

# Paper wasp (*Polistes nimpha*)



Photograph: Vi Superiore, Italy (Wikimedia)

- A social wasp, native to Europe and western Asia where it has recently been expanding its range.
- Could establish in GB, but prefers climate conditions in continental and Mediterranean regions.
- Small colonies and low reproductive output limit the potential for a single colony to form an established population.
- Unlikely to cause significant impacts in GB.
- Natural colonisation from northern Europe may be possible in future, particularly with climate change.

### History in GB

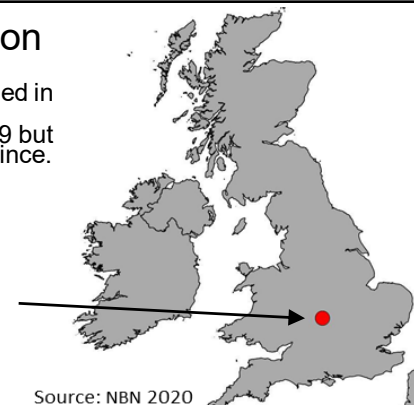
A single colony was detected for the first time in GB in 2019; however, this does not appear to have survived as there were no sightings in 2020. This species forms small colonies and has a low reproductive output and so there it is unlikely that a single colony would be able to form a sustainable population.

### Native Distribution

Europe and parts of western Asia

### GB Distribution

A single colony formed in Compton Verney, Warwickshire in 2019 but has not been seen since.



Source: NBN 2020

- ### Impacts
- Environmental (minor, medium confidence)
- A predator of small-medium sized invertebrates, although detailed prey preferences are not known.
  - Unlikely to cause significant impacts due to limited size of colonies.
- Economic (minimal, high confidence)
- No foreseen economic impact.
- Social (minor, high confidence)
- A social wasp capable of living in urban areas, not known to be aggressive but could sting if threatened.
  - Could irritate or alarm members of the public.

### Introduction pathway

Import of shrubs and trees from continental Europe is likely to be the main pathway of introduction.

Natural range expansion from northern Europe is also possible.

### Spread pathway

Natural (intermediate): little is known of dispersal distances and reproductive rates of a colony; however, natural spread is considered likely if a population were to establish. This would not be as rapid as other invasive wasps due to the small colony size.

Human facilitated (slow): relatively unlikely to assist spread.

### Summary

	Response	Confidence
Entry	VERY LIKELY	VERY HIGH
Establishment	MODERATELY LIKELY	MEDIUM
Spread	INTERMEDIATE	MEDIUM
Impact	MINOR	MEDIUM
Overall risk	LOW	HIGH

## GB Non-native Species Rapid Risk Assessment (NRRAP)

**Rapid Risk Assessment of:** *Polistes nimpha* (a paper wasp)

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**Version:** Draft 1 (Oct 2019), Peer Review (March 2020), NNRAP 1<sup>st</sup> review (March 2020), Draft 2 (Sep 2020), NNRAP 2<sup>nd</sup> review (Sep 2020), Draft 3 (Oct 2020), NNRAP 3<sup>rd</sup> review (Dec 2020), Draft 4 (Dec 2020)

**Signed off by NNRAP:** December 2020

**Approved by Programme Board:** September 2021

**Placed on NNS website:** February 2022

### **Introduction:**

The rapid risk assessment is used to assess invasive non-native species more rapidly than the larger GB Non-native Risk Assessment. The principles remain the same, relying on scientific knowledge of the species, expert judgement and peer review. For some species the rapid assessment alone will be sufficient, others may go on to be assessed under the larger scheme if requested by the Non-native Species Programme Board.

**1 - What is the principal reason for performing the Risk Assessment? (Include any other reasons as comments)**

**Response:** This assessment was commissioned following the detection of *Polistes nimpha* in Compton Verney, Warwickshire, by a member of the public. A photo was submitted to the UK Bees, Wasps and Ants Facebook page and identification confirmed by experts. Further investigation discovered a singly colony, which reached maturity. However, there have been no records since and the reasons for failure of the colony to establish a population are unknown.

**2 - What is the Risk Assessment Area?**

**Response:** *Great Britain*

**3 - What is the name of the organism (scientific and accepted common; include common synonyms and notes on taxonomic complexity if relevant)?**

*Polistes nimpha* (Christ, 1791) a species of paper wasp with no commonly accepted vernacular name in English. It is a variable species with several named colour morphs/subspecies eg *Polistes nimpha* var. *Moltonii* Guiglia, 1944 (described from Italy) and *Polistes nimpha irakensis* Gusenleitner, 1976 from Iraq. The species is known to show significant intraspecific genetic variation.

