



# Ants of the South Okanagan Grasslands, British Columbia

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The South Okanagan grasslands are an extension of the intermontane grasslands of the Great Basin that extends from northern Mexico through the mid-western United States to the southern edge of the temperate forests in British Columbia (Pitt and Hooper 1994). Within the South Okanagan grasslands, the ecosystem of greatest importance to biodiversity conservation is the Antelope-brush (*Purshia tridentata*) shrub-steppe, 60% of which has been lost to agriculture and urban development (Schluter et al. 1995), and 9% remains in good natural condition (Redpath, 1990). This ecosystem occurs from valley bottoms to 700 m elevations, from Osoyoos in the south to Penticton in the north. The dominant plant in the ecosystem's natural state is blue-bunch wheatgrass (*Elymus spicatus* [*Agropyron spicatum*]), followed by big sagebrush (*Artemisia tridentata*), both characteristic plants of bunchgrass ecosystems (Miedinger and Pojar 1991). Occurring on sandy soils, the main bunchgrasses are three-awn (*Aristida longiseta*), needle-and-thread (*Stipa coratea*) and sand dropseed (*Spirobolus cryptandrus*). Douglas-fir and Ponderosa pine are sparse and wetlands are common in valley bottoms.

Invertebrates dominate grassland environments, have the ability to withstand desiccation, and thus exploit the subterranean environment. Since most surface species are inconspicuous and others live underground, the diversity of these animals in grassland environments is often overlooked. Ants make up a significant component of the arthropod diversity in grassland ecosystems, and form a unique subgroup within the

ground and soil surface population. The scarcity of precipitation results in very little soil leaching and consequently, temperate grasslands have an abundance of organic matter that contributes to the microhabitat available to these sub-surface soil dwellers. Ants contribute to the functioning of an ecosystem in their biomass and species richness, and also as soil engineers, seed dispersers, foragers and scavengers (Hölldobler and Wilson 1990; Folgarait 1998). The social nature of the ant gives it an advantage over solitary insects. Ants are not mobile or transient in the manner of most insects; they have a colony and nest that functions as a unit. Nests can persist in one location for months, seasons and years, growing or diminishing in response to the microhabitat and available resources (Wagner and Medler 1970). Ants are entirely dependent on temperature for their daily activities, both inside and outside the nest. With daily summer temperatures in the South Okanagan reaching over 35°C for weeks at a time, ants thrive.



Desert near Osoyoos in the Okanagan  
(photograph by J.D. Shorthouse)



The information in this article is a brief summary of the ant species identified for my master's degree thesis, brief notes on their behavioural and nesting characteristics, as well as some observations made from my thesis data. Ecological information was taken from Bolton (1994); Creighton (1950); Gregg (1963); Hölldobler and Wilson (1990); Wheeler and Wheeler (1963; 1986); Buckell 1932; Brown 1949; Blacker 1992; Naumann et al. 1999; Preston, pers. comm.; Francour, pers. comm. and personal observations.

The main objective of my thesis was to assess the effects of domestic livestock grazing on ant diversity in the South Okanagan grasslands, and this will be reported on elsewhere. The ants were collected (using pitfall traps) from ten sites located throughout the Antelope-brush shrub-steppe ecosystem in 1994 and 1995. These sites were categorized as ungrazed, moderately grazed or heavily grazed based on the known grazing history of the site. This study was part of a larger study that assessed the impacts of grazing on biodiversity in the South Okanagan.

In Canada, the average ant colony has 3000 workers although nests can range from 10 to millions of adults (Masner et. al. 1979). Often, it seemed the whole nest would fall into the closest pitfall trap, blindly following their sisters to a pit of propylene glycol! Nonetheless, they all were identified.

A total of 2397 of the 2500 pitfall trap samples had ant specimens present. All of the 93 515 ants collected in the traps were identified and represent 31 species from 13 genera (Table 1). All ants were identified to species using taxonomic keys in Bolton (1994); Creighton (1950); Gregg (1963); Hölldobler and Wilson (1990); and Wheeler and Wheeler (1963; 1986). Synoptic collection identifications were confirmed by Andre Francoeur (University of Chicoutimi, Quebec) and Bill Preston (Manitoba Museum of Man and Nature).

