

POLISTES BIGLUMIS (HYMENOPTERA: VESPIDAE: POLISTINAE) NEW TO THE UNITED KINGDOM

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ABSTRACT

The eusocial wasp *Polistes biglumis* (L.) is formally recorded as new to the United Kingdom on the basis of females and males present in July to September 2020 at Samphire Hoe Country Park in Kent. The numbers of individuals implies the presence of at least one nest. The species is primarily associated with alpine habitats but is also patchily distributed in lowland habitats, including in northern France and the Benelux countries. It shows a series of behavioural adaptations for living in cooler and more harsh conditions than its congeners. It is therefore a good candidate for establishing itself as a resident component of the UK Hymenopteran fauna.

INTRODUCTION

The recording of British Aculeate Hymenoptera not only provides a valuable insight into the quality of habitat, it also provides insight into how the UK's fauna is changing, responding to changes in climate, land use and pollution. New species of social wasp are becoming established in the UK. *Polistes dominula* (Christ), was first identified as nesting in the UK in 2003 (Baldock, 2003) and has spread elsewhere, mostly on sites along the Thames Estuary (Baldock & Dvořák, 2009). *Dolichovespula media* (Retzius) was first identified in the UK in 1980 in East Sussex (Falk, 1982) and *Dolichovespula saxonica* (F.) was first identified in the UK in 1979 in Surrey (Allen & Archer, 1989), both are now widely distributed. More recently, in 2016, the Asian hornet, *Vespa velutina* (F.), arrived in the UK. This species is an alien invasive accidentally introduced into France from China which has subsequently spread from there. As it predates honey bees, *Apis mellifera* (L.) it is seen as a potential pest species and has excited media attention. This paper places on record a further species of eusocial wasp apparently nesting in the UK in 2020, *Polistes biglumis* (L.). However whilst new social wasp species are arriving in the UK, other species are declining, for instance, in the author's experience *Vespula rufa* (L.) and *Dolichovespula sylvestris* (Scopoli) are becoming less abundant in Kent, at least over the last 25 years. However, the hornet *Vespa crabro* (L.) is increasing.

METHODS

The author first observed the presence of the wasp during an entomological survey of Samphire Hoe Country Park, East Kent (VC 15), on 31 July 2020. It may however been present for several years as the author had observed what appeared to be an unusually large wasp two years earlier at the site, but during the fleeting encounter was unable to establish its identity. In the field the wasp was a striking large yellow and black insect and, with a reasonable view, could be clearly seen to be a *Polistes* species (Fig. 1). The author's initial assumption was that it was *P. dominula*, since this species had previously been recorded in the vicinity. However, on inspection of photos, the Kent Aculeate recorder Geoff Allen, corrected this assumption on the basis of the yellow markings on the head (firm identification of the species was not possible on the basis of photographs). The author subsequently keyed out female and



Fig. 1. Images of female *Polistes bighumis* taken at Samphire Hoe on 7 August 2020. Note the black dorsal surface to the antennae and large dark spot on the tegulae which differentiates it from other European *Polistes* species that have been recorded in the UK.

male specimens to *P. biglumis* using a guide to European species (Schmid-Egger *et al.*, 2017). The identification of a female specimen was subsequently confirmed by Michael Archer (pers. comm.). The UK Aculeate recorder confirmed that there were no previous UK records of this species (Mike Edwards, pers. comm.).

Polistes biglumis females were observed foraging on rock samphire flowers, *Crithmum maritimum* (L.), at Samphire Hoe on four visits: 31 July, 7 and 20 August, and 6 September. Males were also observed on the 20 August, similarly feeding on rock samphire. At a conservative estimate at least ten individuals were seen on each of the July and August dates, fewer in September. No nest was located, but the persistent presence of numbers of male and females makes this highly likely. There are suitable substrates for attaching a nest nearby; bramble thickets, stones, the chalk cliffs and large areas of concrete.

Identification

Only one other species of *Polistes* has been recorded as nesting in the UK: *P. dominula*. *Polistes biglumis* can be separated from *P. dominula* on the basis of the following characters:

Females

- In *P. biglumis* the malar space is black, or black with a small yellow spot. In *P. dominula* the malar space is largely yellow.
- In *P. biglumis* the mandible has a yellow marking. In *P. dominula* the mandible is black.
- In *P. biglumis* the antenna is distinctly marked black or blackish dorsally, compared to the orange-yellow ventral surface, and is similar in colour to the frons. In *P. dominula* the antenna is more uniformly orange-yellow coloured without the dorsal darkening.
- The tegulae of *P. biglumis* can have a distinctive dark spot, unlike the more uniform yellow colouration of the tegulae in *P. dominula*.

Males

- In *P. biglumis* the apical half of the antenna is usually darker dorsally than ventrally. In *P. dominula* the apical half of the antenna isv uniformly orange-yellow dorsally and ventrally.

Individuals of two other European species have been recorded in the UK as presumed vagrants; *Polistes gallicus* (L.) (Archer, 2014) and *Polistes nimpha* (Christ) (Falk in prep.)¹, and there are records of American species brought into the UK in association with imported goods (Archer, 2014). There are also ten further species of *Polistes* in Europe, and the separation of *Polistes* species is not always straightforward. Therefore any definite determination of an unusual *Polistes* in the UK should be made from a specimen with reference to a European key (e.g. Schmid-Egger *et al.*, 2017).

Material Examined

UK: Kent: Samphire Hoe Country Park: TR29610 39109: 31.vii.2020: female caught nectaring: 20.viii.2020: male caught nectaring.

¹ BBC news report <https://222.bbc.co.uk/new/uk-england-coventry-warwickshire-49878547>, and <https://www.flickr.com/photos/63075200@N07/sets/72157658086247212/>.

