



A new species of the soft scale insect genus *Pulvinaria* Targioni Tozzetti (Hemiptera: Coccoomorpha: Coccidae) on *Rhododendron* spp. in Northern Europe

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Abstract

A new species of *Pulvinaria*, *P. rhododendri* Kahrer & Hodgson **sp. nov.** (Hemiptera: Coccoomorpha: Coccidae), found on *Rhododendron* spp. (Ericaceae) in Denmark and Norway, is described and illustrated. Taxonomically, it appears to be close to *P. camelicola* Signoret and *P. floccifera* (Westwood). The geographic area of origin is uncertain but it has probably been introduced into northern Europe on imported live plant material. We also record *P. camelicola* from Norway for the first time, on *Rhododendron* sp.

Key words: Sternorrhyncha, Coccoidea, damage, *Pulvinaria rhododendri*, *Pulvinaria camelicola*

Introduction

The scale insects are sap-sucking insects that form the infraorder Coccoomorpha which, together with the infraorders Psyllomorpha (psyllids), Aphidomorpha (aphids) and Aleyrodomorpha (whiteflies), make up the suborder Sternorrhyncha (Hemiptera). Coccoomorpha includes 36 extant and 20 extinct families (García Morales *et al.* 2016), and is morphologically quite diverse. The soft scale family Coccidae is the third largest family (García Morales *et al.* 2016; Kondo 2022), containing 1241 species in 178 genera (García Morales *et al.* 2016), of which one of the most speciose is the genus *Pulvinaria* Targioni Tozzetti with about 143 described species.

Currently, only two species of *Pulvinaria* have been reported feeding on *Rhododendron* spp., namely *P. ericicola* McConnell and *P. camelicola* Signoret (García Morales *et al.* 2016). *Pulvinaria ericicola* is currently only known from the Eastern United States of America, on Ericaceae. *Pulvinaria camelicola* is a typical *Pulvinaria* species with an almost worldwide distribution and is highly polyphagous (García Morales *et al.* 2016). Until recently, *P. camelicola* was considered a junior synonym of *P. floccifera* (Westwood) but Tanaka & Amano (2007) found that *P. floccifera* had been previously misidentified by most authorities (having been described from non-type specimens). More recently, Tanaka & Kamitani (2022) resurrected *P. camelicola*; and Tanaka & Amano (2007) and Tanaka & Kamitani (2022) redescribed *P. floccifera* (Westwood), based on recently collected Japanese material and syntype specimens. Tanaka & Kamitani (2022) also designated a lectotype of *P. floccifera*, thus fixing the species identity. They showed that *P. floccifera* differed from *P. camelicola* as follows: (i) *P. floccifera* has no or only rare dorsal tubular ducts, whereas these are frequent on *P. camelicola*; (ii) the small ventral tubular ducts near the margin (type III ducts) are absent between the spiracular disc-pore bands on *P. floccifera*, whereas they are present on *P. camelicola*; (iii) the dermal areolations on the dorsum are absent or unclear on *P. floccifera* but well-developed and large on *P. camelicola* (Tanaka & Kamitani 2022). Prior to this paper, the only record of *P. camelicola* on *Rhododendron* was that by Williams & Kosztarab (1972, as *P. floccifera* from Virginia, USA); their figure (plate 19, p.139) clearly shows both frequent dorsal tubular ducts and ventral tubular ducts present marginally between the lateral stigmatic clefts, clearly fitting the current understanding of *P. camelicola*.

During a study of *Pulvinaria* spp. on cultivated *Rhododendron* in Denmark and Norway, we found an undescribed species clearly closely related to *P. floccifera* and *P. camelicola*. Additionally, we found *P. camelicola* on *Rhododendron* spp. in Norway for the first time. In this paper, we describe the above undescribed species as *Pulvinaria rhododendri* Kahrer & Hodgson **sp. nov.**, and record *P. camelicola* on *Rhododendron* sp. for the second time.

