

## The *Polistes* species in northern Europe (Hymenoptera: Vespidae)<sup>1</sup>

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Records of *Polistes nimpha* (Christ, 1791) (*P. opinabilis* Kohl, 1898) from Finland, Russian Karelia, the Baltic countries and some adjacent areas, those of *P. biglumis* (L. 1758) from Scandinavia and those of *P. dominulus* (Christ, 1791) (*P. gallicus* auct.) from the Baltic countries are mapped. The distribution of *P. biglumis* is boreomontane; in Scandinavia the range is disjunct and recent nesting records in the province of Norrbotten in Sweden (about 66°N) are the northernmost of all *Polistes* species in the world. The northern habitats of *P. biglumis* in Sweden are open areas of stony ground about 150 m above sea level. The stones store insulating warmth and the microclimatic conditions are suitable for development of the brood on open combs. *P. dominulus* is expanding its range northwards in Europe. Nomenclature, colour variation and diagnostic characters of the three *Polistes* species are treated.

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### 1. Introduction

The Polistinae has mainly a tropical distribution and it is the most diversified subfamily of the Vespoidea. The large genus *Polistes* (about 200 known species; Carpenter 1996) is cosmopolitan and the ranges of some species reach the southern limit of the boreal vegetation zone in Eurasia and North America (van der Vecht 1967, Spradbery 1973, Starr 1991, 1993). In the Fennoscandian area, the *Polistes* species occur up to the limit of the northern boreal vegetation zone (Fig. 1.; the whole zone, see Hämet-Ahti 1981). In Europe, eight species of *Polistes* have been recorded, three

of which are inquilines living in the nests of other *Polistes* species. In this article, we treat the nomenclature, distribution and diagnoses of the three *Polistes* species recorded in Fennoscandia and its adjacent areas.

### 2. *P. nimpha*

In Finland, there is an old record of *P. nimpha* (Christ, 1791) (*P. opinabilis* Kohl, 1898) from the middle of the last century from *Ab*: Eriksberg (= Uskela) and a later record from *Ik*: Äyräpää (possibly in the 1930's, when this area belonged to