When the species list was checked with provincial data (Buckell 1932; Brown 1949; Blacker 1992; Blades and Maier 1996; Naumann et al. 1999; Royal British Columbia Museum;

**Table 1 Checklist of ant species captured in pitfall trapping in the South Okanagan**

Family Formicidae
Subfamily Myrmicinae
Tribe Myrmicini
Genus <i>Pogonomyrmex</i> Mayr
<i>owyheeii</i> Cole
Genus <i>Aphaenogaster</i> Mayr
<i>subterranea</i> Emery
Genus <i>Pheidole</i> Westwood
<i>californica</i> Mayr
Genus <i>Solonopsis</i> Westwood
<i>molesta</i> Say
Tribe Leptothoracini
Genus <i>Leptothorax</i> Mayr
<i>nevadensis</i> W.M.Wheeler
<i>nitens</i> Emery
<i>rugatulus</i> Emery
Tribe Myrmicini
Genus <i>Myrmica</i> Latreille
<i>nearctica</i> Weber
<i>crassirugus</i> undescribed
Subfamily Dolichoderinae
Tribe Tapinomini
Genus <i>Liometopum</i> Mayr
<i>luctuosum</i> W.M. Wheeler
Genus <i>Tapinoma</i> Foerster
<i>sessile</i> (Say)
Subfamily Formicinae
Tribe Formicini
Genus <i>Camponotus</i> Mayr
<i>nearcticus</i> Emery
<i>vicinus</i> Mayr
Genus <i>Lasius</i> Fabricius
<i>crypticus</i> Wilson
<i>neoniger</i> Emery
Genus <i>Myrmecocystus</i> Wesmael
<i>testaceus</i> Emery
Genus <i>Formica</i> Linnaeus
<i>argentea</i> W.M.Wheeler
<i>curiosa</i> Creighton
<i>haemorrhoidalis</i> Emery
<i>integroides</i> Emery
<i>lasioides</i> Emery
<i>microgyna</i> W.M.Wheeler
<i>neoclara</i> Emery
<i>neogagates</i> Emery
<i>near nepticula</i> Wheeler
<i>obscuripes</i> Forel
<i>planipilis</i> Creighton
<i>propinqua</i> W.M.Wheeler
<i>subpolita</i> Mayr
<i>viculans</i> W.M.Wheeler
Genus <i>Polygerus</i> Latreille
<i>breviceps</i> Emery



University of British Columbia Spencer Entomological Museum), there were five new records for British Columbia (*Formica nr. nepticula*, *Formica planipilis*, *Formica propinqua*, *Myrmica crassirugus* and *Myrmica nearctica*).

Ants are often grouped according to the niche they occupy, the nest they build or the habits they exhibit. Ant functional group profiles have been used in Australia (Andersen 1995) and later in North America (Andersen 1997) to form a basis from which to draw patterns of community structure along an environmental gradient. Research has shown that in ant communities the patterns of distribution and abundance are results of interspecific competition (Savolainen and Vepsäläinen 1988). Differences in exploitation behaviour, interference behaviour and interspecific predation can cause changes in the community structure of ants (Pontin 1997). Nest spacing allows for the coexistence of other less dominant species and coexistence could depend on chemical and behavioural differences, or on competition for food (Pontin 1997). Intraspecific competition can also contribute to nest dynamics. Based on food, nesting, microhabitat and behavioural tendencies, ants are grouped and discussed accordingly.

The aggressive and dominant thatch ants of the *Formica rufa* group are prominent in grassland ecosystems. In this study they comprised approximately 19% of the total ants collected, although often pitfall traps were situated in close proximity to a nest. *Formica haemorrhoidalis*, *Formica integroides*, *Formica microgyna*, *Formica obscuripes*, *Formica planipilis*, *F. propinqua* and *Pogonomyrmex owyheei* are known to be opportunistic ant species that make (sometimes) large thatch mound-like nests out of sticks and needles, vegetative debris, gravel, sand and any other readily available materials. Each of these species, aside from *Formica microgyna*, can also be characterized as aggressive, tends to form multicolonial populations and displays hostility towards ants that compete for similar resources through similar habits, i.e. ants of the same species or same subgenera. Alternatively, if the species forms unicolonial populations, then the ant remains aggressive towards a broad range of species.

