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NOTE

The first record of *Polistes dominula* (Hymenoptera: Vespidae) in Newfoundland

Barry Hicks

Many social insects (especially the eusocial Vespinae) are effective colonizers of new habitats (Moller 1996). They often have broad diets and habitat preferences. Because they have high rates of queen production, where each new queen is inseminated before hibernation, it allows for efficient dispersal to new areas by anthropic means (Moller 1996; Chapman and Bourke 2001; Beggs et al. 2011).

Polistes dominula (Christ), the European paper wasp, is a Palearctic wasp that is native to Europe, North Africa, and parts of Central Asia (Buck et al. 2008). It has become a well-known and abundant invasive species globally (Howse et al. 2020), where it has spread to North and South America, South Africa, Australia, and New Zealand. In North America, it was first recorded near Boston, Massachusetts, U.S.A. in the late 1970s (Hathaway 1981) and has become established throughout much of the continental United States (Liebert et al. 2006; Hesler 2011). In Canada, it was first observed in Ontario (Niagara Falls) in 1997 (Hoebeke and Wheeler 2005), in Nova Scotia (Sydney) in 2003 (Hoebeke and Wheeler 2005), and in British Columbia (Saanich) in 2003 (Borkent and Cannings 2004). iNaturalist.ca (iNaturalist online) shows photographic records of *Polistes dominula* occurring in all provinces except Newfoundland and Labrador and the three northern territories (Yukon, Northwest Territories and Nunavut). This paper reports the first occurrence of *Polistes dominula* in Newfoundland and Labrador.

The province of Newfoundland and Labrador has 22 species of Vespidae (11 Eumeninae; 11 Vespinae). No *Polistes* species (Polistinae) have been recorded in the province until now. The first occurrences were photos and video posted to a local social media group (Insects of Newfoundland): a photo by E. Deniet of an adult on a nest taken on 9 August 2018 (Figure 1) from St. Clare Ave, St. John's; a photo by J.M. Newhook of an adult wasp on foliage taken on 3 September 2018 from Gower Street, St. Johns; a video by S. Gill posted on 19 July 2019 of an adult *Polistes dominula* harvesting wood from a deck railing from Warbury Street, St. John's; and, several photos showing adult wasps on foliage (Figure 2) posted by J.M. Newhook on 13 October 2020 from Gower Street, St. Johns. The author received a voucher specimen from J.M. Newhook on 18 October 2020 which is housed in the insect collection at College of the North Atlantic, Carbonear, NL.

The European Paper Wasp, like many vespids in temperate regions, produces an annual colony in a paper nest. *Polistes dominula* builds aerial nests exclusively (Beggs et al. 2011) and prefers to nest in locations near human habitation (Roets et al. 2019; Höcherl and Tautz 2015). Nest composition consists mostly of dry wood fibers chewed from weathered fences, decks, and wooden buildings. The material is collected by one or more foundress wasps that emerge from overwintering sites. The foundress wasps are mated from the previous fall and find protective areas to overwinter in a diapause until the following spring (Beggs et al. 2011). *Polistes dominula* nests can be founded by one or two, and in some cases more, foundress females (Höcherl and Tautz 2015). One of the foundresses acts as the principal egg layer (alpha queen) while the other foundresses are subordinate where they primarily forage, collect nest material and are responsible for brood care (Pardi 1948; Queller et al. 2000). Oviposition takes place soon after the nest is established. The first brood of non-reproductive females (workers) emerge in approximately 15–40 days, depending on the environmental conditions (Cranshaw 2008; Cervo et al. 2011). This species is a predator by nature (Brown et al. 2012) and like many other vespid relatives, it is a frequent predator of Lepidoptera larvae (Baker and Potter 2020), although, Cervo et al. (2000) suggested that this predatory wasp had a more generalist diet than that of other

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Barry Hicks: College of the North Atlantic, Carbonear, NL, A1Y 1A7.

Corresponding author (email barry.hicks@cna.nl.ca).

Figure 1. A *Polistes dominula* female on a new nest. Photo taken at St. Clare Ave, St. John's, NL, 9 August 2018. **Photo Credit**: E. Deniet.