There has been some confusion in the literature about the correct nomenclature of this species with both *P. nimphus* and *P. nimpha* being used. Carpenter (1996) states that the correct name should be *P. nimphus*, and that the specific epithet should agree with the masculine noun *Polistes*. Dvořák & Roberts (2006) use *P. nimphus* (following Carpenter, 1996). However, Castro & Dvorak (2009) state that the name *nimphus* is incorrect as the specific epithet is not adjectival and cannot therefore agree with the masculine generic name. This Risk Assessment follows Castro & Dvořák (2009).

**4 - Is the organism known to be invasive anywhere in the world?**

No, although there is some evidence that it is expanding its range naturally in western Europe. In Belgium and the Netherlands, S.De Rycke (pers. comm. 2020) notes that the species is increasing in abundance and

occurrence in both Belgium and the south of The Netherlands. In Germany, the species has increased its range to cover the entire country since 2005 (C. Schmid-Egger, 2020, pers. comm), and in eastern Europe, *Polistes dominula* and *P. gallicus*, which have similar behaviour and distributions to *P. nimpha* are expanding their Extent of Occurrence (J. Mendelssohn, 2020, pers.comm.).

This species is native to Europe and western Asia.

## 5 - What is the current distribution status of the organism with respect to the Risk Assessment Area?

There is a single reported occurrence in Great Britain at Compton Verney, Warwickshire in September 2019. There have been no further records in 2020.

## 6 - Are there conditions present in the Risk Assessment Area that would enable the organism to survive and reproduce? Comment on any special conditions required by the species?

Probably. The species occurs widely in temperate and Mediterranean Europe (Schmid-Egger et al., 2017) and the nests are constructed primarily on the lignified plant stems of dwarf shrubs and shrubs (Kozyra et al., 2016). Budrys et al (2013) report that in Lithuania it can be found widely in suitable abandoned or poorly grazed grasslands and scrub habitats on dry poor soil. The species seems to be lacking in the areas with intensive agriculture. Weyrauch (1939) and Bliithgen (1961) state that in central Europe the species prefers low, often warm moorland habitats in central Europe

## 7 - Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment Area or sufficiently similar for the organism to survive and thrive?

Possibly, although the distribution appears to be more concentrated in the Continental, Boreal and Mediterranean climatic zones rather than in the Atlantic region. It is widespread across much of Europe, from the Mediterranean basin as far north as the Baltic states and southern Finland and eastwards across Palaearctic Asia to Mongolia, China, and Russian Far East (Pekkarinen & Gustafsson, 1999; Schmid-Egger et al., 2017).

## 8 - Has the organism established viable (reproducing) populations anywhere outside of its native range (answer N/A if you have answered 'yes' to question 4)?

Not as far as can be ascertained

## 9 - Can the organism spread rapidly by natural means or by human assistance?

Long distance transport is possible with horticultural material which includes the transcontinental shipment of mature shrubs and trees. Importation of a mated queen either in hibernation or post-hibernation (late autumn to spring) would be the most likely time for an importation to result in the formation of a colony. Once established, it would be able to disperse locally without direct human agency.

## 10 - Could the organism itself, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment Area?

Unlikely. Females (workers and queens) are armed with a sting and so there is a possibility that there might be minor conflict with humans. The species is social, but forms small colonies only. J. Mendelssohn (2020, pers.com) working on nests in Italy, states that the nest size is very similar to that of *P. dominula*. Höcherl & Tautz (2015) state that *P. dominula* nests can have a maximum of 211-240 brood cells in a nest, with a mean

number of around 85.5 over a three year study period.

Prey items include a range of small to medium sized insects

There has been a small population of congener *Polistes dominula* at Ham House (Surrey) for a number of years, which is now (2020) probably extinct (J. Early, 2020 pers.comm.). Other records are regularly made of *P. dominula* with the majority from East Anglia and south east England (BWARS data)

In summary, any impacts on an economic, environmental or social level are likely to be minor, and minimal compared with the activities of the native social wasps in the genera *Vespa*, *Vespula* and *Dolichovespula* which have larger colonies and can occur in large densities

## Entry Summary

Estimate the overall likelihood of entry into the Risk Assessment Area for this organism (comment on key issues that lead to this conclusion).

