Solenopsis geminata (Fabricius)

Taxonomic Catergory

Family:	Formicidae
Subfamily:	Myrmicinae
Tribe:	Solenopsidini
Genus:	*Solenopsis*
Species:	*geminata*

Common name(s): tropical fire ant (Smith 1965), aka-kami-ari (www1), native fire ant (www5), fire ant (Smith 1965), ginger ant (www6)

Original name: *Atta geminata* Fabricius

Synonyms or changes in combination or taxonomy: *Myrmica polita* Smith, *Solenopsis cephalotes* Smith, *Atta clypeata* Smith, *Atta coloradensis* Buckley, *Solenopsis eduardi* Forel, *Solenopsis geminata* var. *galapageia* Wheeler, *Myrmica glaber* Smith, *Solenopsis geminata* var. *innota* Santschi, *Crematogaster laboriosus* Smith, *Myrmica saevissima* Smith, *Solenopsis saevissima* (Smith), *Solenopsis geminata* subsp. *saevissima* (Smith), *Atta lincecumii* Buckley, *Solenopsis mandibularis* Westwood, *Solenopsis geminata* subsp. *medusa* Mann, *Myrmica mellea* Smith, *Solenopsis geminata* var. *nigra* Forel, *Myrmica paleata* Lund, *Atta rufa* Jerdon, *Myrmica (Monomorium) saxicola* Buckley, *Diplorhoptrum drewseni* Mayr, *Solenopsis edouardi* var. *perversa* Santschi, *Solenopsis edouardi* var. bahiaensis Santschi, *Solenopsis* germinata var. *diabola* Wheeler, *Solenopsis rufa* (Jerdon), *Solenopsis geminata* var. *rufa* (Jerdon), *Solenopsis geminata* var. *galapageia, Solenopsis geminata* subsp. *eduardi*

Current subspecies: nominal plus *Solenopsis geminata* var. *micans* Stitz

General Description

"Fire ant" is the name usually used to refer to members of the *S. geminata* species group. This group includes; *S. geminata, S. invicta*, *S richteri* (sheet # 27), *S. saevissima* (sheet # 28) and *S xyloni* (sheet # 29). The group get their name from their ability to inflict especially painful bites and stings.

Solenopsis generic diagnosis: Small to medium-sized ants, total length of workers around 1–9 mm. Worker caste monomorphic or polymorphic. Antennae 10-segmented, including a 2-segmented club. Eyes small to medium in size. Mandibles with 4 or 5 teeth. Clypeus with a pair of longitudinal carinae that diverge anteriorly and run to margin where they often project as a pair of teeth or denticles. Anterior clypeal border with one median seta present, clearly differentiated and conspicuous. Rear face of propodeum more or less rounded, never with teeth, spines or thin flanges. Two nodes (petiole and postpetiole) present. Stinger extruded in most alcohol-collected specimens. Most species pale yellow to reddish brown (a few species dark brown to black) and predominantly smooth and shining usually with sparse, long hairs.

Distinction from other genera: Workers of *Solenopsis* are most often confused with workers of *Oligomyrmex*. They can be separated by the single central hair on the front margin of the clypeus (paired hairs are present in *Oligomyrmex*) and the

rounded rear face of the propodeum (spines, teeth or flanges are present in *Oligomyrmex*). *Solenopsis* may also be confused with smaller species of *Monomorium*. In this case, the distinctly 2-segmented club will allow the identification of *Solenopsis*.

Species-level identification: Identification of fire ants to species is difficult and usually involves evaluating the morphology of a series of workers rather than just one specimen. This task is further complicated by the fact that interbreeding between several species has been recorded.

Identification of Solenopsis geminata worker

Size: polymorphic (major and minor castes). Total length 3–8mm.

Colour: head brown, body reddish brown.

Surface sculpture: head and body mostly smooth and shining, without sculpture.