*Formica haemorrhoidalis*, *Formica integroides*, *Formica obscuripes*, *Formica planipilis* and *Formica propinqua* are all known to live in various environments other than grasslands, including wooded coniferous forests at variable elevations.

*Formica haemorrhoidalis* was recorded at each of the ten sites, although at very low numbers in moderately grazed sites and comprised approximately 6% of trap catch. *Pogonomyrmex owyheei*, on the other hand, was recorded at 3 sites and comprised less than 0.2% of trap catch; thus aggressive behaviour may not always lead to dominance or abundance. Ants in this genus are also referred to as harvester ants, and are represented by this species alone in British Columbia. Harvester ants gather and store seeds within their nests and are generally non-selective in seed preference, thus a specific food source is likely not the cause of low numbers. They are also known for a very painful sting. This species is at the northern limit of its range as the genus is fairly abundant in the southern United States and Mexico (Wheeler and Wheeler 1986). The pygmy short-horned lizard (*Phrynosoma douglasii*) is known to feed on harvester ants and is listed as Extirpated from Canada by the Committee on the Status of Endangered Wildlife in Canada. *Pogonomyrmex owyheei* has only been found south of Penticton in grassland and desert environments. The rarity of this ant may partially explain the absence of the lizard, and habitats with known records of harvester ants could provide potential recovery habitat and should be prioritized for surveys.

While aggressive behaviour allows some species to dominate an ecosystem, other ants are ubiquitous by different means. *Solonopsis molesta* and *Tapinoma sessile* are both lestopibiotic; small species of ants that nest in the walls of colonies built by a different ant species. Lestobiotic ants steal food, prey on inhabitants including the brood of the host nest, and utilize the resources of the host nest to survive. These ant species can also live independently and may be abundant, but usually do not behave aggressively (Hölldobler and Wilson 1990) in soil or vegetation mounds, under stones or wood. *Tapinoma sessile* has a wider nesting preference and will also live under dung, a



substrate that is found abundantly in grazed ecosystems. Both *Solonopsis molesta* and *Tapinoma sessile* are very small, and their size coupled with their lestopibiotic ability allows these ants to live throughout all ecosystems of North America. Thus it was not surprising these ants were found in all sites surveyed, *Solonopsis molesta* comprising 42% of all the ants identified!

*Solonopsis molesta* can also be categorized as a dulotic or slave-making ant species. These parasitic ants have a separate nest, with workers raiding other species' nests and capturing the brood, usually the pupae, for rearing in the host nest (Holldöbler and Wilson 1990). A dulotic ant species utilizes enslaved workers for reproduction, foraging and nest building. *Formica curiosa*, *Formica microgyna*, *Leptothorax nevadensis* and *Polygerus breviceps* also exhibit dulotic abilities.

*Polygerus breviceps* is a true slave making species and is known to use a variety of hosts including *Formica subpolita*, *Formica argentea* and *Formica neoclara*, each have been trapped in this study. *F. subpolita* is known as a timid species, and tends to nest under stones or sometimes creates a crater nest in open spaces. The species is also known to tend other insects for honeydew. Elsewhere nests have been located at the base of *Artemisia tridentata*, a shrub commonly known as big sagebrush that occurs widely throughout the South Okanagan grassland ecosystems. *Formica argentea* is found throughout North America, and is common in urban, rural and disturbed environments including those throughout the South Okanagan and elsewhere in BC. *Formica neoclara* is also relatively widespread throughout the southern part of the province and is recorded from open areas, grasslands and disturbed areas.

Only one specimen of *Formica curiosa* was caught, at a moderately grazed site. The species' known host is *Formica lasioides*, which comprised less than 0.2% of trap catches and was found in total numbers less than 50 at any one site over the course of the two year study. This species has been reported from British Columbia in the past, although there is little reported about the habitat in which it was found. Elsewhere the species has

been recorded from dry desert and grassland type environments.

The most abundant slave-making ant after *Solonopsis molesta* was *Leptothorax nevadensis*, also known to form a soil or vegetative mound or nest in and under decaying wood. This species is known to live in a wide range of habitats, including coniferous and mixed forests, open woodlands and grasslands and was found in all grazing categories and at nine of the ten sites.