**Response:** *very likely (present)*

**Confidence:** *very high*

### **Comments:**

The species has been reported in Warwickshire in 2019. Its arrival was not predicted or predictable given the current known distribution of the species in Europe and western Asia. There are suggestions by Belgian, German and Dutch colleagues that the species is spreading northwards and westwards as part of a natural range expansion (S. de Rycke & C. Schmid-Egger, 2020 pers. comm.). There have been no reports in 2020 of the species in GB. The overall likelihood of future entry by 2025 into GB should be assessed as “likely”, and the confidence of such an event happening would be “moderately likely”

Potential pathways of introduction: Long distance transport of horticultural material which includes the transcontinental shipment of mature shrubs and trees is the most likely means of arrival in GB. Importation of mated queens, either in-hibernation or post-hibernation (late autumn to spring), would be the most likely time for an importation to result in the formation of a colony. It is possible that an early season nest could be imported which could become fully established in GB. Importation of plant material for horticulture and silviculture from mainland Europe to GB is predominantly by sea.

## Establishment Summary

Estimate the overall likelihood of establishment (comment on key issues that lead to this conclusion).

**Response:** *moderately likely*

**Confidence:** *medium*

### **Comments:**

Establishment of a single colony is unlikely to lead to the establishment of a viable population of the species as a British insect. Initial establishment would only be possible after an inadvertent introduction of a fertilised queen or an active nest. *Polistes nimpha* has already demonstrated its ability to form a single colony that has progressed to maturity. Overwintering of new reproductives (males and virgin queens) from the successful colony has not been demonstrated in GB.

Given that the continental range of the species includes continental, Mediterranean and boreal ecotypes (Budrys et al, 2013; Kozyra et al, 2016; Schmid-Egger, 2017), it would seem entirely likely that the species would be capable of overwintering in GB. However, there is no evidence to suggest that the Compton Verney colony that was observed in 2019 has been able to establish a population. There have been no records in the UK since the initial discovery in 2019. The reasons for failure to establish a population are unknown.

J. Mendelssohn (2020, pers. comm.) working on the species in Italy, has, however, observed that most nests (90%) produce few, if any queens. He further reports that the vast majority of new queens are produced by just a few colonies. This suggests that single nest establishment is relatively likely after arrival, whereas population establishment is far less likely

## Spread Summary

Estimate overall potential for spread (comment on key issues that lead to this conclusion).

**Overall response:** *medium*

**Confidence:** *medium*

**Sub scores:**

**Natural spread only:**

Response: *medium*

Confidence: *medium*

**Human facilitated spread only:**

Response: *slow (and erratic within GB)*

Confidence: *medium*

**Comments:**

Once present, nesting could occur in similar locations to those used to establish the species. It could also include manmade structures such as buildings, although *P. nimpha* is less associated with urban areas than *P. dominula* (J. Mendelssohn, 2020, pers. comm.). Natural spread from an initial colony would be possible, but little is currently known of the winter mortality rates, dispersal range of new queens, their hibernation sites, or even the number of reproductives (males and virgin queens) produced in an average nest. The number is likely to be similar to that of other *Polistes* species, but lower than that for social wasps in the genera *Vespa*, *Vespula* or *Dolichovespula* given that the overall colony sizes are much smaller.

There is no indication of the number of individuals that would need to overwinter in order to allow population establishment, and subsequent spread.

*Polistes nimpha* occurs widely in temperate and Mediterranean Europe (Schmid-Egger et al., 2017) and the nests are constructed primarily on the lignified plant stems of dwarf shrubs and shrubs (Kozyra et al., 2016). The habitats that the species can exploit include in suitable abandoned or poorly grazed grasslands and scrub habitats on dry poor soil. In central Europe the species prefers low, often warm moorland habitats (Weyrauch, 1939; Bliithgen, 1961). The species seems to be lacking in the areas with intensive agriculture (Budrys et al., 2013).

Cervo et al (2009) and Wilson-Rich & Starks (2010) report on the invasive nature of the close congener *Polistes dominulus* in North America and hypothesize that escaping from the parasite load typical of its natural range (e.g. the Strepsipteran *Xenos vesparum*) may have encouraged rapid expansion in a parasite-free environment.

In view of the widespread European distribution of the species, its ability to cope with a broad range of climatic conditions, its current ability to increase its populations and range in parts of Europe from where it has been either scarce or absent, it would seem that, given the successful establishment of a post-arrival population, subsequent spread would seem likely.

## Impact Summary

Estimate overall severity of impact (comment on key issues that lead to this conclusion)

**Overall response:** *minor*

**Confidence:** *medium*

**Sub-scores**

**Environmental impacts:**

Response: *minor*

Confidence: *medium*

**Economic impacts:**

Response: *minimal*

Confidence: *high*

**Social impacts:**

Response: *minor*

Confidence: *high*

**Comments (include list of impacts in your comments):**

Little is known of the prey preferences of the species, but Polistine wasps typically hunt for a range of small-medium sized insects as food for their larvae. The prey would be likely to change as the nests are active for a number of months in the summer and early autumn.

