

Digital supplementary material to

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Appendix 1: Synthesis of the reactions of different ant species when faced with New World army ants. The size of the ecitonine colonies varies as follows: *Eciton burchellii* WESTWOOD, 1842: up to 650,000 workers (FRANKS 1985) and *E. hamatum* FABRICIUS, 1782: up to 250,000 workers (RETTENMEYER & al. 1983); *Neivamyrmex nigrescens* (CRESSON, 1872): 150,000 to 200,000 (SCHNEIRLA 1958); *Nomamyrmex esenbeckii* (WESTWOOD, 1842): 700,000 workers (RETTENMEYER 1963); *Labidus praedator* (F. SMITH, 1858): one million workers (HÖLLDOBLER & WILSON 1990). SF: subfamily; Dol: Dolichoderinae; Eci: Ectoninae; Ect: Ectatomminae; Form: Formicinae; Myr: Myrmicinae; Par: Paraponerinae; Ps: Pseudomyrmecinae; Pon: Ponerinae.

Raided ant species	SF	Army ant	Details of the reactions	References
Avoided by army ants				
<i>Acromyrmex coronatus</i> FABRICIUS, 1804	Myr	<i>Eciton burchellii</i> (WESTWOOD, 1842)	Encountered <i>Acromyrmex</i> forager immobilized, crouched, was antennated, then it moved; <i>Eciton</i> seemed repulsed.	SAN JUAN (2002)
<i>Atta cephalotes</i> (LINNAEUS, 1758), <i>Atta</i> spp.	Myr	<i>Eciton burchellii</i>	No aggressiveness during the encounters. Once the raid traversed the <i>Atta</i> nest.	RETTENMEYER (1963), this study
<i>Odontomachus</i> spp.	Pon	<i>Eciton hamatum</i> (FABRICIUS, 1782)	Avoided; seldom retrieved workers.	RETTENMEYER & al. (1983)
<i>Crematogaster</i> spp.	Myr	<i>Eciton</i> spp.	Avoided by <i>Eciton</i> as well as <i>Neivamyrmex pilosus</i> .	RETTENMEYER & al. (1983)
<i>Myrmecocystus mimicus</i> WHEELER, 1908, <i>Forelius pruinosus</i> (ROGER, 1863)	Myr Dol	<i>Neivamyrmex nigrescens</i> (CRESSON, 1872)	Avoided; even <i>F. pruinosus</i> climbed over the raiders, which remained motionless.	MIRENDA & al. (1980)
<i>Solenopsis xyloni</i> MCCOOK, 1879	Myr	<i>Neivamyrmex nigrescens</i>	Avoided but was raided by <i>Neivamyrmex harrisi</i> (specialization)	MIRENDA & al. (1980)
Plant-ants that had a repulsive effect on army ants				
<i>Allomerus octoarticulatus</i> MAYR, 1878 <i>Pheidole minutula</i> MAYR, 1878	Myr	<i>Eciton burchellii</i> , <i>Eciton rapax</i> F. SMITH, 1855	On myrmecophytes: <i>Tococa guianensis</i> and <i>Maieta poeppigii</i> (both Melastomataceae). In both cases <i>Eciton</i> repelled (shown experimentally as they made a detour when cut stems were placed across active trails).	HERRE & al. (1986)
<i>Pseudomyrmex ferruginea</i> (F. SMITH, 1877)	Ps	<i>Eciton burchellii</i>	On myrmecophyte: <i>Acacia collinsii</i> ; repellent substance around the base of the tree, <i>Pseudomyrmex ferruginea</i> workers attacked the <i>Eciton</i> workers that tried to avoid them (repellent).	DEJEAN & al. (2001)
<i>Azteca alfari</i> EMERY, 1893	Dol	<i>Eciton vagans</i> (OLIVIER, 1792)	Avoided host <i>Cecropia</i> tree (Myrmecophyte).	BEQUAERT & WHEELER (1922)
<i>Azteca alfari</i> , <i>A. ovaticeps</i> FOREL, 1904	Dol	<i>Eciton burchellii</i>	The raids passed around the base of the host <i>Cecropia</i> (myrmecophyte) without any <i>Eciton</i> climbing up the trunk, while they invaded the surrounding shrubs.	This study
Sacrificed a part of the brood				
<i>Azteca andreae</i> GUERRERO, DELABIE & DEJEAN, 2010	Dol	<i>Eciton burchellii</i>	Arboreal, mostly associated with the myrmecophyte <i>Cecropia obtusa</i> . When an <i>Eciton</i> raid approached the base of their host-tree trunk, <i>Azteca andreae</i> workers dropped a part of their brood on the ground. While numerous <i>Eciton</i> workers gathered this brood, the front of the column advanced, so that the <i>Azteca andreae</i> nests were not plundered.	This study

