

Solenopsis geminata (Tropical Fire Ant)

Order: Hymenoptera (Ants, Wasps and Bees)

Class: Insecta (Insects)

Phylum: Arthropoda (Arthropods)



Fig. 1. Tropical fire ant, *Solenopsis geminata*.

[<https://www.ars.usda.gov/oc/images/photos/nov14/d3337-1/>, downloaded 2 December 2016]

TRAITS. The genus *Solenopsis*, comprises the fire ants, which are named for their aggressive nature and formidable stings, and the thief ants (Trager, 1991). These ants are polymorphic, that is, the members of the species have different morphological features giving them distinct forms based on their function in the colony. Their body length ranges up to 5mm in the large major workers (Yates, 2010). Their body is a brown to orange colour and the head is more brown (Longino, 2005). They can be differentiated from other species by their larger size and greater variability between the worker castes from minor to major workers (Fig. 1) (Wilson, 1978).

ECOLOGY. *Solenopsis geminata*, are abundant in tropical areas around the world (Fig. 2). They are native to Central America and introduced to other areas, including Trinidad and Tobago (Cabi.org, 2016). They tend to forage both during the day and night. Usually, when a new colony is founded by a queen, or several queens, only one survives that early colony establishment period. After a year, many thousands of colony members are established. *S. geminata* show territorial interactions, and eliminate many of their neighbours during their growth in an area. There can be

30-100 nest mounds in a hectare of land (Trager, 1991). Nests are typically in moist areas such as the land near to rivers, ponds, marshes, as well as man-made areas such as wet yards. The tropical fire ant is considered a nuisance in some places, particularly to farmers, as it has a formidable sting.

SOCIAL ORGANIZATION. Five types exist in an *S. geminata* colony, as well as eggs, larvae and pupae. The organization of the social structure depends on their division of labour and roles in assisting the colony (Wilson, 1978). The five types are the workers and their sub-castes, including majors, medias and minors, the queen, which is defined as a mated and egg-laying female, and winged males (McInnes and Tschinkel, 1995). In some colonies there is one queen (monogyne colonies), in others two or more queens (polygyne colonies). The different workers vary in their body sizes, especially their heads (Wilson, 1978). In this species, the larger medias and majors' roles are in milling seeds. The function of the minor workers, which are smaller than the majors and medias, is brood care (Fig. 3).

ACTIVITY. *S. geminate*, along with all ants, are social insects. The nests are basin-shaped but can also be mounds; in both cases, there is an ideal temperature for the ants to survive. The nests have numerous entrance holes, approximately 16-20 in one nest. Just below the soil surface are the foraging tunnels, approximately 10cm deep and leading to multi-directional foraging sites, approximately 30m from the nest. Ants spend their time foraging, transporting food back to the nests, where the major workers mill the seeds and minors function in brood care (Cabi.org, 2016).

FORAGING BEHAVIOUR. In a study by Perfecto (1991), it was found that *S. geminata* exhibits colonist behaviour. When land was ploughed in a fallow field, *S. geminata* was the only species of ant to be found all over the field shortly after ploughing. *S. geminata* is a dominant species, whose presence inhibits most other ant species in the area when resources of food are scarce (Perfecto, 1991). They are primarily seed harvesters and seem to prefer this food over insects, but they are omnivorous. Their food of preference is grass seeds (Perfecto, 1991). When mounds are excavated, seed caches of grasses are the dominant type. Fire ants, when in large numbers, pilfer food from other ant species, which locate food much more readily than *S. geminate* does. They do this by directly taking food from the other ants such as *Pheidole*, *Parathrechina* and other genera. They spring upon these ants, swaying their gasters (most posterior part of the ant body, with stinger), with a drop of venom on the end of their stinger. The other ants are repulsed by the odour, and put up no opposition. Fire ants recruit other individuals to food by a trail of pheromones (chemicals). Major workers, besides seed milling, also have the ability to store food, and often have crops filled with oils (Trager, 1991). They have been seen foraging both during the day and at night, but generally tend to prefer less heat and thus forage after sunset (Norasmah et al., 2006).

COMMUNICATION. It has been determined that carbon dioxide is a vital molecule in communication in tropical fire ants. When there is a cave-in, and ants become trapped, they send out carbon dioxide which triggers digging behaviour in other workers. The workers on the outside respond to this stimulus and attempt to get near to it by digging. Additionally, broods produce a lot of carbon dioxide, which signals to workers to tend to the larvae and pupae (Hangartner, 1969). The carbon dioxide molecule acts as a position marker, allowing fire ant workers to move up the concentration gradient. They also leave pheromone trails after a food resource has been located to recruit other workers.