<sup>1</sup>Contribution to the Vespoidea fauna of northern Europe 10

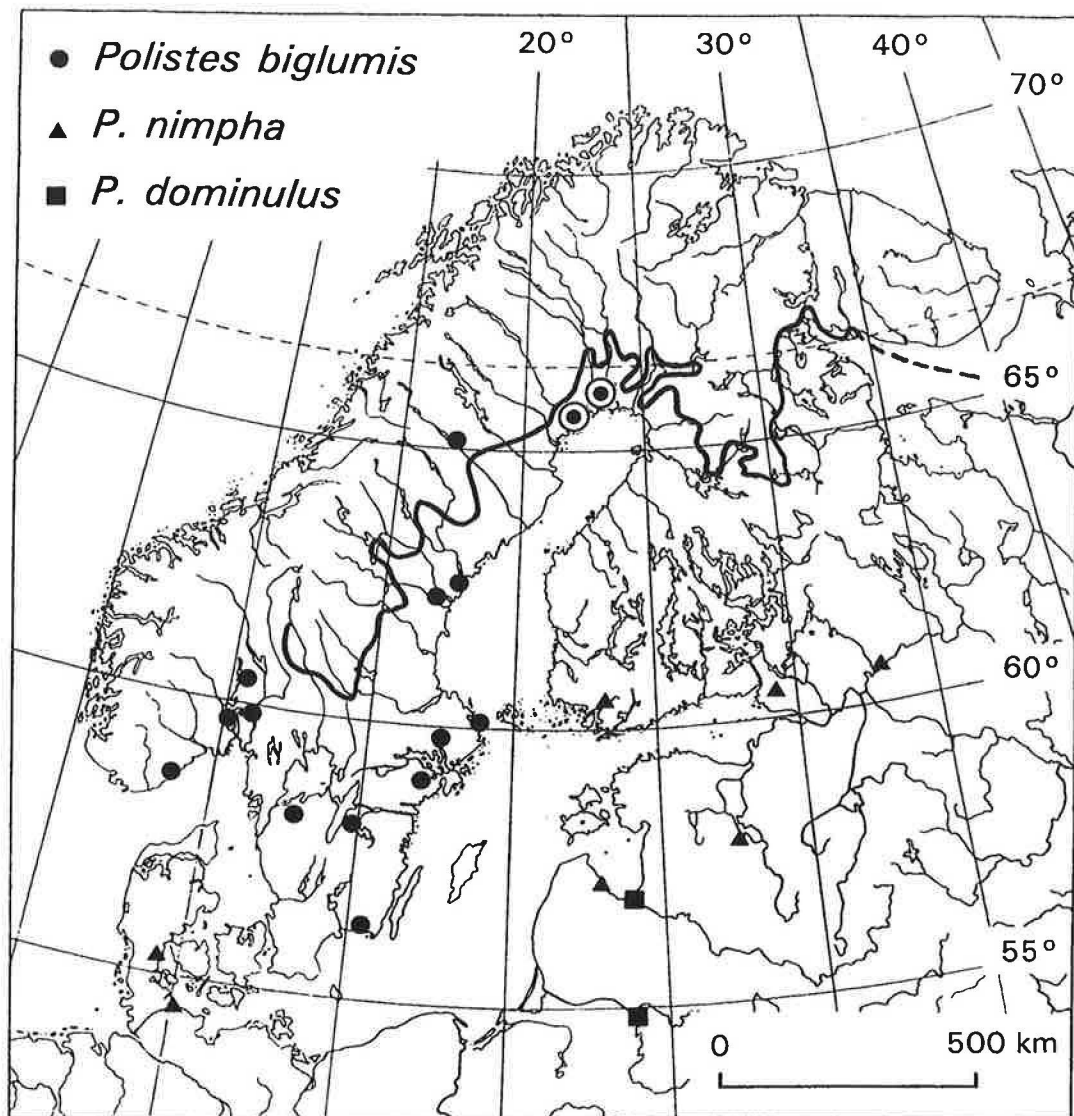


Fig. 1. Records of the *Polistes biglumis*, *P. nimpha* and *P. dominulus* in northwestern Europe. The encircled dots refer to the localities in northern Sweden where *P. biglumis* has recently been found nesting. Some dots from Sweden refer more generally to the province and the actual locality is unknown (see Gustafsson 1996). The line demarcates the southern border of the northern boreal vegetation zone in Fennoscandia (according to Ahti *et al.* 1968). In Fennoscandia and Denmark, several records of introduced specimens of *P. dominulus* have been excluded.

the territory of Finland), as well as one record in 1942 from Russian Karelia, *Kol:* Karelka in 1942 (Pekkarinen & Huldén 1995). *P. nimpha* has been recorded from Väraska, Estonia by Maavara (1984) and Grünwaldt (1939) reported a rich occurrence in Latvia, on the shore of Kanieris Lake (Fig. 1.). Previously the specimens from Finland and Rus-

sian Karelia have been misidentified: Forsius & Nordström (1923) used the name *P. gallicus* var. *biglumis*, and later K. Faester determined the Finnish and Karelian specimens to be *P. dubia* Kohl, 1898 (Hellén 1957). The latter name is a synonym of *P. biglumis* (Linnaeus, 1758) and a homonym of *P. dubius* Saussure, 1867. Furthermore,

Nøstvik (1957) erroneously reported *P. biglumis* from Finland (under the name *P. kohli*). *P. biglumis* has not been recorded from Finland or Russian Karelia.

### 3. *P. biglumis*

*P. biglumis* (*P. bimaculata* Geoffroy, 1785; *P. dubia* Kohl, 1898; *P. kohli* Dalla Torre, 1904) was described by Linnaeus (1758) (from Sweden?). Day (1979) fixed a female specimen in the Linnean collection as a holotype of *Vespa biglumis* Linnaeus, 1758 and the specimen conforms to the current interpretation of the species.

Thomson (1874) noted *P. biglumis* occurring locally in central and northern Sweden and he and Siebke (1880) also recorded the species from Norway. Erlandsson (1971) reported *P. biglumis* from eight provinces in Sweden, the northernmost being Ångermanland and Lycksele Lappmark. Most of the Swedish records are from the last century and the species was regarded as extinct in the Swedish Red list of invertebrates (Ehnström

*et al.* 1993). In Norway, the few records (most recent in 1953) restrict to the southernmost part of the country (Løken 1964). *P. biglumis* has been recorded from Denmark by Nøstvik (1957) (under the name *P. kohli*), but the specimen in question (from Harderslev) is possibly *P. nimpha*. (Fig. 1.) Barbier *et al.* (1995) reported a recent decline of *P. biglumis* in southeastern Belgium and Luxembourg.

Recently, Gustafsson (1996) found *P. biglumis* nests near Övermorjärv, in the Norrbotten province of northern Sweden, in 1994 and 1995. In 1996, the species was also found in another locality about 70 km south of Övermorjärv (5 km west of Luleå). (Fig. 1.) Both habitats are extensive (10-15 hectares), open areas of stony ground about 150 m above sea level, facing to the southeast, possibly the shore of the ancient *Ancylus*-lake (about 8500 years BP). The stony habitats are surrounded by a dry pine and birch forest and pine bog. (Fig. 2.) Three nests were found and on each comb 20-30 brood cells were surrounded by layers of empty cells (Fig. 3). Two males were captured on 27 June 1995 in Övermorjärv.