General description

Major workers: head almost square with a deep, median, lengthwise groove down the middle of the vertex, posterior margin distinctly convex in full-face view. Median clypeal tooth absent. Mandibles robust, each with a strongly convex outer margin and 4 blunt teeth on the masticatory margin; mandibular teeth obscure in some individuals; eyes each with more than 20 facets; anterior ocelli often present; antennal scapes only reaching about halfway from eye to vertex; antennal club longer than the 3rd to 9th antennal segments combined. Petiole with anterior peduncle (subpetiolar process) reduced or absent. Legs, mesosoma and gaster with numerous erect hairs.

Minor workers: head almost square in full-face view; mandibles 4-toothed; antennal scapes reaching posterior margin of head; posterolateral corners of propodeum carinate, the carinae reaching the dorsal surface of the propodeum; subpetiolar process absent.

Sources: www1; Trager 1991

Formal description: Trager 1991

The taxonomy of the *S. geminata* species complex is difficult and has been revised only recently making it difficult to be certain what literature relates specifically to this species. Trager (1991) provides a key to major workers of the *geminata* group.

Behavioural and Biological Characteristics

Feeding and foraging

Foragers are slow moving and show low levels of aggression compared to other pest *Solenopsis* (Trager 1991). A highly omnivorous feeder: foragers will mass recruit to a food source (Taber 2000). They primarily feed on the ground (Carroll & Risch 1983) and generally within 15 m of the nest (Perfecto & Vandermeer 1996). Although slow to find food they are effective at defending resources once found (Perfecto 1994). Workers collect large amounts of seeds (eight times more seeds than *S. invicta*) that are gathered and stored in granaries within the nest (Torres 1984; Tennant & Porter 1991; Trager 1991). The mandibles of Major workers are adapted for milling seeds (Wilson 1978). Foragers also tend honeydew-producing homoptera and feed on arthropods, sweets, meats, and fats, and are an important predator of live insects (Smith 1965). Their venomous sting may give them a greater ability to subdue vertebrate and large invertebrate prey (Holway et al. 2002). A significant amount of foraging may occur underground (Chang & Ota 1976) and workers do not appear to forage extensively in the canopy (Way et al.1989; Wetterer & O'Hara 2002).

Colony characteristics

Both monogyne and polygyne forms occur (Ross et al. 2003). Polygyne *S. geminata* colonies have lower genetic diversity and different gene frequencies than the monogyne form, suggesting that the polygyne form originated via a founder event from a local monogyne population, much like the system proposed for *Linepithema humile* (Ross et al. 2003). Monogyne colonies typically form independent and competitive colonies (McInnes & Tschinkel 1995), whereas polygyne colonies appear to be more cooperative (Taber 2000). Monogyne populations can produce two types of queens – macrogynes and microgynes (McInnes & Tschinkel 1995). Macrogynes are large, have greater fat stores and attempt to found nests independently. Microgynes try and infiltrate or be adopted into existing colonies and may only succeed where colonies are orphaned.

Colonies can attain a large size (Smith 1965) with centralised nest systems that can extend 5 feet into the ground (www6) with extensive underground and covered foraging trials (Perfecto & Vandermeer 1996). The nest entrance is disc-like, with a raised rim composed of soil particles (Vareesh 1990). Nests have entrance holes spread over an area ranging from a few centimetres (for young nests) to several metres (for older nests) (Smith 1965).

The polygyn form can attain high densities, for example more than 2500 occupied mounds per ha have been recorded in Mexico (Mackay et al. 1990), 50 times the density of monogyne forms in the same area. In the US, densities up to 90 mounds per ha are reported (Porter et al. 1988; McInnes & Tschinkel 1995). Individual nests can contain over 100,000 workers (Way et al. 1998; Verresh 1990) and in idea conditions Way et al. (1998) estimated 500,000 workers in 100 m of rice field edge.

Dispersal

Solenopsis geminata is capable of colonising disturbed habitats rapidly and building up high population densities in a matter of weeks (Risch & Carroll 1982a; Perfecto 1991). As budding has not been reported (Taber 2000), this rate of increase must be from a combination of movement of whole colonies into the disturbed area and an increase in foraging into the disturbed area by surrounding nests, as colonization is thought to be too rapid to be due to winged dispersals founding new colonies (Perfecto 1991). In Mexico, *S. geminata* colonised a newly available habitat within 5 weeks despite not being present in the surrounding forest (Ricsh & Carroll 1982b).

