SCIENTIFIC NOTE

First record of *Pholcus opilionoides* (Schrank) (Araneae: Pholcidae) in Canada, with notes on its biology

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Cellar spiders (Araneae: Pholcidae) are widely distributed across the world, with 95 genera and over 1800 species described to date (World Spider Catalog 2021). In Canada only three species are formally recorded (Paquin *et al.* 2010; Canadian Endangered Species Conservation Council 2016). Two are native to western North America: *Pholcophora americana* Banks (in British Columbia and Alberta) and *Psilochorus hesperus* Gertsch and Ivie (in British Columbia; Gertsch 1982; Slowik 2009). The third, *Pholcus phalangioides* (Fuesslin), is an introduced synanthropic species of western Asian origin that now has a cosmopolitan distribution (Huber 2011; World Spider Catalog 2021) and is found across much of southern Canada. Two other species, apparent recent introductions to the Canadian Pholcidae fauna, have not been formally recorded (Bennett *et al.* 2019; R. Bennett and G. Blagoev, unpublished data): *Pholcus opilionoides* (Schrank) and *Pholcus manueli* Gertsch.

The increasing popularity and usability of citizen science mobile applications and dedicated entomological Internet sites, such as iNaturalist (www.inaturalist.org) and BugGuide (www.bugguide.net), have allowed the general public and the scientific community to upload, record, and verify local biodiversity. This has resulted in the recording of a large number of species observations across large geographic areas. Although informal, many of these observations have been verified by specialists and have contributed to current knowledge of species distributions.

A case in point is the apparent recent establishment in Canada and the United States of America of *P. opilionoides*, a synanthropic species with a distribution previously restricted to Europe, Caucasus, Egypt, and possibly Iran (Huber 2011; World Spider Catalog 2021). In his revision of the genus *Pholcus*, Huber (2011) noted that *P. opilionoides* was not then known to occur in North America and existing Nearctic records of it were based on misidentifications of *P. manueli*, a common introduced species in the eastern and central United States of America. These two species and *P. phalangioides* share similar morphology but can be distinguished by markings on the cephalothorax and genitalic characteristics: *P. opilionoides* has a narrow and medially divided central band, and a pair of dark lateral marks on the cephalothorax (Figure 5; Huber 2011, figure 1522), whereas the central band in *P. manueli* is broader and the lateral marks are missing (Huber 2011, figure 1655). The central band is undivided in *P. phalangioides*, and there

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are no lateral marks (Huber 2011, figure 1760). *Pholcus manueli* has a pair of dark marks running from below the median eyes to the top of the chelicerae (Huber 2011, figure 1655), which are absent in *P. opilionoides* and *P. phalangioides*. Males of the three species can be distinguished by differences in the shapes of the uncus, procursus, and appendix, and in general appearance (*P. opilionoides*: Figures 1–2; Huber 2011, figures 1586–1587; *P. manueli*: Huber 2011, figures 1729–1730; *P. phalangioides*: Huber 2011, figures 1819–1820). Females of the three species can be distinguished by differences in their epigynal plates (*P. opilionoides*: Figure 3; Huber 2011, figure 1588; *P. manueli*: Huber 2011, figure 1732; *P. phalangioides*: Huber 2011, figure 1821).