Fig. 2. The habitat of *Polistes biglumis* near Övermorjärv, in the Norrbotten province of northern Sweden.





Fig. 3. A nest of *Polistes biglumis* on a stone in the same habitat as in Fig. 2. The largest diameter of the comb is 48 mm.

#### 4. *P. dominulus* (*P. gallicus* auct.)

In the Linnean collection the specimen bearing the label “*gallica*” and fixed as a holotype of *Vespa gallica* Linnaeus, 1762 is a male of *P. foederatus* Kohl, 1898, a species different from that which has previously been known as *P. gallicus* (Day 1979). *P. dominulus* (Christ, 1791) appears to be the oldest available name for *P. gallicus* auct.

There are several records of *P. dominulus* in Denmark, Scandinavia and Finland. However, this species with a fairly southern distribution has commonly been introduced together with imported fruits, and its occurrence as wild in the area has not been documented. On the other hand, *P. dominulus* has recently expanded to Luxembourg and Belgium (Leclercq *et al.* 1984; Barbier *et al.* 1995) and the species has also been recorded from the Netherlands (Simonthomas 1984). Also, the species has been recorded to be locally abundant in Kaunas, Lithuania in 1997 and 1998 (Eduardas Budrys) and one male specimen was caught by trap in Riga, Latvia in 1998 (Guy Söderman). Thus, the expansion of *P. dominulus* to even more northern areas is possible in the future. Furthermore, the species has been introduced to North America, where it has quickly expanded to a fair-

ly large area in eastern USA (Staines & Smith 1995).

#### 5. Colour variation and comparison of diagnostic characters of the *Polistes* species in northwestern Europe

*Polistes* species have very extensive intraspecific variation of black and yellow colour patterns. Generally, the specimens in northern and mountain areas are more black-patterned compared with those of southern and lowland areas, and this variation is convergent with many species of Polistinae, Vespinae and Eumenidae in the Holarctic area. (Zimmermann 1931.) The two male specimens of *P. biglumis* from the previously mentioned northernmost locality in Sweden have light patterns which are almost white (instead of yellow), corresponding to the colour of some eumenid species (*Ancistrocerus oviventris* and *A. scoticus*) in northern Europe (Blüthgen 1961, Pekkarinen & Huldén 1991). *P. biglumis* and *P. nimpha* are generally more black-patterned compared with *P. dominulus*, which is the most variable of these three species. The keys for closely related European species of *Polistes*, especially those of female specimens, are largely based on colour characters (e.g. Blüthgen 1961; Starr & Luchetti 1993; Witt 1998) and are unreliable for specimens with extreme colour patterns. In addition, it is quite difficult to find reliable morphological differences between females of *P. nimpha* and *P. dominulus*. Some (more or less) diagnostic characters are given in Table 1.

#### 6. Remarks

Both *P. nimpha* and *P. biglumis* have large ranges from western Europe to eastern Siberia (Blüthgen 1961, Kurzenko 1995). *P. nimpha* prefers low, often warm moorland habitats in central Europe (Weyrauch 1939, Blüthgen 1961) and occurs in the steppe zone of Siberia (Dubatolov 1998). Grünwaldt (1939) reported that the habitat of *P. nimpha* on the shore of Kanieris Lake in Latvia was the former bottom of the lake with sparse vegetation. *P. biglumis* occurs mainly in moun-

Table 1. Comparison of important diagnostic characters of the three *Polistes*-species in northern Europe.

	<i>P. biglumis</i>	<i>P. nimpha</i>	<i>P. dominulus</i>
<b>Females and males</b>			
Pubescence of pronotum and scutum	longer (Fig. 4 a)	short (Fig. 4 b)	short (Fig. 4 b)
<b>Females</b>			
Colour of clypeus	black and yellow	black and yellow	yellow
Colour of antennal segments 4-12	dark above	mostly dark above	completely yellow
Colour of malar area (between mandibel and compound eye)	± black	± yellow	yellow
6th gastral sternum	± black	± black	± yellow
<b>Males</b>			
Clypeus	no lateral ridges	lateral ridges	no lateral ridges
Terminal segments of antennae	Fig. 5 a-c	Fig. 5 d-f	Fig. 5 g-j
Colour of antennal segments 4-11	dark above	dark above	completely yellow