Nest entrance hidden or elevated				
<i>Stenamamma</i> WESTWOOD, 1839	Myr	<i>Eciton burchellii</i>	Elevated nest entrance (minimizes detection by army ants); the entrance closed with a single round pebble; built adjacent unoccupied chambers to be used during nest evacuation.	LONGINO (2005)
<i>Pheidole xerophila</i> WHEELER, 1908, <i>P. rugulosa</i> GREGG, 1959, <i>P. sciophila</i> WHEELER, 1908, and <i>P. stanches</i> WHEELER, 1908	Myr	<i>Neivamyrmex nigrescens</i>	Nest openings usually not discernible. If detected, army ants entered the narrow opening singly and later emerged backward, pulling a <i>Pheidole</i> soldier who typically had a vice-grip on the army ant's foreleg or antenna. This process continued until the passageway was cleared. Shortly after the "breakthrough", the army ants emerged from the hole carrying <i>Pheidole</i> brood.	MIRENDA & al. (1980)
Some workers guarded the nest entrance and were avoided by army ants				
<i>Ectatomma brunneum</i> F. SMITH, 1858, <i>Ectatomma ruidum</i> (ROGER, 1861)	Ect	<i>Eciton burchellii</i>	Nest entrance flush with the ground. Guards at the nest entrances. No nest invaded.	This study
<i>Ectatomma tuberculatum</i> (OLIVIER, 1792)	Ect	<i>Eciton burchellii</i>	At the approach of the raid, apparently alerted, numerous workers grouped together in the chimney forming the nest entrance. No attempt at invading these nests.	This study
<i>Pseudomyrmex gracilis</i> FABRICIUS, 1804	Ps	<i>Eciton burchellii</i>	Arboreal nests. A worker always guarded the nest entrance. No attempt at invasion noted. The foraging <i>Pseudomyrmex</i> workers avoided the <i>Eciton</i> easily. Meanwhile the <i>Eciton</i> attacked <i>Camponotus</i> spp.	This study
<i>Pachycondyla villosa</i> (FABRICIUS, 1804)	Pon	<i>Eciton burchellii</i>	Arboreal nests. One or several worker guards according to the size of the nest entrance. No attempt at invasion noted.	This study
Nest evacuation with workers transporting brood				
<i>Solenopsis geminata</i> (FABRICIUS, 1804)	Myr	<i>Eciton burchellii</i> , <i>Eciton hamatum</i>	Nest evacuation by workers transporting brood. The queens were never observed. Workers grouped together in the surrounding vegetation or on a wall of a house.	This study
<i>Pheidole</i> sp. (<i>flavans</i> group)	Myr	<i>Eciton burchellii</i> , <i>Eciton hamatum</i>	Nest evacuation by workers transporting brood. The queens were never observed. Workers grouped together in the surrounding foliage. A large part of the brood was plundered.	This study
<i>Camponotus atriceps</i> (FABRICIUS, 1804), <i>Camponotus planatus</i> (ROGER, 1863)	Form	<i>Eciton burchellii</i> , <i>Eciton hamatum</i>	Nest evacuation far before the raid (more than 2 m away); most workers transporting brood climbed on the surrounding vegetation. Gynes and males also evacuated the nests.	This study
<i>Pachycondyla harpax</i> (FABRICIUS, 1804)	Pon	<i>Eciton burchellii</i>	Nest evacuation with brood in a column. <i>Pachycondyla harpax</i> colonies lost much of their brood.	This study
<i>Leptogenys mexicana</i> MAYR, 1870	Pon	<i>Eciton burchellii</i>	Some defence at the nest entrance; organized nest evacuation with workers transporting almost all brood from another opening. The colonies migrated over ca. 100 m taking refuge in rotting logs. Only a few larvae plundered.	This study