Subsequent to the Huber (2011) revision, however, over 100 observations of *P. opilionoides*, including females carrying egg sacs, have accumulated to date on iNaturalist from across Canada (British Columbia: 16; Alberta: 11; Ontario: 38; Quebec: 5; New Brunswick: 1; Nova Scotia: 4) and the United States of America (North Dakota: 1; South Dakota: 2; Minnesota: 38; Michigan: 3; Massachusetts: 2; Tennessee: 1; Figure 7). Although most of these observations have not been confirmed with voucher specimens or other reliable confirmation besides the verification on iNaturalist based on pictures, most show the presence of the lateral marks on the cephalothorax that are characteristic of *P. opilionoides*. Recently, one female and eight male voucher specimens were collected in Alberta and deposited in the Arthropod Collection at the Northern Forestry Centre (Natural Resources Canada, Canadian Forest Service; specimen catalogue numbers: NFRC-2018-05517, NFRC-2018-05518, NFRC-2018-05519, NFRC-2018-05520, NFRC-2018-05528) in Edmonton, Alberta. As well, an additional female specimen from Kelowna, British Columbia, was deposited in the Natural History Collections at the Royal British Columbia Museum (Victoria, British Columbia) in 2020. All these specimens show the genitalic characteristics of *P. opilionoides* (Figures 1–3) and the lateral markings on the cephalothorax (Figure 5). These observations thus confirm the presence of *P. opilionoides* in North America and establish the first formal record of the species in Canada. Although most observations are from southern localities, the specimens from Alberta correspond to the northernmost known distribution of the species in the continent (Figure 7).

The Alberta specimens observed and illustrated here were collected from the exterior of a house north of Acheson (Parkland County, northwest of Edmonton, Alberta; 53° 34' 19.3" N, 113° 44' 37.8" W), between 13 June and 3 July 2021. The female was carrying an egg sac with 27 eggs that hatched on 7 July. A second egg sac was produced on 25 July, also with 27 eggs. The presence of multiple specimens, along with egg sac production at the Acheson locality – and apparently at other localities in the country – suggests the presence of breeding populations of this species and its successful establishment in Canada subsequent to Huber's 2011 study.

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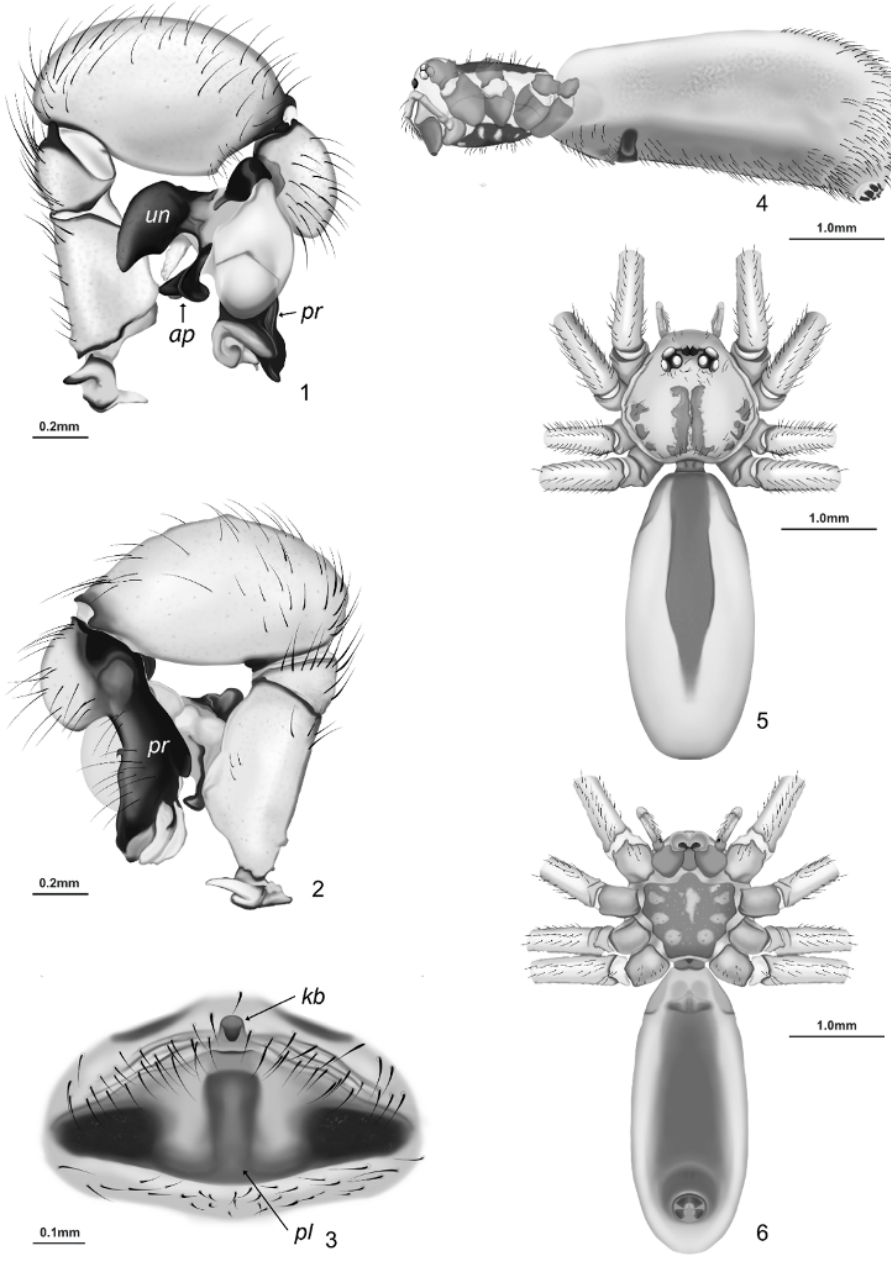

