Solenopsis invicta (Red Imported Fire Ant)

Order: Hymenoptera (Ants, Wasps and Bees)
Class: Insecta (Insects)
Phylum: Arthropoda (Arthropods)

Fig. 1. Red imported fire ant, *Solenopsis invicta*.

[http://www.alexanderwild.com, downloaded 8 April 2015]

TRAITS. A very aggressive ant species, more so than most, *Solenopsis invicta* is usually an unwanted guest though its name suggests otherwise. These ants bite and have a venomous sting. The venom is made of necrotizing alkaloids which causes the victim to develop white, itchy pustules the day after being stung. Persons with severe allergic reactions may undergo anaphylaxis (Desert Museum, 2013). The exoskeleton of *S. invicta* is red-brown except the abdomen which is darker in colour (Fig. 1), and generally their sizes range from 3-7mm. Workers are female but non-egg-producing, and have large mandibles (Collins and Scheffrahn, 2013). There are four stages in the life cycle that is the egg, larva, pupa and the adult form which splits into males and the female worker and queen ants. Workers have a mandible with four teeth and the venomous sting is at the end of the abdomen, an adapted ovipositor.

DISTRIBUTION. This invasive species, native to Central America, is dispersed across the United States, China, Taiwan, Australia and the Caribbean, including Trinidad and Tobago. It was present in New Zealand but was eradicated (ISSG, 2006).

HABITAT AND ACTIVITY. Large ant nests in the form of hard, crusted, mounds (Fig. 2) can be built within hours on cropland, roadsides, rotten wood, debris even suburban backyards and at the base of citrus trees (Banks and Lofgren, 1991). The mounds are developed through the use of excavated soil or sand and shaped like a mountain, varying in height from 10-60cm which have subterranean, unnoticeable entrances that connect to small tunnels leading to numerous chambers at the centre of the mound and possibly to an area's water table (Fig. 3). Ants do not build nests in extremely hot temperatures, exceeding 36°C, but will rebuild mounds soon after light rainfall (eXtension, 2014). The worker ants will move about the mound in order to thermo-regulate young ants and eggs. If a mound becomes uninhabitable due to flooding by heavy rains these ants will migrate to a new nest location by floating and build a second mound usually with another queen. Ants will also go back and forth between colonies if they are near each other and were once one colony (Pyr0static, 2011).

FOOD AND FEEDING. *Solenopsis invicta* can be found foraging a multitude of organic matter at night and as such they are pests in many scenarios but also help to eat other pest species. They eat bark, roots, leaves, seeds, fruit, nectar, sap, fungi and other insects, being omnivores (Weeks et al., 2012) but they have a preference for high protein foods. When food is discovered the foragers will secrete a pheromone trail that tells other workers the coordinates of the food source. Through trophallaxis (food sharing by regurgitation), worker ants store food that they have eaten in their crops to feed other ants such as workers and queens.

POPULATION ECOLOGY. Within the ant colony it is easy to thrive, multiplying in numbers without the presence of a natural enemy which the species has few of. Specialized female worker ants ranging from miniscule to larger aide in the maintenance and development of the colony through foraging and feeding larvae and the queens. The persistence of the *S. invicta* as a pest is because of the species ability to create autonomous nests via multiple queens (Fig. 4), though single queen colonies also exist (Fig. 5). The success of single queen colonies depends heavily on the fitness of the queen; her size for fighting other queens and worker production would determine survival. This means that monogyne or single queens are sturdier, living longer than polygyne or multiple queens. The more queens the higher the chance that separate colonies can branch off, further propagating the species (Weeks et al., 2012) and changing the ecological communities of the area. They upset the stability of ecosystems as they aggressively protect their home range and in doing so exterminate other ant species and attack larger animals like baby birds. The attacking of larger creatures and damaging of trees via cambium chewing is done efficiently by *S. invicta* because of their strong mandibles and sheer numbers. Colonies can range in size from one queen and 100 worker ants to 500,000 ants and multiple queens, meaning that a colony can continue to expand to an extraordinary size.

REPRODUCTION. The social/caste structure of this species allows for polygyne (multiple) queens, however not all queens are functional at once or related. Males in the colonies are winged and will copulate with winged queens while flying during the mating season, after which the males die. The fertilized queens now become active, starting their own colony and assume the role of sole egg layers of up 5,000 eggs a day.