Materials and methods

Material examined: infested host-plant shoots were collected and frozen for one week in a domestic refrigerator at -21°C, then sent to the Naturhistorisches Museum in Vienna, Austria (NHMW), where they were frozen again until needed. The slide-mounting procedure used followed that of Williams & Granara de Willink (1992), involving (i) 12 h in warm 10% KOH (including making a cut descending from the margin and gently pressing on the body with a fine brush); (ii) rinsing for 5 min in hot water; (iii) soaking in absolute alcohol for 10 min at room temperature; (iv) staining (in 10 drops of Essig's medium, 1 drop of 2% aqueous acid fuchsin solution and 1 drop of glacial acetic acid) for 3 mins at 20°C; (v) removal of excess stain by soaking in absolute alcohol for 10 mins, and (vi) clearing in clove oil for 30 min at room temperature, before mounting in Canada Balsam. The central drawing in Fig. 2 shows the distribution of the main dermal structures of *Pulvinaria rhododendri* **sp. nov.**, with features on the dorsum shown on the left side and those of the venter on the right side, and enlargements of the main structures as vignettes around the margins, not all drawn to the same scale. Collection data for the holotype is listed with “#” indicating the end of each line on the slide label.

Depositories: the holotype and 5 paratype adult females of *P. rhododendri* **sp. nov.** will be deposited in the Second Zoological Department, Naturhistorisches Museum Wien, Austria (NHMW). In addition, 3 paratypes will be deposited in the scale insect collections at the Natural History Museum, London (NHML); 3 paratypes will be deposited in the Museum nationale d'Histoire naturelle, Paris (MNHN); 3 paratypes will be deposited in the Zoological Museum, Russian Academy of Sciences, Universitetskaya, Naberzhnyay B164, St. Petersburg, Russia (ZIAS); and 3 paratypes will be deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU). Furthermore, 2 slide-mounted voucher adult female specimens of *P. camelicola* will be deposited at each of NHMW and the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU).

Pulvinaria rhododendri Kahrer & Hodgson **sp. nov.**

(Figs 1–3)

Material examined. Holotype: DENMARK: Fundort; Hadsund Syd dk # Biotop: garden # Wirt: *Rhododendron* sp. # Funddatum: 25.05.2023 # leg: Overgaard # präpariert: Kahrer 2024 # gem. Malumphy—2008 # in Canada Balsam. # Präparat AK-4244/01 (1/1 adult female, in good condition, NHMW).

Paratypes: collection data as for holotype # AK-4244/02–AK-4244/06 (5/5 adult females; fair-good, NHMW; and 12/12 adult females, good, 3 deposited in each of NHML, MNHN, ELKU and ZIAS).

Non-type slides: NORWAY: Arendal, on *Vaccinium myrtillus*, 14th, 21st and 30th June, 2022, I.-L. Fonneland coll. (5/5 adult females, 3 L1, fair to good, NHMW); Grimstad, on *Rhododendron* spp., 29th and 30th June 2023, I.-L. Fonneland coll. (2/2 adult females, fair to good, NMHW).

Description of adult female

Live appearance. Adult female pale yellowish green (Fig. 1), covered in a thin coating of white wax strands; body subcircular to oval. Ovisac white, fairly convex, with slight ridges (many transverse and 1 longitudinal), up to 10 mm long or more.



FIGURE 1. Young adult females and late-stage nymphs of *Pulvinaria rhododendri* Kahrer & Hodgson, **sp. nov.** on *Rhododendron repens* ‘Scarlet Wonder’. Photograph by Inger-Lise Fonneland.

Slide-mounted adult female (Fig. 2) [Data taken from 6 specimens] Body elongate oval, with shallow stigmatic clefts, and an obvious anal cleft about 1/7th of body length; probably not very convex in life, 2.23–3.30 mm long and 1.50–2.45 mm wide.

