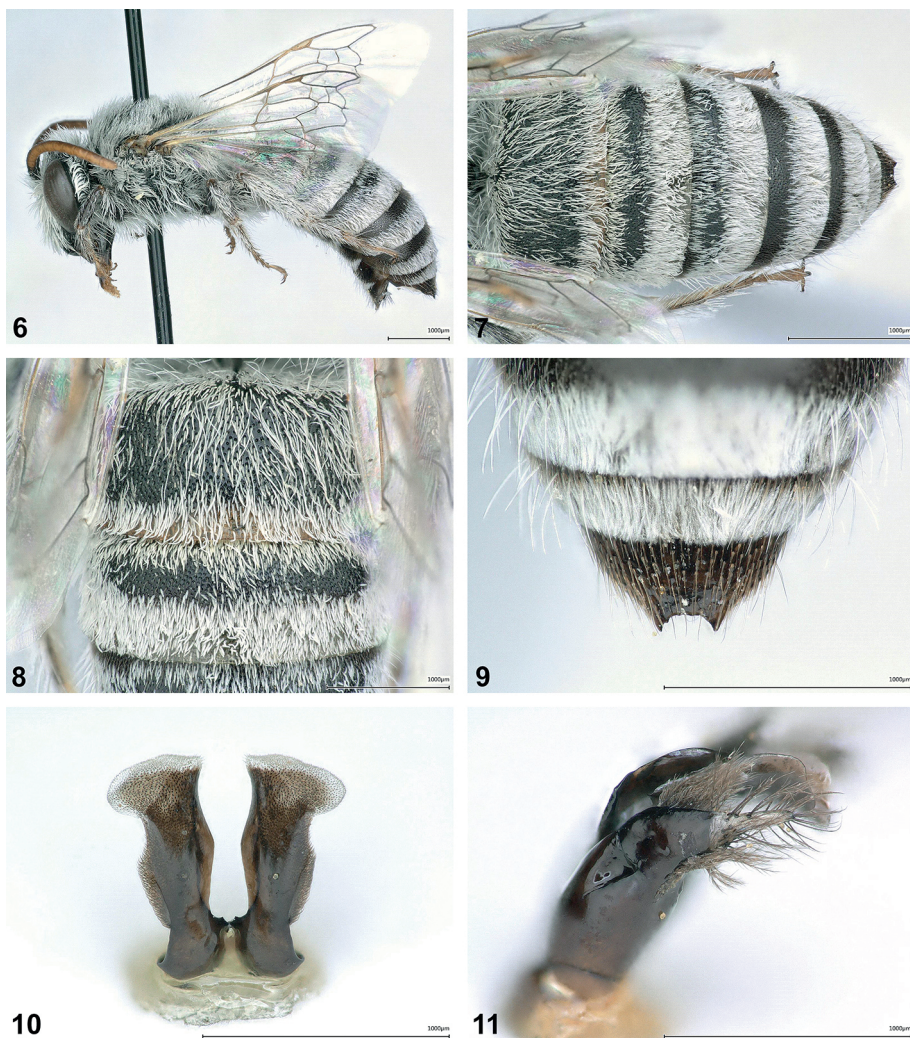
The hitherto unknown female of *C. elegans* is here described for the first time. The male has already been described in detail by NOSKIEWICZ (1936, 1955), so this rarely collected species is only photographically documented here (Figs 6-11) to facilitate its identification.



**Figs 1-5:** *Colletes elegans* NOSKIEWICZ, female. (1) Habitus lateral; (2) head; (3) mesoscutum; (4) metasoma dorsal; (5) metasomal terga T1-T2.