<i>Paratrechina longicornis</i> (LA-TREILLE, 1802); (tramp species originating from Africa)	Form	<i>Eciton burchellii</i> , <i>Eciton hamatum</i>	Alarm followed by an organized nest evacuation: the queens at the centre, workers transporting brood around them, then workers. The <i>E. burchellii</i> did not try to attack them. Yet once the alarm was not triggered and the nest was not evacuated. The <i>E. hamatum</i> workers tried to attack the <i>Paratrechina longicornis</i> workers from the periphery, but the latter were too fast and zigzagged to avoid them.	This study
<i>Aphaenogaster araneoides</i> EMERY, 1890	Myr	<i>Eciton burchellii</i> , <i>Labidus</i> , <i>Neivamyrmex</i>	Nest evacuation and removal of brood, climbed nearby vegetation, hid within the litter and often aggregated in the closest refuge above the litter layer.	MCGLYNN & al. (2004)
<i>Gigantiops destructor</i> FABRICIUS, 1804, <i>Camponotus</i> spp., <i>Dolichoderus</i> , <i>Pheidole</i> , <i>Strumigenys</i> , <i>Anochetus</i> , <i>Pachycondyla</i>	Form Dol Myr Pon	<i>Eciton hamatum</i> , <i>Eciton lucanoides</i> EMERY, 1894	Nest evacuation and removal of brood by colonies; after the raid, the escapees returned to their nest with the brood and resumed colony activity (to a lesser degree for the last three species).	RETTENMEYER & al. (1983)
<i>Dolichoderus rugosus</i> F. SMITH, 1858	Dol	<i>Eciton hamatum</i>	Nest evacuation and removal of brood. Odour of a crushed <i>E. hamatum</i> triggered nest evacuation.	RETTENMEYER & al. (1983)

<i>Aphaenogaster araneoides</i>	Myr	<i>Eciton</i> , <i>Labidus</i> , <i>Neivamyrmex</i>	Several colonies raided, workers abandoned the nest with brood and hid inside the litter and often aggregated in the closest refuge above the litter layer.	MCGLYNN & al. (2004)
<i>Pheidole desertorum</i> WHEELER, 1906, <i>Pheidole hyatti</i> EMERY, 1895	Myr	<i>Neivamyrmex nigrescens</i>	<i>Pheidole desertorum</i> and <i>Pheidole hyatti</i> anticipated the raids through signals from foragers. Workers massed around their nest holes, each holding a piece of brood. When the army ants approached to within a few cm of the nest, the mass dispersed sometimes in all directions, sometimes uniformly away from the raiders or escaped sufficiently early to avoid the raid entirely. Workers also climbed on nearby vegetation; <i>Neivamyrmex nigrescens</i> rarely followed. After the raiding subsided, <i>Pheidole</i> returned to their nest. Queens never fled the nest.	MIRENDA & al. (1980)
<i>Pheidole desertorum</i> ; <i>Pheidole hyatti</i>	Myr	<i>Neivamyrmex nigrescens</i>	Nest evacuation and removal of brood; full colony (queen). Colonies have multiple nests, only one is used at a time. When <i>Neivamyrmex</i> was detected, the colonies entered an alert phase in which workers carried brood outside the nest. If not discovered, they returned to the nest. If the raid came close, <i>Pheidole desertorum</i> workers scattered in all directions while <i>Pheidole hyatti</i> followed a recent recruitment trail. In both cases, the colony rendezvoused in a surplus nest.	DROUAL & TOPOFF (1981); DROUAL (1983, 1984)
<i>Aphaenogaster cockerelli</i> ANDRÉ, 1893	Myr	<i>Neivamyrmex nigrescens</i>	Nest evacuation and removal of brood; full colony (including the queen)	SMITH & HAIGHT (2008)