SEXUAL BEHAVIOUR. Mating flights by queens occur at times when the wind speed is low. Mating flights usually occurs at sunset after rain has fallen (Trager, 1991). The male alate (winged ant) (Fig. 4) and female queen alate leave the nest to mate in the air (Cabi.org, 2016). After mating, the females set up new nests by burrowing and laying eggs, which hatch to larvae in two weeks. The total development from egg to adult takes approximately one month. After this the new workers begin their roles immediately.

JUVENILE BEHAVIOUR. Newly emerged adults immediately start tending to all stages between eggs and pupae, and the queen. They are called minors, and their roles change as they get older (Yates et al., 1994).

ANTIPREDATOR BEHAVIOUR. Despite being described as an aggressive species (Perfecto, 1991), some species of ants do attack *S. geminata*, such as the army ants *Eciton burchellii* and *E. hamatum*. The raiders rarely kill workers or queen but seek to plunder the brood. Just prior to the attacks, the workers of *S. geminata* vacate their nests. The workers carry their brood with them, that is, the larvae and pupae. They migrate for 3-8 hours, in nearby vegetation, stones and pillars or walls. They stay there in groups of about 5-20 ants, after which they travel back into their nests all at the same time and the colony resume their activities. They usually lose a part of their brood in the process. The queen usually stays in the nest (Dejean et al., 2013).

REFERENCES

- Cabi.org.*Solenopsis geminata* (tropical fire ant). Invasive Species Compendium.
<http://www.cabi.org/isc/datasheet/50568>
- Dejean A., Corbara, B., Roux, O. and Orivel, J. (2013). The antipredatory behaviours of Neotropical ants towards army ant raids (Hymenoptera: Formicidae). *Myrmecological News*. **19**: 17-24.
- Hangartner, W. (1969). Carbon Dioxide, a release for digging behaviour in *Solenopsis geminata* (Hymenoptera: Formicidae). *Biological Laboratories, Harvard University*.
<http://webcache.googleusercontent.com/search?q=cache:vumLKme1-yIJ:downloads.hindawi.com/journals/psyche/1969/058428.pdf+&cd=2&hl=en&ct=clnk&gl=il>
- Longino, J. T. (2005). *Solenopsis germinanta* (Fabricius 1804). *The Evergreen State College, Olympia WA 98505 USA*. <http://academic.evergreen.edu/projects/ants/genera/solenopsis/species/geminata/geminata.html>.
- McInnes, A. D. and Tschinkel, W.R. (1995). Queen dimorphism and reproductive strategies in the fire ant *Solenopsis geminata* (Hymenoptera: Formicidae). *Behav Ecol Sociobiol*. **36**: 367-375.
- Norasmah, B., Abu Hassan, A., Che Salmah, M.R., Nurita A.T and Nur Aida, H. (2006). Daily foraging pattern and proteinaceous food preferences of *Solenopsis geminata*. *Tropical Biomedicine* **23(2)**: 134-139.
- Perfecto, I. (1991). Dynamics of *Solenopsis geminata* in a tropical fallow field after ploughing. *School of Natural Resources, Univ. of Michigan*. **62**: 139-144.
- Trager, J. C. (1991). A Revision of the Fire Ants, *Solenopsis Germinata* group (Hymenoptera: Formicidae: Myrmicinae). *Journal of the New York Entomology Society* 99(2): 141-198.
- Yates, J. R. (2010). Global Invasive Species Database-*Solenopsis germinata*. *College of Tropical Agriculture and Human Resources, University of Hawaii*. Downloaded 18 October 2016.
<http://www.iucngisd.org/gisd/species.php?sc=169>
- Yates J. R III., Tenbrink, V. and Hara, A.H. (1994). *Solenopsis germinata* (Fabricius). *College of Tropical Agriculture and Human Resources, University of Hawaii*. Urban Knowledge Master.
- Wilson, E.O. (1978). Division of Labour in Fire Ants Based on Physical Castes (Hymenoptera: Formicidae: *Solenopsis*). *Journal of Kansas Entomological Society*. **51**: 615-636.