Dispersal by nuptial flight also occurs. *Solenopsis geminata* is known to conduct nuptial flights during the day and after dark in the United States (Hung et al. 1977; Taber 2000). In the Northern Territory, Australia, Hoffman and O'Connor (2004) have only ever noticed alates during warm tropical nights. Nuptial flights require high temperatures and humitity, little wind and few or no clouds (Bhatkar 1990).

Habitats occupied

In its native range this species occurs in disturbed ecosystems in moist tropical lowlands (Smith 1965; Risch & Carroll 1982a) in a wide range of soil types (Taber 2000). The more frequently and highly disturbed the system the more likely *S. geminata* is to dominate the ant community (Risch & Carroll 1982a). It can also nest in sandy areas and well-drained woodlands (Taber 2000), and survives in Florida in more shaded, less disturbed habitats than are colonised by *S. invicta* (Tschinkel 1988; 1998). Where it is found in forested areas it is found in more open micro-habitats (Taber 2000) and avoids dense shaded areas (Phillips 1934 cited in Chang & Ota 1976). Populations quickly invade open habitat of a cleared forest in Mexico, but within a year decreased as herb and tree vegetation became re-established (Risch & Carroll 1982b; Carroll & Risch 1983). On Christmas Island, *S. geminata* is found predominantly in disturbed urban areas (K. Abbort pers. comm.). Within Kakadu, Northern Territory colonies were found in the grounds of a tourist complex, rather than the surrounding savannah (Hoffman & O'Connor 2004).

Global Distribution (See map)

Native to

Central America to the southern United States (www1).

Introduced to

Many tropical and sub-tropical areas of the world. There are also at least five collection records from temperate locations: Maquinchao in Argentina (Lat -41.25; Donisthorpe 1933 cited in www55); Beijing in China (Lat 39.93; Wheeler 1927); Kew Gardens in London (Lat 51.47; Donisthorpe 1943 cited in www55); Winnipeg in Canada (Lat 49.83; Ayre 1977); Durbin in South Africa (Lat -29.87; Prins et al. 1990). At least some are collections in tropical display houses (Ayre 1977). There are no follow-up records for any of these locations to indicate this species can permanently establish in a temperate location.

History of spread

This species has a long association with human activities and spread outside its native range at least several centuries ago – to the Antilles and Galapogos (Trager 1991), and was well established in Hawaii by the 1870's (Reimer et al. 1990). It appears to be still spreading, being a relatively new arrival in Arabia with the first records from the region reported from Dubai by Collingwood et al. (1997), and new populations being detected in towns in northern Australia (Andersen et al. 2004; Hoffmann & O'Connor 2004).

Interception history at NZ border

Workers are commonly intercepted at the border (61 interceptions to April 2004) on a wide range of commodities. Nests and queens have also been intercepted. A nest was located during routine ant surveillance at Mt Maunganui (2003) next to a container storage area, and appears to have been a monogyne colony. The nest was chemically treated and no other colonies were found at the site.

Justification for Inclusion as a Threat

One of 5 ants listed among the "100 of the World's Worst" invaders" (www6).

This ant is commonly intercepted at the New Zealand border and at least one incursion has occurred. It possesses a painful sting (www5) causing injury to humans and domestic animals (www6), and cases of anaphylactic shock have been reported (Hoffmann 1997). They can be common around urban areas, are attracted to electric fields (MacKay et al. 1992), and can cause chewing damage to PVC coatings of electrical wiring (Prins 1985). They also build ugly mounds in lawns, steal seeds from seedbeds, bite holes in fabrics and feed on a range of household foods (Smith 1965). Workers tend honeydew-producing homoptera, especially mealybugs (www6). This increases pest populations and can reduce seed set and yields (e.g., Way et al. 1998) and the incidence of disease vectored by homoptera (Gadiyappanavar & ChannaBasavanna 1973; Behera et al. 2001). They can also girdle citrus trunks, which may introduce disease (Wolcott 1933; Suarez-Sotolongo 1990). *S. geminata* has the potential to invade native communities and affect both animals and plants in that community. This is especially the case in disturbed ecosystems, which it reinvades rapidly after disturbance and probably acts as an important organiser of the arthropod community (Risch & Carroll 1982a).

