Zootaxa 3716 (3): 431–440
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3716.3.6
http://zoobank.org/urn:lsid:zoobank.org:pub:3307FF48-59A1-413A-9ECF-B032A2A3443F

Species status of *Bombus monticola* Smith (Hymenoptera: Apidae) supported by DNA barcoding

JAN OVE GJERSHAUG, ARNSTEIN STAVERLØKK, ODDMUND KLEVEN & FRODE ØDEGAARD
Norwegian Institute for Nature Research, P.O. Box 5685 Sluppen, NO-7485 Trondheim, Norway
E-mail: jan.o.gjershaug@nina.no; arnstein.staverlokk@nina.no; oddmund.kleven@nina.no; frode.odegaard@nina.no

Abstract

Certain species of bumblebees are difficult to distinguish based on morphology alone due to a lack of diagnostic characters and extensive intraspecific variation in colour patterns. The discussion concerning whether *Bombus lapponicus* and *Bombus monticola* are the same species or not, seems to be ongoing. We present a study of 16 speciemens of *B. monticola/B. lapponicus* from Norway, identified with previously published morphological characters and with DNA barcoding. The results showed a match with the examination of the morphological characters and the DNA sequence data. These results confirm that *B. lapponicus* and *B. monticola* appear as separate species in Norway, which supports earlier conclusions based on both morphological differences and differences in cephalic marking pheromones in males. The wide sympatric range of the two taxa in Scandinavia also strongly support their species status.

Key words: Bilberry bumblebee, *Bombus lapponicus*, COI sequence, Norway

Introduction

Until 1979, *Bombus lapponicus* (Fabricius) was regarded as two subspecies in Fennoscandia, with subspecies *B. l. lapponicus* (with yellow, black and red coat) in northern Fennoscandia and subspecies *B. l. scandinavicus* Friese (with black and red coat) in the mountains of Scandinavia. Løken (1973) described a zone of intergradation between these subspecies in northern Scandinavia. Based on differences in cephalic marking pheromones in males of the two subspecies (Bergström & Svensson 1973, Svensson 1977, Svensson & Bergström 1977) and morphological differences between them (Svensson 1973, Svensson & Lundberg 1977), Svensson (1979) considered the two subspecies as separate species. Svensson (1979) also found that the male cephalic marking pheromones were the same in both subspecies *B. l. hypsophilus* from the Austrian Alps and subspecies *B. l. scandinavicus* in Fennoscandia. Based on morphological similarities, Svensson (1979) concluded that *B. l. scandinavicus* was conspecific with *B. monticola* in the British Isles, and redescribed *B. monticola* and *B. lapponicus*. Pekkarinen (1982) also found significant morphological differences between the two species and supported Svensson (1979) in that there are two closely related species in Fennoscandia with a wide sympatric range in Scandinavia. Specimens of *B. lapponicus* queens from northern Fennoscandia vary from those with a coat consisting of numerous yellow hairs (Figure 1A) to those with none (Svensson 1979). In southern Norway, we also found specimens with at least some yellow hairs on pronotum (collar) and scutellum (Figure 1B), but melanism (Figure 1C) is much more common in southern Norway than in northern Fennoscandia (Svensson 1979). A similar pattern has also been described for *B. balteatus* and *B. hortorum* in Norway (Løken 1973). Specimens of *B. monticola* are melanistic all over Norway (Figure 2A), but some individuals have some yellow hairs on pronotum and scutellum in southern Norway (Figure 2B). In a more recent study, Koulianos (1999) applied a molecular approach to examine the phylogenetic relationship among bumblebees. Analysis of sequence data from the COI gene, revealed little differentiation between *B. lapponicus* and *B. monticola* (Koulianos 1999). Based on this finding, Koulianos (1999) concluded that *B. lapponicus* and *B. monticola* are not two separate species. Koulianos (1999) did, however, only sequence a relatively short fragment (333 base-pairs) from a single individual in each of the two putative species, which may have affected the results. Løken (1973) suggested that the recent distribution

Accepted by C. Rasmussen: 5 Sept. 2013; published: 24 Sept. 2013