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RESEARCH ARTICLE

The records of *Dolichovespula pacifica* (Birula, 1930) (Hymenoptera: Vespidae) and the northern limits of its range in European North of Russia

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Abstract

In this study, we present new records of *Dolichovespula pacifica* (Birula, 1930) in Northern European Russia. The range of *D. pacifica* in the studied region extends up to transitional zone between taiga and low-shrub tundra. The northernmost records of this species in Northern European Russia are located in the northern part of Murmansk Region and the south of Nenets Autonomous District. Among the island territories of Northern European Russia, *D. pacifica* has been recorded only in the Solovetsky Archipelago.

Keywords

Wasps, Northern Europe, fauna, new records, island territories

Introduction

Dolichovespula pacifica (Birula, 1930) is a species of the family Vespidae, with very limited information on its distribution in Northern European Russia. It is known that *D. pacifica* occurs from Scandinavia across Northern European Russia and Si-

beria to the Russian Far East and Japan (Archer 1999). However, records of this species are scarce across the territory of Russia, particularly near the northern limit of its range. The morphological similarity between *D. pacifica* and the widespread *D. norwegica* (Fabricius, 1781), coupled with persistent taxonomic challenges (review in Archer 1999), has resulted that *D. pacifica* remaining understudied for an extended period. There is also a notable lack of information on the ecological attributes of this species (Archer 2006).

Information regarding *D. pacifica* in Northern European Russia are limited to several records of this species in Murmansk Region, Republic of Karelia (Pekkarinen, Huldén 1995; Archer 1999; The Finnish Museum of Natural History: http://id.luomus.fi/GP.98294, GP.98282, GP.98353), and Arkhangelsk Region (http://id.luomus.fi/GP.93310). In contrast, significantly more records are available for Finland, Norway, and Sweden (Pekkarinen, Huldén 1995; Archer 1999).

In this study, we present new records of *D. pacifica* in Northern European Russia, a region representing the northern limit of its range.

Materials and methods

The study is based on material from the collection of the Russian Museum of Biodiversity Hotspots (RMBH), the N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences (Arkhangelsk, Russia). Specimens of *D. pacifica* were studied using a stereomicroscope Solo 2070 (Carton Optical (Siam) Co., Ltd., Thailand). They were identified and investigated following Kurzenko (1995).

The identification of a specimen of *D. pacifica* collected on Solovetsky Islands was confirmed through molecular analysis using a standard phenol/chloroform procedure (Sambrook et al. 1989). The *COI* gene was amplified and sequenced using primer pairs LepF and LepR (Hajibabaei et al. 2006). The PCR mix contained approximately 100 ng of total cell DNA, 10 pmol of each primer, 200 μmol of each dNTP, 2.5 μl of PCR buffer (with 10 x 2 mmol $MgCl_2$), and 0.8 units Taq DNA polymerase (SibEnzyme Ltd.); H_2O was added for a final volume of 25 μl. Temperature cycling was as follows: 95°C (4 min), 40 cycles of 95°C (45 sec), 48–53°C (40 sec), 72°C (50 sec) and a final extension at 72°C (5 min). The sequencing was carried out at the Engelhardt Institute of Molecular Biology of the Russian Academy of Sciences (Moscow) using the ABI PRISM® BigDye™ Terminator v. 3.1 reagent kit. Reaction products were analyzed using an automatic sequencer, ABI PRISM® 3730 (Applied Biosystems). The obtained results were analyzed using BioEdit version 7.2.5 (Hall 1999). Additionally, seven *COI* sequences were obtained from the Barcode of Life Database (BOLD) (Table 1).

Table 1. List of available *COI* sequences for *Dolichovespula pacifica*

***COI* BOLD IDS/ GenBank acc. no.**	**Specimen Voucher**	**Locality**	**References**
ACUFI820-13	HE.807	Finland: Tavastia australis	BOLD [public record]
ACUFI821-13	HE.808	Finland: Tavastia australis	BOLD [public record]
BCHYM8973-15	BC ZSM HYM 11063	Sweden	BOLD [public record]
BCHYM8974-15	BC ZSM HYM 11064	Sweden	BOLD [public record]
NOVES026-14	HYMNI586	Norway: Sor-Trondelag, Oppdal	BOLD [public record]
NOVES027-14	HYMNI587	Norway: Sor-Trondelag, Holtalen	BOLD [public record]
NOVES029-14	HYMNI589	Norway: Sor-Trondelag, Oppdal	BOLD [public record]
PV855747	RMBH Api879	Arkhangelsk Region: Solovetsky Islands	This study

Results

***Dolichovespula pacifica* (Birula, 1930)**
Fig. 1

Material examined: RUSSIA: Arkhangelsk Region, Solovetsky Islands, meadow near coniferous forest, 65°03'04"N, 35°39'49"E, 20.vii.2024, N. Zubrii leg. – 1♀; Arkhangelsk Region, Nizhma River, road side in coniferous forest, 64°29'18"N, 38°14'59"E, 15.vi.2023, G. Potapov leg. – 1♀; Arkhangelsk Region, Lake Pachozero, road side in coniferous forest, 64°57'46"N, 41°09'49"E, 3.viii.2012, Yu. Kolosova leg. – 1♀; Arkhangelsk Region, Koyda village, willows on a slope, 66°23'37"N, 42°37'16"E, 11-12.vi.2020, V. Spitsyn leg. – 1♀; Nenets Autonomous Region, Naryan-Mar town, road side in coniferous forest, 67°37'12"N, 53°02'08"E, 9.viii.2024, G. Potapov leg. – 1♀; Murmansk Region, Kildinstroy settlement, road side in coniferous forest, 68°46'40"N, 33°06'55"E, 4.viii.2020, G. Potapov leg. – 1♀.

Reference *COI* barcode sequence: GenBank acc. no. PV855747 (Solovetsky Islands).

Discussion

This study substantially expands the known distribution of *D. pacifica* in the European North. The previously known records were limited to scattered ones along the Russian-Finnish border, and one isolated record from Arkhangelsk Region (Fig. 2). Notably, no records of *D. pacifica* existed from the northernmost parts of its range until now.

Our research has revealed that the range of *D. pacifica* in Northern European Russia extends up to transitional zone between taiga and low-shrub tundra. The northernmost records of this species in the studied region are located in the northern part of Murmansk Region and the south of Nenets Autonomous District (Fig. 2). This distribution pattern corresponds to known records from Scandinavia, where this species occurs up to the north of Norway (Pekkarinen 1995; NTNU Vitenskapsmuseet, Norsk institutt for naturforskning: https://artsdatabanken.no/Pages/200753/).

D. pacifica is likely widespread across the taiga zone of Northern European Russia, though further confirmation through additional records is needed. Among the island territories, *D. pacifica* has been recorded only in the Solovetsky Archipelago (Fig. 2). Molecular analysis identified that a *COI* sequence for *D. pacifica* from the Solovetsky Islands is closely related to ones that found in Finland, Sweden, and Norway. It has only one nucleotide substitution. The absence of *COI* sequence for *D. pacifica* from other geographical areas currently prevents the phylogeographic analysis of this species.

Figure 1. General view of a specimen of *Dolichovespula pacifica* collected on Solovetsky Islands (GenBank acc. no. PV855747). Scale bar = 1 mm.

Figure 2. Map of Northern European Russia with records (black dots) of *Dolichovespula pacifica*. Open circles are the previously known records.

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