The impact of colonisation is likely to be low given the size of the colonies, the annual lifecycle (which would include a winter diapause) and the relatively small number of individuals in each colony

As this is a species of social wasp, and in addition to being capable of living in urban and peri-urban areas as well as in the wider countryside, it would be likely to come to the attention of the general public if numbers of colonies increased. It is somewhat similar to the other social species which can irritate, alarm or sting the public, especially if/when numbers get large. The species is not known to be aggressive, but can act defensively if nests or individuals are threatened.

## Climate Change

What is the likelihood that the risk posed by this species will increase as a result of climate change?

Response: *medium*

Confidence: *medium*

**Comments:**

As *Polites nimpha* is currently a species primarily of the continental and Mediterranean biomes in Europe, it is likely to find a warming climate with hotter summers more suitable. Natural expansion of range to include GB is likely to be only a medium-long term prospect, but the chances of establishment from deliberate or inadvertent introduction, followed by unassisted spread from a newly established centre are greater given the regular movement of plants for horticulture across the continent and the apparent lack of rigorous biosecurity.

## Conclusion

Estimate the overall risk (comment on the key issues that lead to this conclusion).

Response: *low*

Confidence: *high*

There is a relatively low risk of introduction and subsequent establishment and spread within GB. Add to this the small colony sizes, the likely low numbers of reproductives produced per nest, and the damper Atlantic climatic conditions experienced in GB, which are not generally suitable for survival. However, the risks could increase with climatic shifts to warmer summers.

The impacts on existing populations of GB insects are also likely to be low in the short to medium term after a

colonisation event as the colony sizes are small (especially when compared to the abundant and widespread Vespid species such as *Vespula vulgaris* and *V. germanica*).



## References

Provide here a list of the references cited in the course of completing assessment

Bliithgen P. 1961 - Die Faltenwespen Mitteleuropas (Hymenoptera, Diptera). - Abh. Deutschen Akad. Wiss. Berlin 2: 1-240.

Budrys E, Budriene A, Gliwa B. 2013 - Distribution of paper wasps (*Polistes Latreille, 1802*) in Lithuania (Hymenoptera: Vespidae). *Naujos Ir Retos Lietuvos Vabdziu Rusys* 25: 79-82

Carpenter JM., 1996 - Distributional checklist of species of the genus *Polistes* (Hymenoptera: Vespidae; Polistinae, Polistini). *American Museum Novitates* 3188: 1–39.

Cervo R, Zacchi F, Turillazzi S. 2000 - *Polistes dominulus* (Hymenoptera, Vespidae) invading North America: some hypotheses for its rapid spread. *Insectes Sociaux* 47(2):155-157.

Castro L, Dvořák L. 2009 - New and noteworthy records of vespid wasps (Hymenoptera: Vespidae) from the Palaearctic region (II) *Boletín de la Sociedad Entomológica Aragonesa* 44:295–304

Dvořák L, Roberts SPM. 2006.- Key to the paper and social wasps of Central Europe (Hymenoptera: Vespidae). *Acta Entomologica Musei Nationalis Pragae*, 46: 221-224

Höcherl N, & Tautz. J. - 2015. Nesting behavior of the paper wasp *Polistes dominula* in Central Europe—a flexible system for expanding into new areas. *Ecosphere* 6(12):262. <http://dx.doi.org/10.1890/ES15-00254.1>

Kozyra KB, Baraniak E., Kasproicz M. 2016. Nesting ecology of *Polistes nimpha* (Hymenoptera, Vespidae): a preliminary study in western Poland. *Journal of Hymenoptera Research* 51: 187-201.

Schmid-Egger C, van Achterberg K, Neumeyer R, Morinière J, Schmidt S, 2017.- Revision of the West Palaearctic *Polistes Latreille*, with the descriptions of two species - an integrative approach using morphology and DNA barcodes (Hymenoptera, Vespidae). *ZooKeys* (713): 53–112.  
<https://doi.org/10.3897/zookeys.713.11335>

Weyrauch, W. 1939 - Zur Systematik der palliarktischen Polistinen auf biologischer Gmndlage. -Arch. Naturgesch. Zeitsch. Syst. Zoo!. Neue Folge 8: 145-197.

Wilson-Rich N, Starks PT. 2010 - The *Polistes* war: weak immune function in the invasive *P. dominulus* relative to the native *P. fuscatus*. *Insectes Sociaux*, 2010 - Springer