Dorsum. Derm membranous throughout but each pore or duct associated with thinner derm. Setae spinose and conical, of 2 sizes: (i) setae each about 8–12 μm long with a basal socket about 5 μm wide, frequent throughout apart from a broad medial band, where replaced by large conical spinose setae; and (ii) large conical spinose setae, mostly each about 10–16 μm long with basal socket about 8 μm wide, but those at anterior end becoming narrower; distributed more-or-less in a medial band from anal plates to head, distribution suggesting a possibly segmental arrangement; with small groups on meso- and metathorax; total number of setae highly variable, approximately 5–20. Preopercular pores closed, each slightly convex with a granulate surface and about 5 μm wide, forming a group of 20–37 anterior to anal plates. Tubular ducts, each with a rather narrow outer ductule about 13 μm long and with no inner ductule, frequent throughout. Microducts each with a narrow inner filament, abundant, scattered throughout. Simple pores each significantly larger than a microduct, with a strongly sclerotised rim about 3 μm wide and without an inner filament; present in sparse medial band between large conical spinose setae. Dorsal submarginal tubercles small, each about 8 μm wide; number present highly variable, with 1–4 on each side of abdomen, 0 or 1 on each side of thorax and 0 or 1 on head (no specimen had a total of 0). Anal plates together quadrate; anterolateral margin straight or slightly concave, posterolateral margin slightly longer and convex; combined width of plates 150–166 μm ; each plate 133–152 μm long, with 4 long setose setae, approximately subequal in length, each 23–35 μm long. Ano-genital fold with 2 pairs of long setae, inner pair 40–50 μm long, outer pair 55–60 μm long, and with 2, occasionally 3 shorter lateral margin setae on each side. Anal ring broad, bearing 6 setae, each about 175 μm long.

Margin. Marginal setae long, each 30–40 μm long, with a slightly broadened fimbriate apex: numbering 36–57 between anterior stigmatic areas and, on each side, with 10–21 between stigmatic areas and 28–48 on abdomen. Stigmatic clefts shallow, each containing 3 (one with 4) stigmatic spines, medial spine much the longest; lateral spines conical, each 20–25 μm long; median spines with more parallel sides and generally with a curved apex, each 70–75 μm long. Eyespot small, situated on margin, with lens about 12 μm wide.