Additional ants trapped during this study that can be enslaved to work by a dulotic species include *Formica neogagates*. This species is known to form a soil or vegetation mound, or nest under stones, under dung or create crater nests in a variety of environments, including grasslands, forests and open woodlands. In British Columbia it has been recorded in areas other than the South Okanagan and in this study it was one of seven species recorded at all sites. *Formica neogagates* has also been characterized as a timid species, an ant that tends to hide or run away fast when disturbed, does not defend its brood when the nest is disturbed, and is out-competed or readily displaced by more aggressive ant species.

Other species characterized as having timid behaviour include *Aphaenogaster occidentalis* (*subterranea*), *Camponotus nearcticus*, *Lasius crypticus*, *Lasius neoniger* and *Leptothorax rugatulus*. *Aphaenogaster occidentalis* is known to have nests in both extreme cover and in open spaces, in open and forested landscapes. The species is known to range from southern Vancouver Island through the southern interior of British Columbia, and although it was not trapped from all sites it was the second most abundant species, comprising 12% of the total trap catch.

*Camponotus nearcticus*, a carpenter ant, is known to live under the bark of dead trees and other forms of dry wood, in pine cones, galls and rotting logs and under dung. The species has previously been recorded from the South Okanagan and although occurring at seven of the ten sites, the species comprised less than 0.2% of ants identified. Both *Lasius crypticus* and *Lasius neoniger* nest under stones, decaying wood and dung,



may form crater nests and are known to tend other species of insects such as aphids for honeydew. Both species have previous records in the South Okanagan and are known to inhabit grassland environments and occurred in all grazing categories. Another ant known to tend insects and have similar nesting habits is *Leptothorax rugatulus*.

*Camponotus vicinus* is a widespread species in British Columbia and like most carpenter ants it is known to build nests in rotten wood, although this species has also been observed to build nests under stones and other forms of cover. The species is also known to feed on and tend insects as well as scavenge on dead insects and decaying material. The aggressive behaviour of the species enables it to readily compete for resources and thus it was not surprising that it was found in all ten sites of this study, comprising approximately 3% of the total trap catch.

Some ants can also be categorized as tolerant: they do not appear to be disturbed easily, do not display aggressive tactics when disturbed, and are able to live within close proximity (nest territories overlap) with other more aggressive ant species. Stratification of foraging activities permits the coexistence of dominant and subordinate species in greater diversity and abundance (Cerdá et al. 1998). Tolerant ants include *Myrmecocystus testaceus*, *Myrmica crassirugus*, *Myrmica nearcticus* and *Pheidole californica*, and all four of these species are known only from South Okanagan records. Both *Myrmica crassirugus* and *Myrmica nearctica* are new records for British Columbia. *Myrmica crassirugus* is a species new to science (A. Francoeur pers. comm.) yet has been documented elsewhere in Canada. These species are known to nest in rotten wood, under stones or form soil and vegetation mounds in addition to tending insects.

The ant fauna of British Columbia is little studied and thus it is difficult to assess whether species occurring solely in the South Okanagan are truly specific to the ecosystems of this region. Based on the provincial records and scanning the literature it would appear that *Pogonomyrmex owheeyi*, *Camponotus nearcticus*, *Lasius neoni-*

*ger*, *Lasius cryptigus*, *Myrmecocystus testaceus*, *Myrmica crassirugus*, *Myrmica nearcticus* and *Pheidole californica* are associated with the grassland environments of the South Okanagan. Of these species, *Pogonomyrmex owheeyi*, *Myrmica crassirugus* and *Myrmica nearcticus* were extremely rare in the trapping done in this study.

Ants may be considered resilient to habitat alterations due to innate defence mechanisms as a direct result of their sociality. Grassland ant species typically nest in microhabitats that protect and conceal their nests: under rocks, stones or boulders, under the bark of a dead tree, or piece of wood or at the base of a plant or under thatch. If the nest is an exposed crater or thatch mound, it may be just outside of the fray of herbage, which would attract grazers or browsers; therefore the probability of periodic and repeated disturbance (e.g. from trampling) is considerably lessened, although ants can be quite resilient to livestock trampling (Heske and Campbell 1991). Although apparently ubiquitous and considered somewhat resilient, ants should not be overlooked in conservation planning, specifically in the rapidly changing South Okanagan grasslands.

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