ECOLOGY

Distribution

To date *P. biglumis* has only been found at Samphire Hoe in the UK. In Europe it is considered to be primarily a boreo-montane species which mainly inhabits mountain areas in south-central Europe (Lorenzi & Turillazzi, 1986). *Polistes biglumis* occurs up to 2400m in the European Alps, and in the southern part of its range is limited to mountainous areas, but at higher latitudes is found at lower elevations. Its distribution extends north to Norway and Sweden south of 65°N, and its range extends eastwards to Turkey and Central Asia. It can be found in northern France and the Benelux countries. However within this range it is considered to have a markedly patchy distribution, although able to live in a wide range of conditions (Fucini *et al.*, 2009). It is able to live in cooler conditions than its congeners (Seppa *et al.*, 2011).

Habitat

Samphire Hoe Country Park, East Kent VC 15, TR290389, is situated just above sea level at the base of high chalk cliffs between Dover and Folkestone. It is an artificial area of land, created from the chalk marl spoil from the excavation of the Channel Tunnel. It covers 45 hectares, and has a 1.7 km long sea wall. Three quarters of the area is managed as a country park by the White Cliffs Country Partnership. The area behind the seawall is conserved as chalk grassland, maintained using cattle grazing. As well as short turf there are ponds and bramble thickets, and the upper areas of sea wall support a salt tolerant flora (Fig. 2). Samphire Hoe has an interesting fauna and flora, and is well known for its early spider orchids, *Ophrys sphegodes* (Mill), its migrant Lepidoptera, and in recent years for supporting a population of bee chafers, *Trichius gallicus* (Dejean). The remainder of the site is outside public access and controlled by Eurotunnel for machinery used for cooling of the atmosphere in the tunnel. The French coast can be seen from Samphire Hoe on a clear day.

Flight Period

Polistes biglumis has a shorter flight period than compared to other European *Polistes* species – reduced to three or four months, beginning in May–June and ending in August–September. This is thought to be an adaptation to living in habitats with a shorter summer season. This short season appears to be the case for populations living in more temperate as well as more harsh conditions (Fucini *et al.*, 2009).

Eusocial Behaviour

Polistes biglumis exhibits flexible caste expression, a characteristic of primitive eusocial behaviour. Populations living under severe conditions have no female workers, instead all females are gynes² whilst those living in less severe conditions do have workers (Fucini *et al.*, 2009). There are no external morphological differences between workers and gynes; rather gynes have more fat bodies and spend less time foraging than workers.

Colonies are always founded by a single foundress (in some other *Polistes* species such as *P. dominula*, multiple related females can found the same nest (Alessandro Cini, pers. comm.)). However *P. biglumis* nests are characterised by frequent queen

² Reproductive female caste of social insects. Gynes which have mated and have a nest are known as queens.

turnover, caused by mated gynes usurping the nests of unrelated queens. As a result most nests in one study had offspring that were not related (Seppa *et al.*, 2011). These usurpers are believed to be mated gynes whose own nests have failed, and because of the short flight season do not have time to establish a new one. Gynes which have not yet over-wintered are unable to lay eggs and so do not usurp resident queens (Lorenzi & Cervo, 1994).

Nest founders in control of their nest produce a strongly male biased sex ratio at the beginning of the season. This breeding pattern is unorthodox for eusocial Hymenoptera. In social wasps with an annual nest cycle, such as other *Polistes* species, nests produce worker brood at the beginning of the season, followed by sexual brood towards the end of the season. In *P. biglumis*, however, there is no temporal separation of worker and sexual brood, this is believed to be due to the reduced colony cycle (Lorenzi & Turillazzi, 1986). However usurpers appear to selectively kill male offspring and produce mainly females (Seppa *et al.*, 2011).

The paper nests can be attached to bushes and on the walls of buildings, although not in enclosed spaces such as loft cavities. The nests generally hang vertically from a single pedicel, but in mountainous areas the nests are more often built attached to the sides of large stones on the ground. The nest is very largely built by the single foundress before the emergence of any adult wasps from the nest. The nests are small: in an alpine population the number of cells varied between 34 and 48, and on average they produced 18 adults in total. The outer cells are kept empty and this is thought to be because their function is to act as a protective layer for the occupied cells. The cocoons are darker than other *Polistes*, and this is interpreted as an adaptation for living in cooler climates (Lorenzi & Turillazzi, 1986).

Status

Polistes species have only recently colonised the UK, with *P. dominula* having established itself in south-east England since at least 2003 (Baldock & Dvořák, 2009).



Fig. 2. Foraging habitat of *Polistes biglumis* at Samphire Hoe. In the foreground flowering rock samphire.

No other species are thought to have become established, whilst other European species, *P. gallicus* and *P. nimpha*, have been recorded in the UK as vagrants.

The persistent presence of numbers of female and male *P. biglumis* wasps at Samphire Hoe strongly suggests that they are nesting there. *Polistes biglumis* is able to survive under a wide range of climates in Europe, including cooler conditions than can be tolerated by *P. dominula* (Seppa *et al.*, 2011). The flexible expression of a caste system might also assist the species to adapt to the UK climate and spread. So there is distinct possibility that it may become an established resident across the UK.

The origin of the species at Samphire Hoe is unclear. A mated female could well have flown directly from continental Europe – Samphire Hoe is about the closest place in England to France. However, a human assisted introduction is also possible – Samphire Hoe is regularly visited by travellers from Europe with their cars, caravans and motor homes as it is the first inviting place to rest on leaving the port of Dover, and so it is possible to envisage a scenario where a mated gyne arrived on board, or attached to, a vehicle.

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