Prey Specificity and Raid Ecology of Army Ants at Manu Biological Station, Peru



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Table of Contents

Abstract **3**
I. Introduction **3**
What are army ants 3
Ecological significance 3
II. Methods **4**
Data documentation 4
II.a. Location 4
II.b. Determination of Movement Style: Raid or Emigration 6
II.c. Organization of Data Collected 8
III. Findings **9**
III.a. Prey Specificity 9
III.b. Movement Patterns 9
III.c. Raid behavior 10
IV. Conclusion **10**
Works Cited **11**

Abstract

Army ants are one of the most impactful and important arthropod predators, and as such they drive rainforest food web dynamics and influence the larger ecology found within tropical rainforests. Prey specificity, raid behavior, and habitat use are three crucial elements to understand these impactful predators, and much is unknown about their inner mechanisms. By studying these elements a greater understanding can be gained of how tropical biodiversity operates as a whole, and of predator-prey interactions within tropical rainforests.

This project investigates prey specificity, raid behavior, and habitat use among army ant species in the vicinity of Manu Biological Station in southeastern Peru. The study focuses primarily on *Eciton burchellii* and *Eciton hamatum*, two conspicuous Neotropical army ants commonly associated with large-scale coordinated foraging raids within tropical rainforest ecosystems. This paper will include the results of an eleven-day observation-based project that documents the *prey transport, raid behavior, and movement patterns* observed along the trails and forested habitats encompassing the Manu Biological Station in Manu, Peru. Over the course of these eleven days, four raids were observed, two of *Eciton burchellii* and two of *Eciton hamatum*, and in total twelve movements/bivouacs were observed, seven of *Eciton burchellii* and five of *Eciton hamatum.* Among the four raids, with the exception of one termite nest raid, all prey that was observed and captured for further observation was of other ant species.

These results from our small-scale observation will then be compared with the results of two other larger, peer reviewed, published academic papers on the subject, in the attempt to apply our findings to broader research on neotropical army ants.

I. Introduction

What are army ants

Army ant, also referred to as “legionary ant,” is a name that encompasses over two-hundred species within the “true ant” family, Formicidae. Carnivorous and nomadic, these army ant species are characterized by their aggressive and coordinated hunts, known as “raids,” that more often than not leave nothing behind. These “raids” include the prey larvae, prey nest material, as well as the prey itself. While there are over two-hundred army ant species, there is a distinction between “Old World” and “New World” army ant species– with five distinct genera that make up the “New World” group, located in the neotropics of Central and South America. Those five genera are: Cheliomyrmex, Eciton, Labidus, Neivamyrmex, and Nomamyrmex. (Hoenle et al., 2024) In this study, we focus on two New World army ant species within the genus Eciton: *Eciton burchellii* and *Eciton hamatum.*

Ecological significance

Army ants within our target genus, *Eciton,* are ”keystone species in neotropical forests due to their major role as top predators and due to the numerous vertebrate- and invertebrate associated species that depend upon their colonies for survival.” (Pérez-Espona, 2021) With some of these affected species being birds, other insects, and reptiles, who have “...have evolved intricate morphological, behavioural and/or chemical strategies to conceal their presence and integrate into the colony life.” (Pérez-Espona, 2021). One evolution is exemplified by a sect of bird species, called “ant followers,’ that are characterised by following army ant marches to prey on fleeing invertebrates and vertebrates that are fleeing their march. While there are many species that fall in this category, there are eighteen known species within the family Thamnophilidae. This family of obligate antbirds are found exclusively in Central and South America, and are so closely reliant on army ant swarms that it has been reported that in isolated, patchy

forest areas, where army ants disappear due to the fragmentation, these antbirds soon follow suit. (Folhadella, 2018)

The impact and vital connections that this genera has on a wide array of species in the neotropics has earned them the status of being considered a keystone species, meaning that their influence is irreplaceable at a trophic level. Simply put: if the species were removed due to circumstances such as extirpation or effective extinction, the entire ecosystem of the area would be at major risk for collapse at a trophic level. The environmental and biological ramifications of their absence is highlighted with the concern of rapid forest fragmentation in the neotropical regions– when forested regions become sparse and disjointed, army ants tend to disappear from the area due to heat stress. This then impacts species associated with this keystone species. This correlation with forest fragmentation has researchers urging for the army ants genera (Cheliomyrmex, Eciton, Labidus, Neivamyrmex, and Nomamyrmex) to be utilized as an umbrella species for conservation efforts. (Pérez-Espona, 2021)

II. Methods

In the duration of the eleven days where effective data was collected, our team, composed of three individuals, would explore trails around the Manu Biolodge Research Station in Manu, Peru. As we would hike the jungle surrounding the station, our team was equipped with a GPS, camera, collection tubes, and field journals to document our observational data.

Data documentation

II.a. Location

Roughly, our hikes were conducted in a trifold method, conducting one search in the morning, one in the afternoon, and one in the evening. These search-hikes were performed consecutively over the course of eleven days. For consistency purposes, we targeted Trails two and four, however our observations were not restricted only to these trails; these trails were simply our regular hikes. These trails consisted of uninterrupted forest corridors, and were reported to be army ant hot-spots by our colleagues and peers. As documented in *Fig. 1.,* some data was collected outside of these trails: the point was to document every sighting we could, with no restriction on location as long as it was within the confines of the station.



Fig. 1. Map of GPS Coordinate Locations; with context of trails and paths within the Manu Biological Station, Peru.

All sightings of our target species, *Eciton burchellii* and *Eciton hamatum,* were recorded on our GPS. On site, we would collaborate to determine if the movement was immigration or an active raid, as well as which species we were observing.