<i>Aphaenogaster albisetosus</i> (MAYR, 1893)	Myr	<i>Neivamyrmex nigrescens</i>	Nest evacuation and removal of brood; full colony (queen); aggressive defence possible.	MCDONALD & TOPOFF (1986)
<i>Trachymyrmex arizonensis</i> (WHEELER, 1907)	Myr	<i>Neivamyrmex rugulosus</i> BORGMEIER, 1953	Nest evacuation and removal of brood by workers; loss of 75% of the brood and parts of the fungus.	SCHNEIRLA (1958, 1971), MIRENDA & al. (1980), LAPOLLA & al. (2002)
<i>Camponotus festinatus</i> BUCKLEY, 1866	Form	<i>Neivamyrmex rugulosus</i>	Nest evacuation and removal of brood; full colony (including the queen); climbed up nearby vegetation.	LAMON & TOPOFF (1981)
<i>Wasmannia auropunctata</i> (ROGER, 1863)	Myr	<i>Neivamyrmex compressinodis</i> BORGMEIER, 1953	Nest evacuation and removal of brood; gynes attacked but not the queens.	LE BRETON & al. (2007)
<i>Camponotus</i> , <i>Odontomachus</i>	For Pon	<i>Nomamyrmex esenbeckii</i> (WESTWOOD, 1842)	Nest evacuation and removal of brood.	SOUZA & MOURA (2008)
<i>Dorymyrmex</i> sp. <i>Solenopsis geminata</i> , <i>Pheidole</i> sp., <i>Pheidole radoszkowskii</i> (MAYR, 1884)	Dol Myr	<i>Labidus coecus</i> (LATREILLE, 1802)	Brood was carried above ground and transported elsewhere: to other nest holes in the case of <i>Dorymyrmex</i> sp. and to nearby leaf litter by <i>Pheidole</i> sp. and <i>Solenopsis geminata</i> . No <i>Pheidole radoszkowskii</i> was observed using the above ground response to a <i>Labidus</i> attack.	PERFECTO (1992)
<i>Blepharidatta conops</i> KEMPF, 1967	Myr	<i>Labidus coecus</i>	Nest evacuation by workers carrying a portion of the brood. After 1 h the colony returned to the nest. The raiders took larvae, pupae and males.	DINIZ (1998)
Reacted by fighting, blocking access to army ants				
<i>Paraponera clavata</i> FABRICIUS, 1775	Par	<i>Eciton burchellii</i> , <i>Eciton dulcius</i> FOREL, 1912	Fought for hours.	RETTENMEYER & al. (1983)
<i>Camponotus ocreatus</i> EMERY, 1893, <i>Camponotus vicinus</i> MAYR, 1870	Form	<i>Neivamyrmex nigrescens</i>	Defended their nests by recruiting major workers.	LAMON & TOPOFF (1981)
<i>Pheidole obtusospinosa</i> PERGANDE, 1896	Myr	<i>Neivamyrmex texanus</i> WATKINS, 1972	Super majors switched between passively blocking the nest entrance with their head and aggressive combat outside the nest.	HUANG (2010)

<i>Cephalotes atratus</i> (LINNAEUS, 1758)	Myr	<i>Nomamyrmex crassicornis</i> F. SMITH, 1855	The majority of the <i>Cephalotes atratus</i> were inside the nest, some of them closed the entrance by placing their heads side-by-side, whereas a few others on the outside were struggling with the invaders. Resisted the attack.	SANTSCHI (1929)
Reacted by fighting, blocking the army ants inside their nests for a long time, partly plundered				
<i>Pheidole megacephala</i> FABRICIUS, 1793 (invasive tramp species originating from Africa)	Myr	<i>Eciton burchellii</i> , <i>Eciton hamatum</i>	The <i>Eciton</i> were able to enter the <i>Pheidole</i> nests and to plunder brood in all cases. Yet, the <i>Pheidole</i> workers, extremely numerous, reacted by spread-eagling many <i>Eciton</i> individuals. Among the latter, all those that returned to their bivouac were attacked and killed by their nestmates (they never defended themselves) whether or not they were retrieving <i>Pheidole</i> brood. Consequently, the front of the column turned away from the <i>Pheidole</i> nest. Only a part of the <i>Pheidole</i> brood was lost.	This study
Reaction of <i>Atta</i> spp.				