**Diagnosis:** *Colletes elegans* belongs to the *C. squamosus* species group that is particularly speciose in deserts and semi-deserts of North Africa, the Middle East and Central Asia. To facilitate identification, the diagnosis is limited to the other four closely related small-bodied species of the *C. squamosus* group that occur in the same region as *C. elegans*, namely *C. bytinskii* NOSKIEWICZ, 1955, *C. jejunos* NOSKIEWICZ, 1936, *C. pseudojejunos* NOSKIEWICZ, 1959 and *C. salsolae* COCKERELL, 1934, (= *C. omanus* KUHLMANN, 2003). Females of these species are very difficult to separate due to the subtle differences in sculpture and because most of the body is densely covered by appressed or plumose hair, obscuring the sculpture.





**Figs 6-11:** *Colletes elegans* NOSKIEWICZ, male. (6) Habitus lateral; (7) metasoma; (8) metasomal terga T1-T2; (9) metasomal tergum T7 with apical spines; (10) metasomal sternum S7; (11) gonostylus lateral.

The female of *C. elegans* differs from the above mentioned four species by the following character combination: T2 completely covered with short appressed hair (Fig. 4) (in *C. salsolae* disc of T2 glabrous), clypeus medially finely and densely ( $i < d$ ) punctate (Fig. 2) (distinctly coarser and more dispersed in *C. bytinskii*), punctures more elongate, some at least twice as long as broad ( $\pm$  circular in the reference species), clypeus without mediolongitudinal depression (at least shallowly depressed in apical half in *C. jejunos* and *C. pseudojejunos*), discs of T1 and T2 with very fine, superficial and dense punctation (Fig. 5) (coarser and more dispersed in *C. bytinskii*).



## Description

**Female:** Body length: 7.0-8.0 mm (Habitus Fig. 1). Head wider than long (Fig. 2). Integument black, apical margin of clypeus dark reddish-brown, mandible reddish-brown. Face densely covered with moderately long white, erect hair, on vertex hair light yellowish-white (Fig. 2). Clypeus convex, without mediolongitudinal depression, medially finely and densely ( $i < d$ ) punctate (Fig. 2), punctures  $\pm$  elongate, some at least twice as long as broad; surface between punctures smooth and shiny, inconspicuous pair of small apical clypeal depressions. Malar area medially narrow, about  $1/3$  as long as width of mandible base, finely punctate and matt. Antenna dorsally blackish to brown, ventrally bright yellowish-brown (Fig. 2). Scutum relatively coarsely and densely punctate ( $i < d$ ), between punctures smooth and shiny (Fig. 3). Scutellum anteriorly almost impunctate, smooth and shiny; rest of scutellum densely and coarsely punctate ( $i < d$ ). Mesosoma densely covered with short plumose, white to yellowish-white hair (Fig. 1). Wing membrane transparent and slightly yellowish, venation yellowish-brown. Legs predominantly reddish-brown, tarsi more yellowish-brown, vestiture whitish, scopa white. Integument of metasoma black, the broad apical tergal depressions translucent yellowish to reddish (Figs 4, 5). Terga in normal position (except T6) completely and densely covered with short appressed white to yellowish-white hair, almost completely hiding integumental sculpture, T1 anteriorly and T4 / T5 on disc additionally with few long erect, white hairs (Figs 4, 5). Terga apically with broad but only slightly depressed margin; terga very finely and very densely punctate, matt. S2 with broad apical sternal hair band, following sterna with a sparse fringe of some long, erect ciliae.