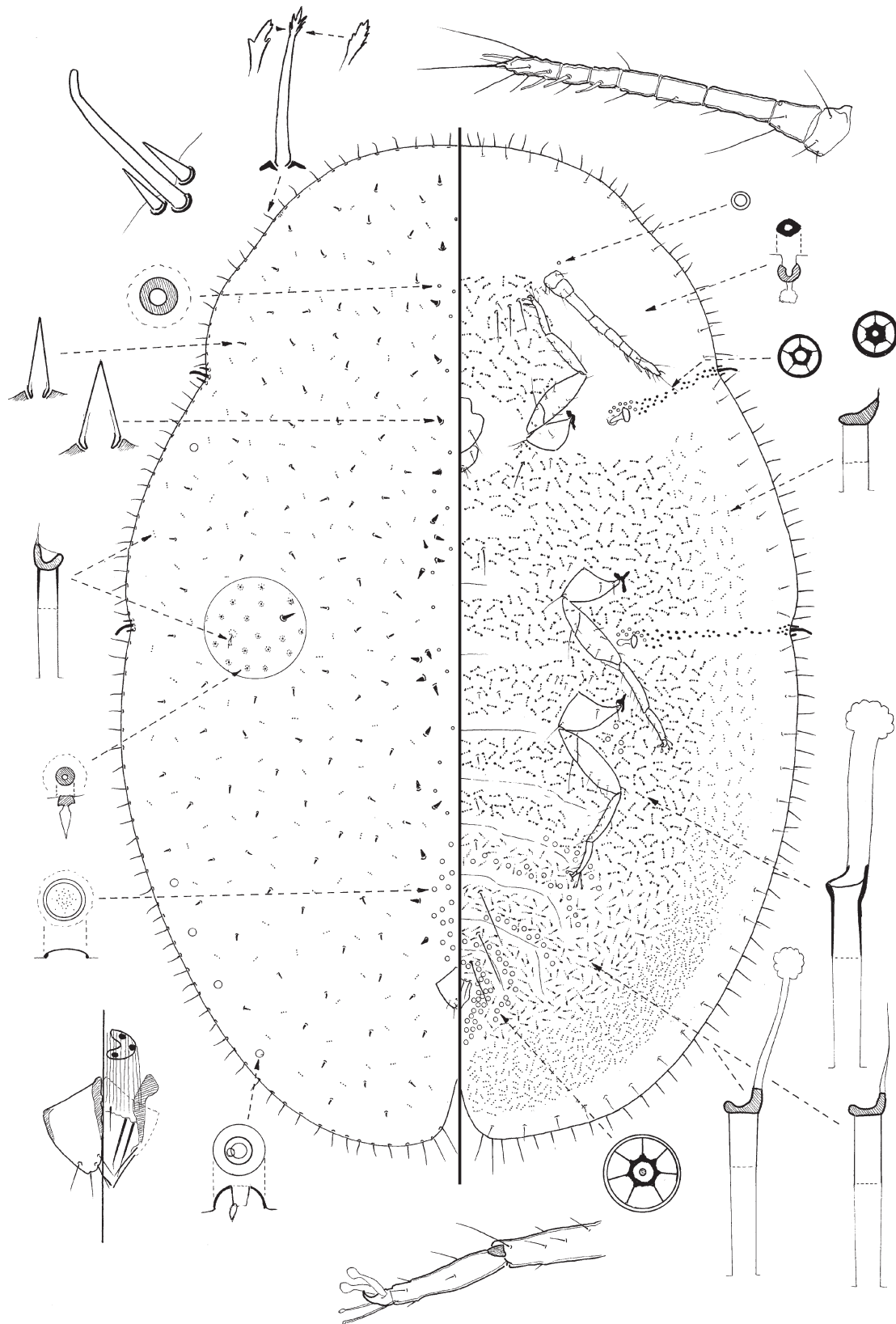


FIGURE 2. *Pulvinaria rhododendri* Kahrer & Hodgson, sp. nov., adult female.

Venter. Derm membranous. Pregenital disc-pores each 7–9 µm wide, mostly each with 7 loculi (occasionally 6, 8 or 9); present around genital opening and across all preceding abdominal segments, as follows (on each side): segment VII about 50, extending posteriorly almost half-way down each side of anal cleft; VI, 10–22; V, 10–15; IV, 12–17; III, 5–13, and II with 1–5 positioned just postero-laterally to each metacoxa. Spiracular disc-pores mostly each with 5 loculi, present in bands up to several pores wide near each spiracle; with a few pores extending medially, latter pores clearly larger, often each with 6 or 7 loculi; with 26–44 pores in each band. Ventral tubular ducts of 3 types: Type I: a large duct with inner and outer ductules both broad and about equally long (outer ductule 13–17 µm long), with a well-developed terminal gland, present medially in head (extending anteriorly to between antennae), thorax and anteriormost 2 abdominal segments; Type II: a duct with a moderately long outer ductule (13–17 µm long) but inner ductule either narrow and quite long with a well-developed terminal gland, or almost filamentous without a terminal gland, present medially in more posterior abdominal segments and extending laterally and posteriorly on abdomen, intermixed with marginal band of type (iii) ducts; and Type III: a small duct with a short outer ductule (6–7 µm long), a very short or no inner ductule and no terminal gland, present in a submarginal band from anal clefts to just posterior to anterior spiracular disc-pore band, submarginal band narrow anteriorly, becoming broader posteriorly. Ventral microducts sparsely present throughout. Preantennal pores present. Ventral setae: with a pair of long pregenital setae on each of segments VII, VI and V, each seta 115–175 µm long; with 5–10 pairs of inter-antennal setae, longest about 170 µm long; other setae sparse but submarginal setae relatively strong, almost spinose, each 16–30 µm long, numbering 6–8 between stigmatic clefts on each side. Spiracles normal; width of peritremes: anterior 46–62 µm, posterior 48–68 µm. Legs well developed, each with a distinct tibio-tarsal articulation and articulatory sclerosis; claw without a denticle; claw digitules similar and broad; tarsal digitules slender, longer than claw digitules and capitate. Hind leg dimensions: coxa 200–230 µm; trochanter + femur 275–300 µm; tibia 200–280 µm and tarsus 95–130 µm. Antennae each 7 or 8 segmented; third segment longest, with a pseudoarticulation when 7 segmented, total antennal length 435–495 µm; setal distribution on 8-segmented antenna: segment I with 3 hair-like setae (hs); II with 2 hs; segment III with 1–3 hs; IV with 0–2 hs; V with 3 hs; VI with 1 fleshy seta (fs); VII with 1 fs + 1 hs; and VIII with 3 fs + 6 hs. Clypeolabral shield 180–193 µm long. Labium with 4 pairs setae.