<i>Atta colombica</i> (GUÉRIN-MÉNEVILLE, 1844); <i>Atta cephalotes</i>	Myr	<i>Nomamyrmex esenbeckii</i>	Deployed separate teams of large major workers (primary combatants) and smaller workers (assistant combatants) to counter-attack army ants outside their nest. Leafcutter majors could form a line to block an intruding <i>Nomamyrmex</i> raiding party. Soil and organic debris used to plug nest entrances.	POWELL & CLARK (2004)
<i>Atta cephalotes</i>	Myr	<i>Nomamyrmex esenbeckii</i>	Plugged nest entrance with dry leaf fragments or majors formed a barricade by holding leaf fragments side-by-side. Ring-shaped barrier of leaf debris around the nest entrances (nest was destroyed).	SWARTZ (1998)
<i>Atta cephalotes</i>	Myr	<i>Nomamyrmex esenbeckii</i>	Fought, but were losing the battle.	LONGINO (2012)
<i>Atta laevigata</i> F. SMITH, 1860, <i>Atta mexicana</i> (F. SMITH, 1858), <i>Acromyrmex rugosus</i> F. SMITH, 1858	Myr	<i>Nomamyrmex esenbeckii</i>	Fought.	BORGMEIER (1955)
<i>Atta mexicana</i>	Myr	<i>Nomamyrmex esenbeckii</i>	Attacked from underground; captured larvae, pupae and callow workers	RETTENMEYER & al. (1983)
<i>Atta mexicana</i> , <i>Atta</i> sp.	Myr	<i>Nomamyrmex esenbeckii</i>	<i>Atta mexicana</i> : no counter aggression; <i>Atta</i> sp.: little or no reaction.	SANCHEZ-PENA & MUELLER (2002), SOUZA & MOURA (2008)
Attacked the army ants				
<i>Azteca chartifex</i> (FOREL, 1896)	Dol	<i>Eciton burchellii</i>	Workers attacked army ants at the base of their trees, causing their columns to deviate.	CHADAB-CREPET & RETTENMEYER (1982)
<i>Azteca</i> sp.	Dol	<i>Eciton hamatum</i>	<i>Eciton</i> workers attacked and spread-eagled by <i>Azteca</i> .	WILD (2011)
<i>Azteca instabilis</i> (F. SMITH, 1862)	Dol	<i>Eciton hamatum</i>	Attacked and caused <i>Eciton</i> to fly away. Forel wrote: " <i>Azteca instabilis</i> vit dans les arbres. Elle est extrêmement guerrière. C'est elle que j'ai vu mettre une armée d' <i>Eciton hamatum</i> en déroute".	FOREL (1896, in ANTWEB 2012)
<i>Dolichoderus bispinosus</i> (OLIVIER 1792)	Dol	<i>Eciton burchellii</i>	Nest entrance plugged by workers; several individuals alarmed by nestmates left their nests and approached the <i>Eciton</i> raids. <i>Eciton</i> always avoided them.	This study
<i>Dorymyrmex pyramicus</i> ROGER, 1863	Dol	<i>Eciton burchellii</i>	A single <i>Dorymyrmex</i> worker could attack an <i>Eciton</i> raid or column. It emitted an alarm pheromone to attract other foragers plus nestmates from the nest. Almost all these workers approached the <i>Eciton</i> that then panicked. Their column re-formed later, avoiding the area situated around the <i>Dorymyrmex</i> nest.	This study