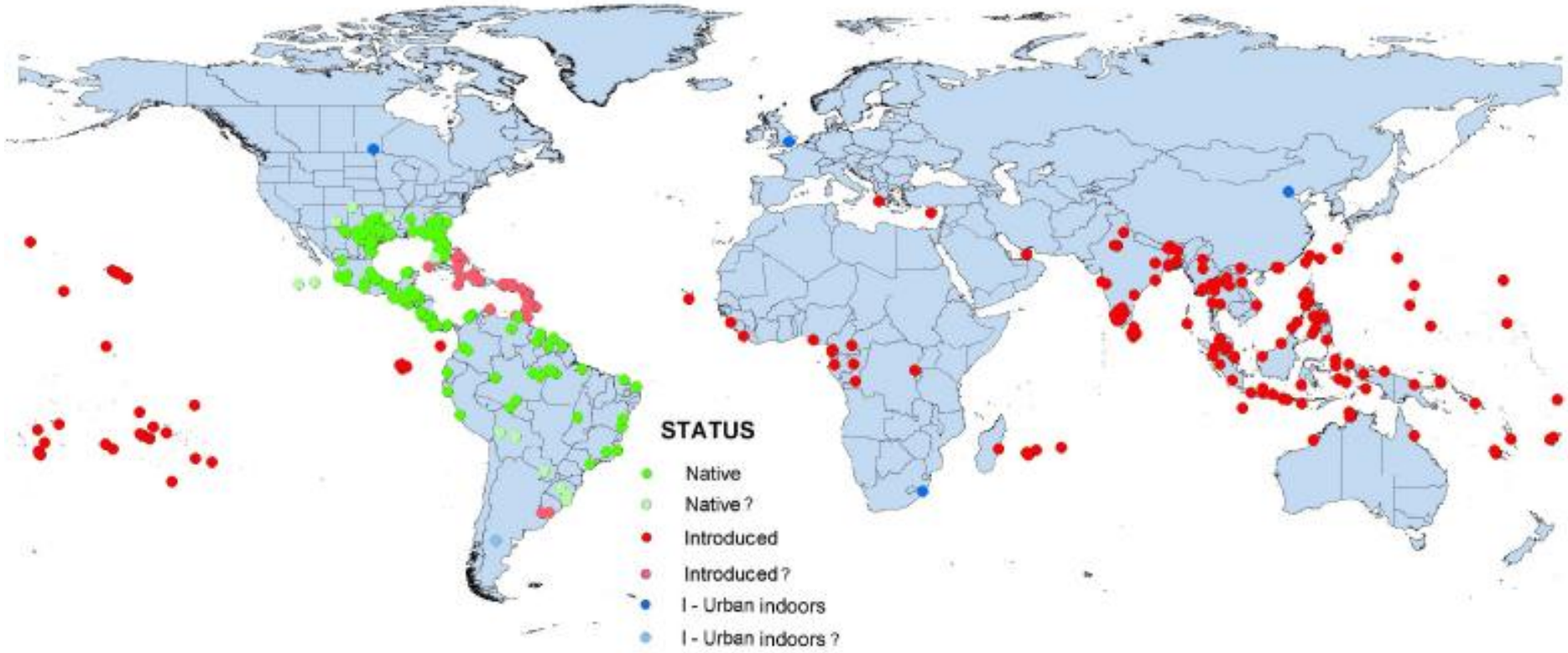
Mitigating factors

Summer temperatures in areas where it is established are high compared to New Zealand, which will reduce chances of establishment and the magnitude of detrimental impacts, should it establish.

Control Technologies

Hydramethylnon based toxins in granular formulations are reported to be very effective (www6), but Hoffmann and O'Conner (2004) found repeated applications failed to kill all foragers from some nests, and direct nest treatment was required to kill colonies in an extensive eradication attempt in Northern Australia.

Compiled by Richard Harris & Jo Berry



Global distribution of Solenopsis geminata *(Fabricius)*