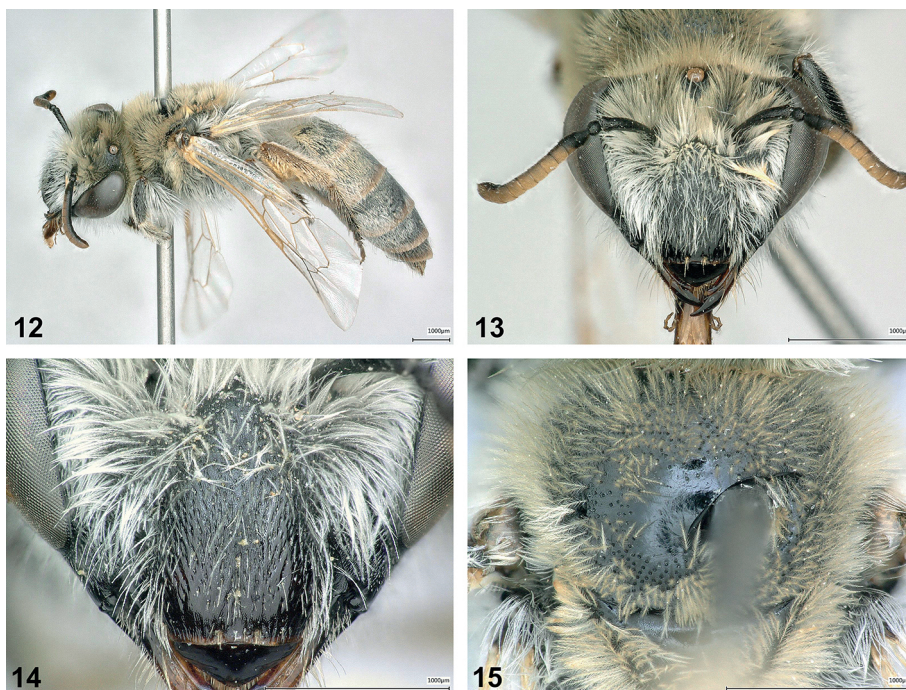
**Material examined** (38 specimens): ALGERIA: 4♀♀, "Béni-Abbès [30°08' N 2°10' W]" (OLML, Coll. Warncke); 1♂, "Saida, 8 km NO de Ain Ouarka [34°50' N 0°08' E], 6.4.1983, R. Leys" (NBCL). EGYPT: 1♂, "N. Coast [30°30' N 29°00' E], 5.5.1991, A. Mochi" (NBCL); 1♂, "C. Sinai, near Naql [29°54' N 33°44' E], 16.5.1992, A. Mochi" (NBCL); 1♂, "Ain Sokhna road 29-43 km E of Maadi [29°55' N 31°35' E], 2.5.1992, C.G. Roche" (OUMN); 8♀♀, "Mersa Matruh [31°21' N 27°14' E], 30.5.1987, C.G. Roche" (OUMN, RCMK); 1♂, "Za'afarana road 90-110 km E of El Korimat (? , illegible) [29°00' N 32°12' E], 1.5.1992, C.G. Roche" (OUMN). ISRAEL: 1♂, "Hatzeva, 30°40'40" N 35°14'19" E, 10.4.2009, Gotlieb A." (SMNH); 2♂♂, Revivim (Palestine) [31°02' N 34°42' E], (NOSKIEWICZ 1955). JORDAN: 2♂♂, "Road Desert Highway, Wadi Rum [30°20' N 35°30' E], 17.4.2007, Praz, Sedivy, Müller" (PCAM, RCMK). MOROCCO: 2♂♂, "20 km N Missouri [33°11' N 4°00' W], 14.5.1995, M. Halada" (RCMK); 1♀, "Figuig, Oued ed Defla, 32°35'07" N 1°51'16" W, 1180 m, 30.5.1996, P. Rasmont" (RCMK); 1♂, "Midelt, R503, 7 km NE of Ait Ben Yacoub, 33.0217 -4.8197, 1600 m, 21.5.2022, T. Wood" (PCTW); 1♂, "Midelt, R503, W of Ait Ali, Oued Taourda, 33.0424 -4.7816, 1550 m, 23.5.2022, T. Wood" (RCMK). TUNISIA: 5♂♂, "Nefta [33°53' N 7°53' E], 8.-9.4.1998, K. Denes" (OLML, RCMK); 1♀, "Tozeur [33°55' N 8°08' E], 10.5.1992, J. Gusenleitner" (RCMK); 1♀, "Tozeur [33°55' N 8°08' E], 14.7.1979, J. Gusenleitner" (OLML, Coll. Warncke); 4♂♂, "10 km W Remada [32°20' N 10°21' E], 10.4.2001, M. Halada" (OLML, RCMK).