Comments. *Pulvinaria rhododendri* Kahrer & Hodgson, sp. nov. is very similar to *P. floccifera* and *P. camelicola* but differs from both (and all other *Pulvinaria* species) in having the following combination of character-states: (i) a medial band of large conical spinose setae extending from the anal plates anteriorly onto the head; and (ii) simple pores with a strongly sclerotised rim present in a narrow medial band between the large conical spinose setae. It also differs from *P. floccifera* in having (character state of *P. floccifera* in parenthesis) type III tubular ducts present submarginally between the lateral stigmatic clefts (absent).

Etymology. This species is named after the plant genus on which it has been most frequently collected, namely *Rhododendron* L. The species epithet is a noun in apposition, borrowed from ancient Greek in the genitive case.

Discussion. *Pulvinaria rhododendri* Kahrer & Hodgson has been collected from *Rhododendron* spp. in Denmark and Norway; also, from *Vaccinium myrtillus* L. (Ericaceae) in Norway, but only when *Rhododendron* spp. was present nearby (Inger-Lise Fonneland, pers. comm.). In Denmark, it has been found in two gardens, namely on the mainland in Hadsund Syd, Jutland, and in Tyfelse on the island of Zealand, 25 km southwest of Copenhagen. These gardens are perhaps about 150 km apart. In Norway, *P. rhododendri* has been collected from Arendal and Grimstad on the south coast, some 250 km north of Jutland, Denmark. Thus, currently, the species is only known from a small area of northern Europe. The species was probably first noted on *Rhododendron* spp. in Norway in 2018, causing a heavy infestation of sooty mould (Inger-Lise Fonneland, Norway, pers. comm.). These plants were destroyed but the population seems to have persisted as specimens were collected in the same location in 2022. Thus, it seems extremely probable that I.L. Fonneland's first discovery refers also to *P. rhododendri* and, as it is still present, it is clearly established and can overwinter under northern European conditions, having survived the intervening two winters (Bodil Damgaard, Denmark, 2024, pers. comm.). To date, no geographic surveys have been carried out to determine the wider distribution of the species; it could be more widespread because cultivated *Rhododendron* spp. are popular plants and are frequently moved about in the plant trade. The species could be potentially important as a pest of urban plants, particularly *Rhododendron* spp., based on the distribution mentioned above. In the field (Fig. 1), the new species is somewhat similar in appearance to *P. camelicola*, for which it may have been mistaken by non-entomologists in the past. At present, *P. rhododendri* has only been recorded on bilberry (*Vaccinium myrtillus* L.) and *Rhododendron* spp. (both Ericaceae).

Damage. *Pulvinaria rhododendri*, like other *Pulvinaria* species, produces copious honeydew, so sooty mould growths are a major problem, forming an unsightly, thick layer that covers the leaves (Fig. 3). However, so far it does not appear to cause host die-back or other problems (Bodil Damgaard, pers. comm.).



FIGURE 3. Leaves of *Rhododendron x yakushimanum* ‘Percy Wiseman’ covered in sooty mould and with some *Pulvinaria rhododendri* Kahrer & Hodgson, **sp. nov.** on the twigs. Photograph by Inger-Lise Fonneland.

***Pulvinaria camelicola* Signoret, 1873.**

Material examined. As part of this study, adult female *P. camelicola* were also recorded on *Rhododendron* spp.: NORWAY, Bergen, 20th June 2023, T. Pousi (2/8 adult females (NHMW: AK-4317/1–AK-4317/4)). We believe this is the first published formal record of the species from Norway.

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