Author: Krystal Eccles

Posted online: 2016

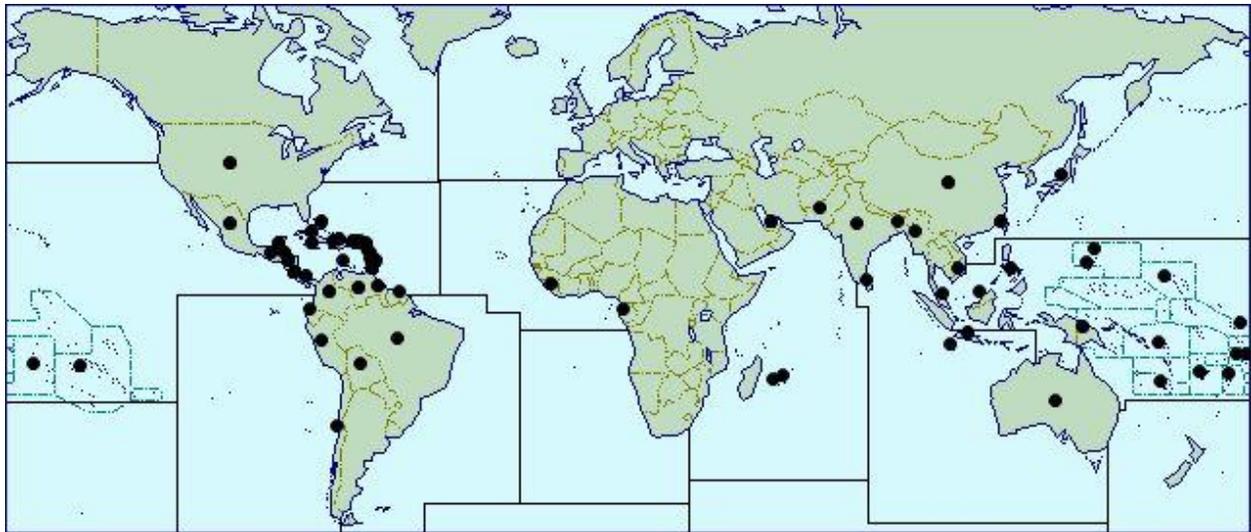


Fig. 2. Distribution map for *Solenopsis geminate*, by countries.

[<http://www.cabi.org/isc/datasheet/50568>, downloaded 1 November 2016]



Fig. 3. Tropical fire ant, a healthy brood chamber.

[<http://www.myantshop.com/Solenopsis.htm>, downloaded 12 November 2016]

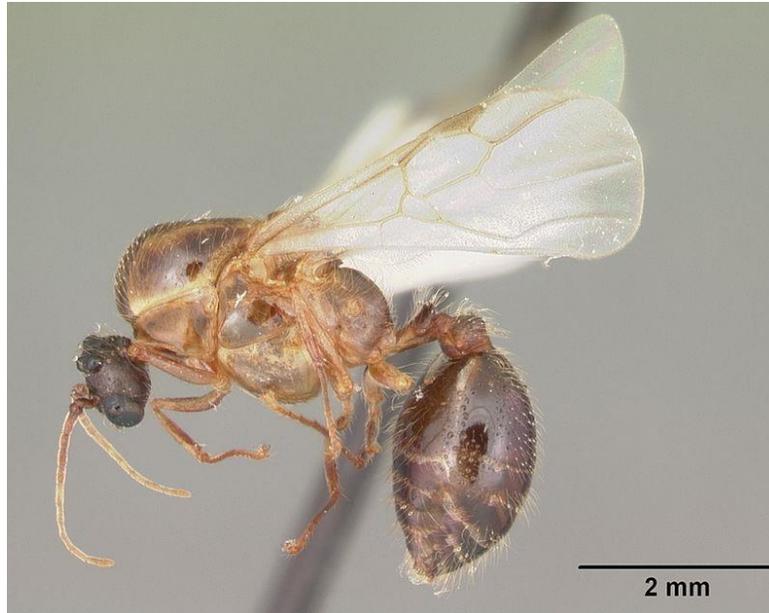


Fig. 4. Alate (winged) male tropical fire ant.

[http://www.antwiki.org/wiki/Solenopsis_geminata#mediaviewer/File:Solenopsis_geminata_casent0104519_profile_2.jpg, downloaded 12 November 2016]

For educational use only - copyright of images remains with original source