**General distribution:** North Africa, Israel and Jordan (Fig. 26).

**Host plants:** According to MÜLLER & KUHLMANN (2008) the species is polylectic with a strong preference for Resedaceae.

## *Colletes arabicus* species group

Due to the synonymisation of *C. diodontus*, the species group named after this species (KUHLMANN 2014) also needs to be renamed. It is now named after *C. arabicus* KUHLMANN, 2002, the next earliest described species in the group.



**Figs 12-15:** *Colletes sahariensis* **nov.sp.**, female. (12) Habitus lateral; (13) head; (14) clypeus; (15) mesoscutum.

### *Colletes sahariensis* **nov.sp.** (Figs 12-25)

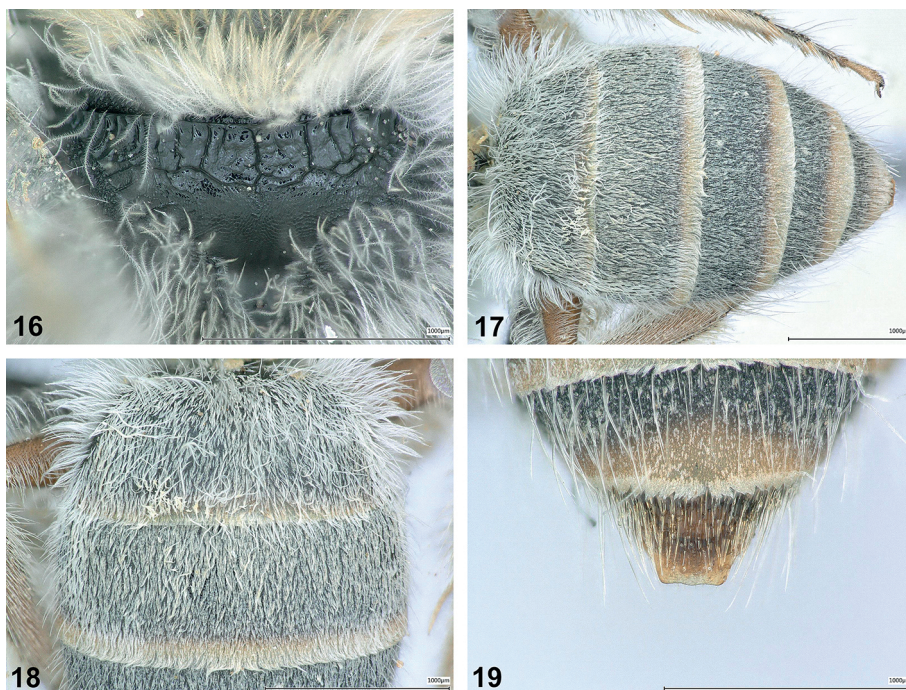
**Diagnosis:** The female *C. sahariensis* differs from the other two species of the group by the following character combination: malar area  $\pm 1.5$  times longer than width of the base of the mandible (Fig. 14) (in *C. arabicus* about as long and in *C. schmideggeri* KUHLMANN, 2014 shorter than width of the base of the mandibles) and without short appressed white hairs (present in *C. schmideggeri*), disc of scutum impunctate, polished and shiny (Fig. 15) (with fine and dispersed punctation in *C. schmideggeri*), basal area of propodeum medially shorter than metanotum (about as long or longer in the other two species), short appressed hair on metasomal terga denser, hardly allowing a glimpse on the integumental sculpture (Figs 17, 18) (pilosity sparser, integumental sculpture at least partly visible).

