FIRST REPORT OF THE PALEARCTIC SAWFLY

PRISTIPHORA SUBBIFIDA (THOMSON 1871)
(HYMENOPTERA: TENTHREDINIDAE) IN CANADA

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Species are moved by human activity. The frequency of such movement is increasing in the Anthropocene (Steffen et al. 2011). Identifying such translocations is a challenge, especially within the largest and most diverse taxon – the insects. One method to facilitate the identification of these adventives is via DNA associated with publicly accessible DNA barcodes in the Barcode of Life Data System (BOLD) (Ratnasingham and Hebert 2007).

We report here the discovery of a Palearctic sawfly (Pristiphora subbifida (Thomson 1871) (Hymenoptera: Tenthredinidae)) in Canada via Malaise trapping paired with DNA barcoding. The detection was contextualised to a species level via inclusion in the DNA barcode library where it was directly comparable to large-scale barcoding initiatives in Europe and Canada.

During the flight season (April – November) in 2009-2011, a Townes-style Malaise trap (Malaise 1937; Townes 1962) was erected in a downtown backyard in Guelph, Ontario, Canada (43.554, -80.264; Fig. 1). The trees in the yard and surrounding area include several maple species (Norway, Manitoba and Sugar - Acer platanoides L., A. negundo L. and A. saccharum Marshall), spruce (Picea glauca (Moench) Voss), black walnut (Juglans nigra L.), and dogwood (Cornus L. spp.). In 16 May 2010, a Malaise trap sample spanning the previous fortnight was collected from the location above. Trap contents were moved to the Biodiversity Institute of Ontario (BIO) where they were sorted, photographed and tissue-sampled for DNA barcoding (Fig. 2) by the collections staff. The DNA barcode produced from the DNA extract of this single sawfly specimen was added immediately to the public library of DNA barcode sequences on the Barcode of Life Data System. There, it received

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FIGURE 1. The appearance in 2009 of the location in Guelph, Ontario where the sawfly *Pristiphora subbifida* was captured in 2010. The 2010 location of the Malaise trap is noted with a red box. http://www.gigapan.com/gigapans/26024/

FIGURE 2. Lateral image of the *Pristiphora subbifida* sample, ASGLE397-10, MAS603-10, collected in Guelph, Ontario in May 2010.
a persistent identifier – a Barcode Index Number (BIN) (Ratnasingham and Hebert 2013) (BOLD:AAU8503) indicating that it was genetically unlike any other named or unnamed specimen in the database to that point. This specimen represents the first Canadian record for the Palearctic sawfly *Pristiphora subbifida*. A BOLD dataset with all public records of barcoded individuals of this species are accessible via dx.doi.org/10.5883/DS-ASPRiS.

It is not uncommon for a DNA sequence from hyperdiverse groups (such as the Hymenoptera) to appear first on the Barcode of Life Data System as a BIN lacking a species name. Indeed, national initiatives to barcode a nation’s fauna have reported that 35% of the samples processed could not be identified to species by their DNA (Geiger *et al*. 2016). However, the samples in the BOLD database are frequently accessed and regularly curated by taxonomic experts, leading to the regular addition of species epithets to “nameless” BINS. In one recent example, a European species of gall wasp was discovered as an adventive in Canada via a comparison of sequenced and named European samples with BOLD records of Malaise-trapped samples from Canada (Moffat and Smith 2014).

The BIN BOLD:AAU8503 received a name via sequences submitted to BOLD associated with a large initiative in 2010 to sequence and release DNA barcode data for the fauna of Germany, “the Fauna Bavaria” project (Hendrich *et al*. 2010). Several taxonomic groups have recently seen publications emerge from this initiative, including the Symphyta (Schmidt *et al*. 2017). Associated with the Hendrich *et al*. (2010) publication, there were barcode records included for *Pristiphora subbifida*. These records associated the name *Pristiphora subbifida* with the BIN “BOLD:AAU8503” that was created based on the Guelph record. The recognition that this BIN was, in fact, a named Palearctic species and an unexpected adventive to Canada was possible since all sequences were in BOLD.

The Bin reported here is the first known Canadian occurrence of this Palearctic sawfly. A new national record documented via the public release of de novo specimen data in a database that includes accessioned and named museum collections illustrates the value of publicly releasing DNA barcodes towards tracking the movement and arrival of species in the Anthropocene. Intensive surveying by the Biodiversity Institute of Ontario (BIO) across Canada over the last decade (1.6 M DNA barcoded occurrence records), mostly derived from Malaise traps (e.g., Steinke *et al*. 2017), has resulted in no additional records for this species. Such rarity, despite multiple years of continuous trapping, corresponds with infrequent Malaise trap captures reported earlier in the United States (Smith 2016). This might due to such as strong association with the trees, that these (apparently) *Acer* feeding *Pristiphora* do not easily fly into Malaise traps even close by to their associated trees.

Smith (2016) reported the first North American records for *Pristiphora subbifida* based on five individual Malaise trap collections in suburban Virginia and Maryland between 2000 and 2002 and a further two single individuals appeared in each of 2015 and 2016 (Fig. 3). All individuals except one were trapped in April. The recorded host in Europe are *Acer* spp., and thus far only *Acer campestre* L. has been identified unequivocally as a host (Prous *et al*. 2017). The host(s) in North America remains unknown due to their collection via Malaise traps; however, maples were present at all trap sites in the U.S. and Canada. The individual we report here allows us to add more data to our understanding of this adventive. The Guelph sample was also collected later in the year (May) as one would expect for a site farther north in Canada. In addition, the Guelph sample was also intriguingly isolated in an area that is covered in space and time by multiple Malaise traps. Thus, while our
collection adds to what we know about the extent of this adventive species in Canada and North America, most elements of the biology of this adventive sawfly in North America remain unknown.

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References


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