BEHAVIOUR. When a potential predator approaches the worker ants will rapidly swarm and attack upon the release of a pheromone by the first attacking ant. This cue allows for all the ants to bite on to the predator's skin then stinging in unison (BBC Worldwide, 2008). For ants numbers are power and in the case of *Solenopsis invicta* the larger the colony the more brutal the attack due to their venomous stings. Intruders are steered away or out of the nest unless killed. These ants use pheromone trails and cues to communicate with each other such as in attacking a predator, signalling the approach of a predator and in creating a trail for other ants from the colony to find food.

APPLIED ECOLOGY. The red imported fire ant is a highly successful invasive species and so has pest status in many countries, and measures are taken to limit the population size. One such is the introduction of natural predators of *Solenopsis invicta* like *Pseudacteon* species. Some species attack ants and others parasitize the ants by laying eggs on their thorax, the larvae decapitating the ant while developing (Greenberg and Kabashima, 2013). The ecologically dominant raspberry crazy ant *Nylanderia fulva* has specific mechanisms to protect them from fire ant venom, completely detoxifying it (LeBrun et al., 2014).

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Fig. 2. Mound of red imported fire ant nest.

[http://www.ipm.ucdavis.edu/TOOLS/ANTKEY/rifamnd.html, downloaded 25 May 2015]

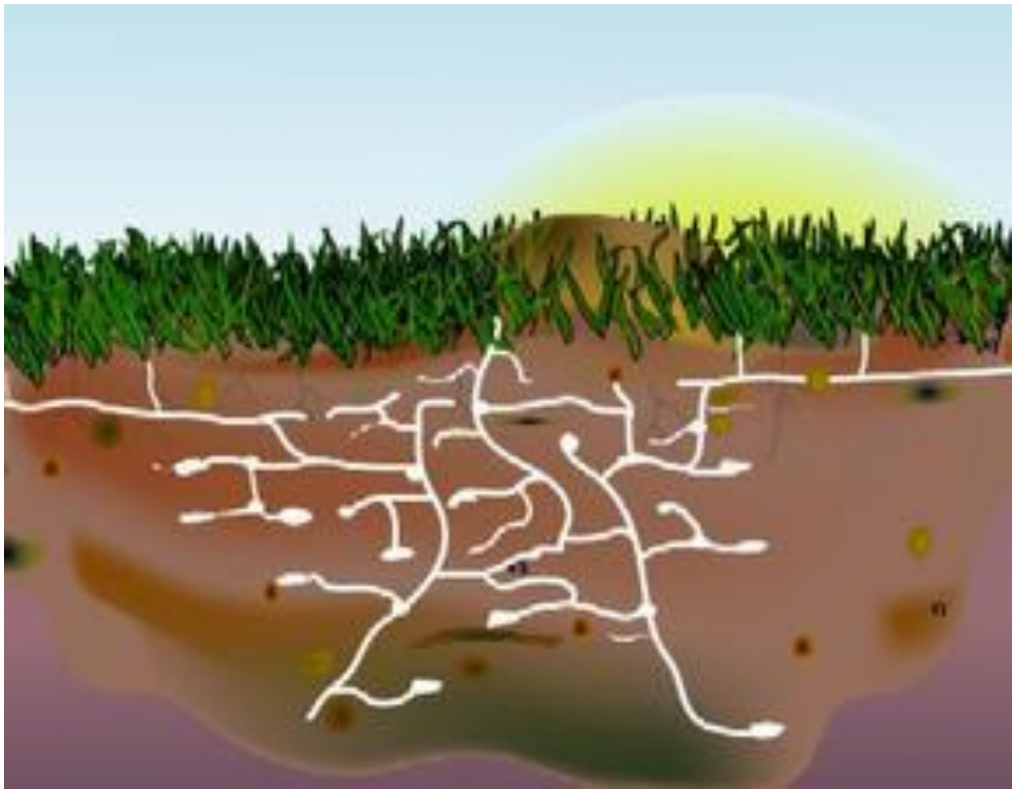

Fig. 3. Red imported fire ant mound with underground galleries.

[http://www.ipm.ucdavis.edu/TOOLS/ANTKEY/rifamnd.html, downloaded 8 April 2015]

Fig. 4. Polygyne (multiple queen) colony of the red imported fire ant, *Solenopsis invicta.*

[http://entnemdept.ufl.edu/creatures/urban/ants/red_imported_fire_ant.htm, downloaded 25 May 2015]

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Fig. 5. Typical (single queen) colony of the red imported fire ant, *Solenopsis invicta*.

[http://entnemdept.ufl.edu/creatures/urban/ants/red_imported_fire_ant.htm, downloaded 25 May 2015]