<i>Aphaenogaster cockerelli</i>	Myr	<i>Neivamyrmex nigrescens</i>	Workers are larger than <i>Neivamyrmex</i> . When raids approached these nests, the <i>Aphaenogaster</i> workers approached the column and engaged the army ants. It took five to ten raiders to subdue one of these ants and two to	MIRENDA & al. (1980)

			four raiders to carry it back to the bivouac. Many <i>Aphaenogaster</i> workers were killed, but the tide of the raid was always stemmed. However, likely due to a decrease in the number of <i>Pheidole</i> , two colonies of <i>N. nigrescens</i> consistently raided <i>Aphaenogaster</i> for two weeks.	
<i>Pogonomyrmex barbatus</i> F.SMITH, 1858	Myr	<i>Neivamyrmex nigrescens</i>	<i>Pogonomyrmex barbatus</i> workers are larger than <i>Neivamyrmex</i> . They often walked through <i>Neivamyrmex</i> raid columns. The army ants attacked the intruders, but were generally unable to subdue them, even when ten or more workers contributed to the effort. Small groups of <i>Pogonomyrmex barbatus</i> workers could break up an army ant emigration and a raid column that "trespassed" on their mound. They simply walked into the column and scattered army ants in all directions. The emigration resumed later over a new route that gave the mound a wide berth. Not one <i>Pogonomyrmex barbatus</i> worker was killed in this encounter.	MIRENDA & al. (1980)
<i>Pogonomyrmex californicus</i> COLE, 1968	Myr	<i>Neivamyrmex nigrescens</i>	<i>Pogonomyrmex californicus</i> fared less well; some small colonies of this species were raided.	MIRENDA & al. (1980)
Preyed on the army ants				
<i>Wasmannia auropunctata</i>	Myr	<i>Eciton burchellii</i>	<i>Wasmannia auropunctata</i> workers even attacked <i>E. burchellii</i> in the bivouac.	DAVIDSON (2005)
Raided versus avoided				
<i>Acromyrmex octospinosus</i> REICH, 1793	Myr	<i>Eciton hamatum</i>	"Preferred prey", while <i>Acromyrmex coronatus</i> was avoided by <i>E. burchellii</i> (San Juan [2002]).	POWELL (2011)
<i>Atta</i> spp.	Myr	<i>Eciton quadriglume</i> (HALIDAY, 1836)	Raided while other <i>Eciton</i> species avoided them (see also this study).	RETTENMEYER (1963)
<i>Pseudomyrmex</i> sp.		<i>Neivamyrmex pseudops</i> FOREL, 1909, <i>Neivamyrmex diana</i> FOREL, 1912	Raided, while <i>Eciton burchellii</i> avoided <i>Pseudomyrmex ferruginea</i> and <i>Pseudomyrmex gracilis</i> (DEJEAN & al. 2001; this study).	RETTENMEYER & al. (1983)
Encounters between army ants				
Ecitoninae	Eci	Ecitoninae	Never fought each other.	RETTENMEYER & al. (1983)
<i>Eciton burchellii</i>	Eci	<i>Eciton burchellii</i>	Avoided each other.	FRANKS & BOSSERT (1983), FRANKS & FLETCHER (1983); WILLSON & al. (2011), this study
<i>Eciton burchellii</i>	Eci	<i>Eciton hamatum</i>	Avoided each other, but some aggressive reactions were observed.	This study

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