The male differs from the other species of the group by its very long malar area ( $\pm$  twice as long as the width of the base of the mandibles), that is distinctly shorter in the other two species (1.5 times longer in *C. arabicus* and about as long as broad in *C. schmideggeri*), gonostylus as in Fig. 25 (even smaller and shorter in the other species), S7 small, long oval (Fig. 24) (even smaller and apically more flattened in the other species).

### **Description**

Female: Body length: 7.0-8.0 mm (Habitus Fig. 12). Head wider than long (Fig. 13). Integument black, mandible partly red to dark reddish-brown. Face sparsely covered with moderately long greyish-white, erect hair, on vertex hair yellowish-white (Fig. 13).

Clypeus strongly convex, apically with a very shallow longitudinal median depression, relatively finely and densely ( $i = 0.5\text{--}1.0d$ ) longitudinally punctured; surface between punctures laterally smooth and shiny, medially finely shagreened and matt, inconspicuous pair of apical clypeal depressions (Fig. 14). Malar area  $\pm 1.5$  times longer than width of the base of the mandible (Fig. 14), finely striate and matt. Antenna dorsally blackish-brown, flagellum ventrally bright yellow (Fig. 13). Scutum on disc impunctate, polished and shiny (Fig. 15). Scutellum mostly impunctate, smooth and shiny, posterior margin shagreened and matt. Propodeum as in Fig. 16. Mesosoma densely covered with moderately long hair, laterally of greyish-white and dorsally of yellowish-white colour (Fig. 12). Wing membrane slightly yellowish, venation light yellowish-brown. Front and mid legs black (except apical tarsus yellowish-brown), hind legs predominantly (femur, tibia, tarsi except brown mid tarsal segments) red-brown; vestiture whitish, scopa white (Fig. 12). Integument of metasoma black, apical tergal depressions translucent light yellowish to dark reddish-brown (Figs 17-19). Terga completely and densely covered with short appressed white to light yellowish-brown hair, hiding integumental sculpture; in addition T1 sparsely covered with long erect, white hairs, following terga on disc with fewer and much shorter erect, white hairs (Figs 17, 18). Terga apically indistinctly depressed, T6 apically truncated (Fig. 19). When hair is removed terga with very fine superficial and dense ( $i < 0.5d$ ) punctation visible, shiny. Sterna laterally with narrow and thin apical hair bands, consisting only of some long ciliae in the middle.



**Figs 16-19:** *Colletes sahariensis* nov.sp., female. (16) Propodeum; (17) metasoma; (18) metasomal terga T1-T2; (19) metasomal tergum T6.





**Figs 20-25:** *Colletes sahariensis* **nov.sp.**, male. (20) Habitus lateral; (21) metasoma; (22) metasomal terga T1-T2; (23) metasomal tergum T7 with apical spines (arrows); (24) metasomal sternum S7; (25) gonostylus lateral.

**Male:** Body length: 7.0-8.0 mm (Habitus Fig. 20). Head wider than long. Integument black, mandible partly red to dark reddish-brown. Face densely covered with long white, erect hair (Fig. 20). Malar area  $\pm$  twice as long as width of the base of the mandible, finely striate and matt. Antenna dorsally blackish-brown, flagellum ventrally bright yellow (Fig. 20). Scutum on disc impunctate, polished and shiny. Scutellum mostly impunctate, smooth and shiny, posterior margin shagreened and matt. Mesosoma densely covered with long, white hair (Fig. 20). Wing membrane slightly yellowish, venation light yellowish-brown. Legs black, just apical tarsal segments yellowish-brown; vestiture whitish. Integument of metasoma black, apical tergal depressions translucent light

yellowish to dark reddish-brown (Figs 21, 22). Terga (except T7) completely and densely covered with short appressed white hair, hiding integumental sculpture; in addition T1 sparsely covered with long erect, white hairs, following terga on disc with fewer and much shorter erect, white hairs (Figs 21, 22). Terga apically indistinctly depressed, T7 with a pair of apical spines (Fig. 23). When hair is removed terga with very fine superficial and dense ( $i < 0.5d$ ) punctation visible, shiny. S2-S5 with distinct apical hair bands, on S3-S5 hair bands medially less than half as wide as laterally. Gonostylus (Fig. 25) and S7 (Fig. 24) as illustrated.