Figure 2. *Polistes dominula* female on foliage. Photo taken at Gower Street, St. John's, NL, 13 October 2020. **Photo Credit**: J.M. Newhook.

related species. For example, while Cranshaw et al. (2011) observed *Polistes dominula* in Colorado feeding primarily on Lepidoptera caterpillars (e.g., *Peiris rapae* (Lepidoptera: Pieridae)) they also observed feeding on other insects like sawfly larvae. In addition, *Polistes dominula* adults also fed on aphid honeydew, took nectar from flowers, and fed on fruit crops (e.g., *Prunus avium* and *Rubus* sp.) (Cranshaw et al. 2011). Its generalist diet was also shown by Schenk and Bacher (2002), where the larvae of the shield beetle, *Cassida rubiginosa* Muller (Coleoptera: Chrysomelidae), were preyed upon in the field.

The emergence of the European Paper Wasp overwintered queens in Newfoundland is likely later than observed in mainland area because of climate limitations. The climate experienced in eastern Newfoundland is described as cool maritime where the growing season is short. While the winters are not considered harsh compared to mainland areas, cool temperatures and rainy weather extend into mid-June (Banfield 1983). Because of that, vespid colonies (e.g., *Dolichovespula norvegicoides* (Sladen)) are initiated in late June with worker production during July and queens and males produced in late August (Hicks and Baker 2014). The nests are naturally terminated in late September or early October when the first frosts occur (Hicks and Baker 2014). Nest founding in *Polistes dominula* occurs between mid-March to mid-April, with worker wasps emerging 21–40 days later depending on climate (Pardi 1948; Queller et al. 2000; Cranshaw 2008; Höcherl and Tautz 2015). Höcherl and Tautz (2015) showed that the average colony duration was 4.6 months with end times from mid-August to early September. We cannot say for sure when nests of *Polistes dominula* are founded in Newfoundland as it is early in its invasion. However, if they are like other vespinae, the cool climate of the area does not allow early nest founding (Hicks and Baker 2014). Howse et al. (2020) used global occurrence and climate data to predict the spread of *Polistes dominula*. The species occurred mostly in regions where the annual average temperature was between 8 °C and 12 °C. The annual temperature at St. John's International airport is 5.0 °C (Environment Canada online) and is outside the optimal temperature range determined by Howse et al. (2020).

This species has the potential to reach high densities in favorable environments (Beggs et al. 2011). Its predatory nature is a potential threat to biodiversity (Pilowsky and Starks 2017; Howse et al. 2020), and its preference for nesting on sheltered manmade structures (Silagi et al. 2003) results in direct potential health risks due to their stinging behavior. Because of this, it is considered an invasive species in much of its non-native range (Buck et al. 2008; Howse et al. 2020). *Polistes dominula* was the most common reported nuisance wasp in Colorado only five years after its introduction (Cranshaw et al. 2011). Eight years after introduction, it was the most important stinging insect (Cranshaw et al. 2011). This data is from Colorado which has much more favorable climate than experienced in Newfoundland so its stinging propensity

can only be speculated on at this time in Newfoundland.

The present distribution of the wasp in St. John's (in the downtown adjacent to the port) suggests that its introduction was likely through commercial shipping. The port of St. John's is busy with considerable international and Canadian domestic shipping (Montreal and Halifax).

Invasive species are the most common and destructive factors in ecosystems generally, but island ecosystems are the most vulnerable (see Reaser et al. 2007). The island of Newfoundland has four introduced species of social Hymenoptera in recent years: *Monomorium pharaonis* (L.) (Pharaoh ant), *Tetramorium caespitum* L. (Pavement ant), *Myrmica rubra* (L.) (European fire ant), and *Vespula germanica* (Fabricius) (German yellowjacket) (Hicks 2012, Buck et al. 2008, B. Hicks, unpublish data). While the impact of *Polistes dominula* on native insect diversity is presently unknown, it is not likely going to be a major threat to local biodiversity. However, it is important to monitor its activities and spread in the coming years.

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