

## THE SUBSPECIES OF BOMBUS PASCUORUM (SCOPOLI) IN SCANDINAVIA

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### ABSTRACT

Bombus pascuorum exhibits a great variability of colour pattern over the entire range of its distribution both locally and among inhabitants in a colony, yet geographic varieties, some of which form clines, are also recognized. A vast number of European forms have been designated (Kirby 1802; Vogt 1909, 1911; Krüger 1928, 1931; Pittioni 1939; etc.), some of which are segregated into geographic subspecies while others are only infrasubspecific forms.

Three Norwegian subspecies have been recognized in the past, viz. B. pascuorum smithianus White (= B. agrorum erlandssoni Kruseman) B.p. sparreanus Løken (= B.a. bicolor) Sparre Schneider) and B.p. barcai Vogt, considered as arctic, western and southwestern subspecies respectively (Løken 1960). A total of five subspecies were designated in Sweden, viz. B.p. romani Vogt and B. gotlandicus Erlandsson, in addition to the three subspecies also occurring in Norway. Four Scandinavian subspecies were recognized by Løken (1973) based on a study of about 4450 Norwegian and about 3000 Swedish specimens, viz. B.p. smithianus, B.p. sparreanus, B.p. pallidofacies Vogt nov. status and B.p. gotlandicus. It is the subspecific evaluation of these four subspecies I would like to put forward for discussion.

Generally speaking, the Scandinavian populations display a shift in the colouring of the coat from the palest in Southern Sweden to the darkest in Northern Scandinavia. Parallel with the change of greyish-white to black hairs on episternum and venter, the dorsum becomes brighter yellowish-brown and turns to orange-brown. An increase in hair length on going north has not been measured, but the difference between the southern- and northernmost populations in length of the dorsal coat of the thorax is estimated at 50 mm.

Striking features of clinal variability, viz. the colour in pile of the face, episternum and hind femur, have been studied to evaluate the taxonomic position of the populations. The data, being grouped in steps and in progression from the palest to the darkest, prove that each of the characters form clines directed from southernmost Sweden to the western coast of Norway (Table 1), and also north to the inner part of the Gulf of Bothnia (Table 2). The result is presented graphically (Figs. 1-2) and indicates a correlation of the features. The levelling of the clines at either end may justify subspecific designations, viz. B. pascuorum pallidofacies Vogt, herewith designated to the population in Southern Sweden cf. below, and B.p. sparreanus extending from the western coast of Norway north-east to the Gulf of Bothnia (Fig. 4). The subspecific identity of the populations occurring in Hordaland (Fig. 1) and in Medelpad-Norrbottnen (Fig. 2) is confirmed by a study of the same three features on individuals from countries ranging in between Hordaland and Norrbotten. The results (Table 3)

show only slight local variations. If the darker two forms, mainly black, and all black, are grouped together, isophens can be drawn from Hordaland to Norrbotten. As the populations along the isophens do not display other distinct phenotypical differences, except for a possible small decrease in hairlength going eastwards, they represent the same subspecies, viz. B.p. sparreanus.

The striking difference between B.p. sparreanus and the northern population is the colour in hairs on T<sub>1</sub> and T<sub>2-4</sub>. The two features were studied, in addition to those above, on populations ranging along the coast from Hordaland to Troms (Table IV). As in the case above, isophens can be drawn for the three features, colour of the pile of the face, episternum, and hind femur. There is, however, a marked difference in the two remaining features, viz. the colouring of hairs on T<sub>1</sub> and T<sub>2-4</sub>, which is graphically illustrated (Fig. 3). The stepped clines promote the subspecific designation of the northern population, B.p. smithianus.

The fourth Scandinavian subspecies is B. pascuorum gotlandicus, the isolated population in Gotland.

The designations B. pascuorum barcai Vogt and B.p. romani Vogt concern transitional populations, i. e. they are suppressed as subspecies for the following reasons.

According to Vogt (1909) B. pascuorum var. barcai occurs in "Mittleres Sweden und Christiania (und weitere Umgebung)". In addition to the holotype, labelled Delsbo, the type material consists of specimens from Sweden: Hälsingland: Delsbo and from Norway: Akershus Oslo and Östfold. Östfold, Akershus, Hälsingland are however situated in intergrading areas (Tables 1-2; Figs. 1-2, 4), the former perhaps on the periphery of the distribution of B.p. pallidofacies, the latter reaching almost the area of B.p. sparreanus. The type material from Hälsingland, including the holotype, is all of intermediates with close affinity to B.p. sparreanus. The light-coloured individuals in southernmost Sweden do not agree at all with the description of B.p. barcai. Revisions reveal that the Norwegian form of barcai concerns intermediates between B.p. sparreanus and B.p. pallidofacies, while the Swedish B.p. barcai concerns either intermediates or B.p. pallidofacies.

Vogt (1911) states that B.p. var. romani occurs in "Uppsala. Gouv. Petersburg". However, the type locality, viz. Uppland: Uppsala, refers to the intergrading area or the peripheral northern occurrence of the subspecies B.p. pallidofacies (Table 2, Fig. 2). The holotype belongs to the darker individuals of the local population, (pile of face black, episternum with a few greyish-white hairs admixed with the black ones, hairs of T<sub>1</sub> predominantly yellowish-white, those of femora partly greyish). Romani is an intermediate form between B.p. sparreanus and B.p. pallidofacies.

As demonstrated in Table 5, the four Scandinavian subspecies recognized in this study are fairly colour-stable within their central area of distribution.

Remarks on taxonomy

It might be questioned whether the subspecific designation B.p. pallidofacies should be suppressed and the population in Southern Sweden treated either as a transitional form linking B.p. sparreanus with the subspecies further south, or perhaps included in this subspecies. In my opinion the subspecific status of the population in Southern Sweden should be kept at least until the subspecific status of populations in Germany and adjacent areas has been studied further.

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