**Type material** (11 specimens): **Holotype**: ♂, "S. Morocco: Oued Draa (Rd. E. of Tan Tan) [28°31' N, 10°57' W], 18.iii.1974 / K.M. Guichard & G.R. Else, B.M. 1974-160 / Halophytes on sand and silt" (OLML, Coll. Warncke). **Paratypes**: MAURITANIA: 1♀, "Mauritanie, Nouakchott [18°05' N, 15°58' W], iii.1991, bac jaune, F. Borgato rec., A. Pauly col." (RCMK). MOROCCO: 2♀♀, same data as for the Holotype (OLML, Coll. Warncke); 1♀, 2♂♂, "Morocco, Guelmin-Oued, Noun, El Quatia, 28.487 -11.344, leg. Schmid-Egger, 20.03.2024, ma-c01" (RCMK); 1♀, 1♂, "Morocco, Laayoune [27°10' N, 13°14' W], 13.2.88, K. Guichard" (RCMK); 1♀, "Marokko, Tagmout, E [29°02' N, 9°27' W], 28.3.1986, leg. Max. Schwarz" (RCMK); 1♂, "Laayoune, LBSH, Mo, 27.1577, -13.2293, 63 m, 23-III-2023, A. Agiagane and O. Errguibi, S106" (RCMK).

**Additional material examined**: The following specimens are all labelled as *C. diodontus* but are *C. sahariensis*: MOROCCO: 1♀, "Morocco, Laayoune [27°10' N, 13°14' W], 13.2.88, K.M. Guichard" (NHML); 2♂♂, "Morocco, Guelmin-Oued, Noun, El Quatia, 28.487 -11.344, leg. Schmid-Egger, 20.03.2024, ma-c01" (PCCS); 1♀, 2♂♂, "Dakhla 20 km NE, Halbwüste [23°54' N, 15°43' W], 2 m, 23.3.2024, W.H. Liebig" (PCWL).

**Etymology**: The name refers to the Sahara desert.

**General distribution**: Endemic to southern Morocco and neighbouring western Mauritania (Fig. 26).

**Host plants**: Unknown.



**Fig. 26:** Distribution records of *Colletes elegans* NOSKIEWICZ and *Colletes sahariensis* **nov.sp.**

## Discussion

The synonymization of *C. diodontus* with *C. elegans* was taken as an opportunity to describe the female of the species for the first time. The rarely collected and little-known *C. elegans* and *C. sahariensis* were photographed to facilitate their identification, and the

available information on their distribution and biology was summarized. Both species are representative of the numerous "desert species" among the bees of North Africa and show how little we know about them.

### Acknowledgements

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### Zusammenfassung

Das bislang unbekannte Weibchen der seltenen nordafrikanischen Bienenart *Colletes elegans* NOSKIEWICZ, 1936 wird erstmals beschrieben und *C. diodontus* BENOIST, 1958 als ihr jüngeres Synonym erkannt (**syn.nov.**). Die in Nordwest-Afrika endemische *C. sahariensis* **nov.sp.** wird beschrieben. Die *C. diodontus*-Artengruppe wird in *C. arabicus*-Artengruppe umbenannt.

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Address of the author: Prof. Dr. Michael KUHLMANN  
Zoological Museum  
Christian-Albrechts-University Kiel  
Hegewischstr. 3  
D-24105 Kiel  
Germany  
E-mail: [mkuhlmann@zoolmuseum.uni-kiel.de](mailto:mkuhlmann@zoolmuseum.uni-kiel.de)

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