Scientific Note

First record of *Sphaerularia bombi* (Nematoda: Tylenchida: Sphaerularidae), a parasite of bumble bee queens, in the Pacific Northwest

The nematode, *Sphaerularia bombi* Dufour, is a parasite of queen bumble bees, *Bombus* spp. (Hymenoptera: Apidae) (Cumber 1949). In infected bees, the corpora allata are inactive, and ovaries are not developed. As a result, infected queens are unable to establish nests and lay eggs (Ponoir & van der Lann 1972, Macfarlane et al. 1995). Instead, they attempt to return to the overwintering hibernaculum, and during the process release juvenile nematodes into the soil. The parasite has not been detected in workers and drones (Nickel 1984).

Worldwide, *S. bombi* has been reported from Europe in 22 *Bombus* species, and from North America in 15 species. It has also been detected in New Zealand in the introduced species *B. terrestris* L. and *B. hortorum* L. (Macfarlane et al. 1995). So far, *S. bombi* has not been reported in tropical bumble bees.

Infection levels nearing 100% have been reported from Europe (Nickel 1984) while these have ranged from 1 to 38% in North America (Macfarlane et al. 1995), and from 7 to 56% in New Zealand (Macfarlane & Griffin 1990). The vast range in parasitism levels is speculated to be due, in part, to when queens were collected for detection of the nematode. Higher levels are expected when queens are collected later in the season as, by this time, uninfected queens would have initiated nests and would thus not have been included in estimates of parasitism (McCorquodale et al. 1998).

Here, we report the first detection of *S. bombi* in queens of a native bumble bee species in Oregon on the west coast of the USA. During a study on colony development in *B. vosnesenskii* Radoszkowski at Oregon State University in 2010, wild queens were obtained from various locations in and around the city of Corvallis (45.56° N, 123.26° W; annual average rainfall-145 days, 1109 millimeters) within the Willamette Valley in western Oregon (Fig. 1). Queens were collected from February through May, and maintained for establishment of nests under laboratory conditions following protocols described by Plowright and Jay (1966) and Pomeroy and Plowright (1980). Out of 360 queens collected, 147 died without laying eggs. These were preserved at −40° C for subsequent determination of the causes of mortality. For determining the presence of pathogens, 40 preserved queens were randomly selected and dissected. Unexpectedly, we detected the presence of *S. bombi* in 12 (30%) of the queens. Adult nematodes were observed in the body cavity, while juveniles were detected in the body fluid. This discovery led to subsequent dissection of wild bumble bee queens that were collected the previous year for other lab studies. From these studies, queens that died were preserved at −40° C. When a random sample of 40 queens were dissected, *S. bombi* was detected in six individuals. The adults were visually identified by George Poinar, Oregon State University. Specimens were also sent to Mark Brown, University of London, UK, who confirmed the identity using 18S and 28S ribosomal DNA sequence analysis.