Figures 1–6. *Pholcus opilionoides*: 1, 2, left male palp, prolateral and retrolateral views; 3, epigynum, ventral view; 4, 5, and 6, body of female, lateral, dorsal, and ventral views. Abbreviations: *ap*, appendix; *kb*, knob; *pl*, posterior plate; *pr*, procursus; *un*, uncus.

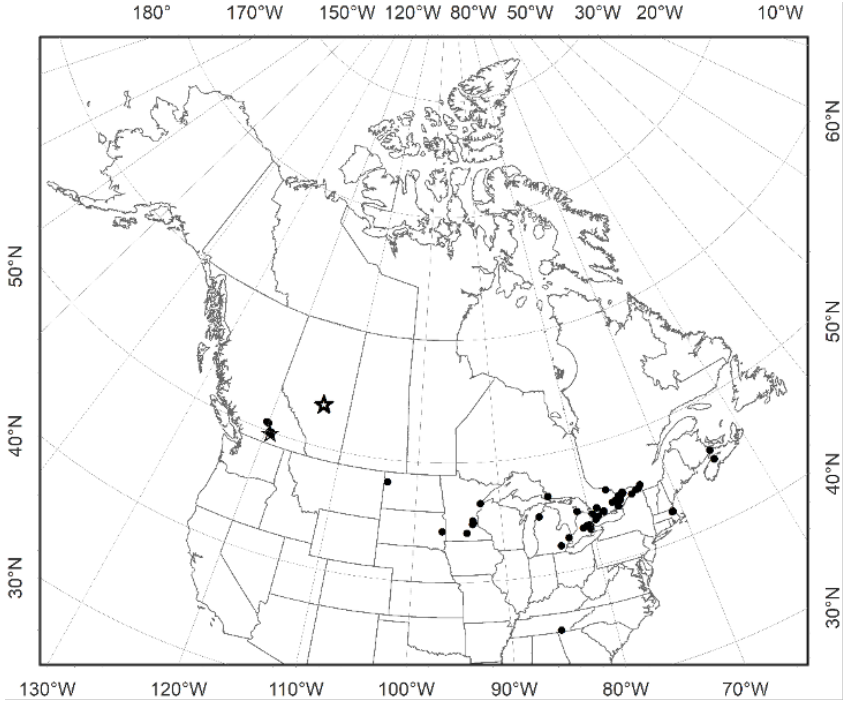

Figure 7. Distribution of *Pholcus opilionoides* in Canada and the United Stated of America, based on verified observations from iNaturalist. Stars denote localities where confirmed voucher specimens are available in collections; circles denote localities of specimens verified only from pictures.

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