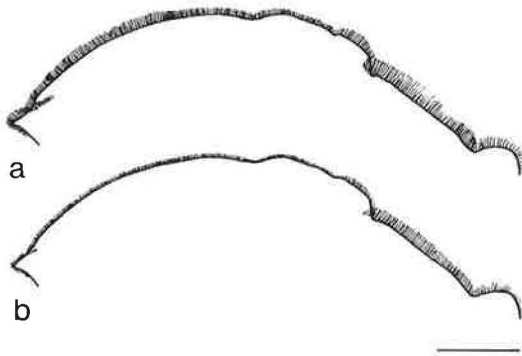


Fig. 4. Profiles of thorax and propodeum with pubescence in lateral view: a *Polistes biglumis*; b *P. nimpha*. Scale 1 mm.

junct and the occurrence in Norrbotten (at 66°N) is only about 50 km south of the polar circle. In Karelia, the northernmost record of *P. nimpha* is at 60°40'N. In other areas of Eurasia and North America, the limit of *Polistes* distribution is recorded to be clearly more southern (Starr 1991; Kurzenko 1995; Dubatolov 1998), with the exception of a record from the Yakutsk area (about 62°N) in eastern Siberia (Starr 1993). The collection of the Zoological Museum of the University of Helsinki also contains one female specimen of *P. nimpha* from Yakutsk (B. Poppius leg.).

In Vespinae, a multi-leaved envelope forms the outer covering of the nest and insulates the combs with the brood, enabling a fairly constant temperature to be maintained inside the nest. On *Polistes* nests, there is no envelopes. Therefore, a sufficient outer temperature is necessary for brood development and the summer temperature is an important factor delimiting the distribution of *Polistes* species. The open and stony ground in

tain areas of central and southern Europe (Zimmerman 1930, 1931; Blüthgen 1961; but see also Lefebvre 1996), in the Alps up to 2300 m above sea level (Lorrenzi & Turilazzi 1986), and the distribution can be characterized as boreo-montane. The range of *P. biglumis* in Scandinavia is dis-

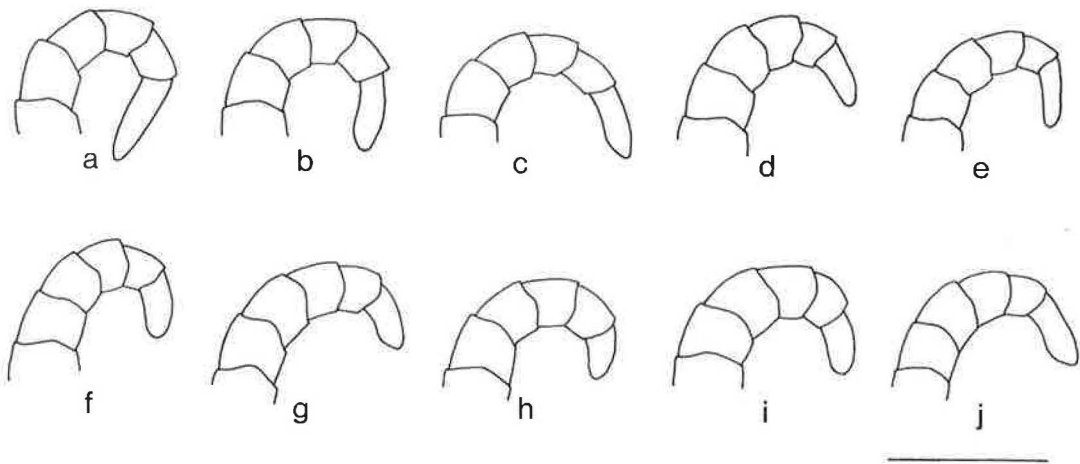


Fig. 5. Terminal segments of antennae in *Polistes* males (in upper view). a-c *P. nimpha*; d-f *P. biglumis*; g-j *P. dominulus*. The localities of the specimens are: a Svir Karelka (Russian Karelia); b Osnatyennoye (Central Siberia); c Corsica; d and e Övermorjärv (northern Sweden); f Chioppia (the Italian Alps); g Athene (Greece); h Cyprus; i Taganrok (southwestern Russia); j Riga (Latvia). Scale 1 mm.

the northern habitats of *P. biglumis* (Fig. 2) is warmed effectively by insolation. Large stones store warmth and the microclimatic conditions remain suitable for development of the brood during the night as well as during overcast. Adlerz (1904) described development of a *P. biglumis* colony which was located on a vertical wall of rock facing south and he referred to the description of the species by Linnaeus (1767:951) "*ad latera australia lapidum conficit nidum e fistulis aggregatis*". The nests in Övermorjärv were also situated on the south-facing sides of stones.

Lorenzi & Turillazi (1986) reported protogyny in the colonies of *P. biglumis* in the high mountain environment of the Alps. Thus, the emergence of male *P. biglumis* in Övermorjärv already by the end of July indicates quite a short season for the colony. However, the colony studied by Adlerz (1904) in Medelpad (central Sweden) was protandrous and gynes were not reared until the beginning of September.

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