Fig. 2. E. burchelli; credit: Jonathan Benway



Fig. 3. E. burchellii; credit: Jonathan Benway

To determine between each species, we looked at the color of their bodies and the gaster of the ants. *Eciton burchellii* (*fig. 2.)* has a distinct orange gaster, whereas *Eciton hamatum* (*fig. 3.)* is mostly orange all over.

II.b. Determination of Movement Style: Raid or Emigration



Fig. 4. E. hamatum bivouac; photo credit: Jonathan Benway

To identify whether the movement we witnessed was a raid or simply emigration, we searched for two points: what they were carrying, and how they were moving.

We determined whether the movement was a raid or just emigration by evaluating the items/prey they were carrying, as well as behavior (fanning movement, active soldier-ant behavior, fast gait, etc). If prey or prey nest material was observed, we classified the movement as a raid– this proved difficult to determine with certainty due to their nomadic nature, meaning many times they were transporting their own larvae (which looks comparable to prey larvae.) To determine between the two, we searched for two indicators in the totality of the army ant march, them being:

1. Nest material carried by other ants, and/or;
2. Broken or damaged larvae.

If either of these indicators were observed, we would conclude the movement to be a raid. Otherwise, the sighting was documented as a movement.



Fig. 5. E. hamatum with prey (yellow circle); photo taken by self, during raid C (refer to fig.6.)

From there, we would collaborate to determine whether the movement fell into one of the six categories of movement styles:

1. Raid; Swarm Raid
2. Raid; Column raid
3. Raid; Raid front at prey source
4. Raid; Returning raid column
5. Movement; Bivouac-associated activity (*fig. 4.*)
6. Movement; Emigration

By doing this, we could interpret the styles of movement and further add to the understanding of how these ants collect prey of different types.

II.c. Organization of Data Collected

Our findings were then entered into our master spreadsheet (*fig. 6.)*, with additional empirical observations such as behavioral data, prey/objects in their grasp, movement styles, etc. This was to add further context for our interpretations.

Date	Time	GPS: Lat., Long., Elevation	Trail	Species	Raid/Movement Type	Carrying?	Additional behavior/misc notes
6/18/2026	9:22	-12.895393, -71.408139,565	Trail 2	burchelli (orange gaster)	Swarm Raid	N/A	Taking over the entire trail, Soldiers were observing
6/19/2026	12:12	-12.893038, -71.405187,564	Trail 4	burchelli (orange gaster)	Column Raid	N/A	Swarming the whole trail, lots of other insect buzzing sounds
6/24/2026	14:08	-12.894167, -71.403056,509	Near trail 1, by the pond at the bird blind just before the tourist cabins	hamatum (orange)	Raid Front at Prey Source	Ant	Few hamatum were surrounding it, and other ants were climbing the wooden structure and seemingly hunting. Start of the raid on a termite nest. They started attacking the side nest pieces first.
6/25/2026	14:03	-12.894064, -71.403298,540	Heading to Trail 6, Cafeteria/Cabin area	hamatum (orange)	Swarm Raid	Large Ant/Misc.	Many were surrounding the ant, piling on it, and others were forming a trail away and coming towards it.
MOVEMENT:							
6/17/2026		-12.893513, -71.405513,560		burchelli (orange gaster)	Emigration		
6/17/2026		-12.892947, -71.406032,629		burchelli (orange gaster)	Emigration		
6/18/2026		-12.893664, -71.405005, 549		burchelli (orange gaster)	Emigration		
6/19/2026		-12.893896, -71.404832,541		burchelli (orange gaster)	Emigration		
6/19/2026		-12.893239, -71.405063,556		burchelli (orange gaster)	Emigration		
6/19/2026		-12.893168, -71.405151,549		hamatum (orange)	Emigration		
6/19/2026		-12.893158, -71.405890,540		hamatum (orange)	Emigration		
6/21/2026		-12.894219, -71.404860,546		burchelli (orange gaster)	Emigration		
6/21/2026		-12.895858, -71.406702,554		hamatum (orange)	Emigration		
6/21/2026		-12.895859, -71.406978,553		burchelli (orange gaster)	Emigration		
6/22/2026	12:34	-12.894833, -71.403393,537	Between dorms and the cafeteria	hamatum (orange)	Emigration	larvae	Not aggressively swarming; every time there was an ant with a larva, there was a cluster, and a soldier nearby From the tree between the dorms and cafe, tracked all the way till orchid trail Specimen collected at the bivouac.
6/24/2026	11:02	-12.895005, -71.403740,573		hamatum (orange)	Emigration		

Fig. 6. Master Spreadsheet of Observations

Raid	Date	Species	Raid/Movement Type	Carrying?	Temp	Sun exposure	Weather type	Additional environmental
A	6/18/2026	*E. burchellii*	Swarm Raid	N/A	21°C	Partly Shaded	Sunny	None
B	6/19/2026	*E. burchellii*	Column Raid	N/A	30°C	Partly Sun	Sunny	None
C	6/24/2026	*E. hamatum*	Raid Front at Prey Source	Ant	16°C	Shaded	Cloudy	Cold front
D	6/25/2026	*E. hamatum*	Swarm Raid	Large Ant/Misc.	22°C	Partly Shady	Partly Sunny	Occured after the previous cold front, Post rain

Fig. 7. Weather and Environmental Observations per each raid documented (listed in same order as fig. 6. for ease of comparison)

For further context of raid dynamics, weather and environmental conditions were documented for each of the four raids. Weather during emigrations were not documented, as this was not our main focus of study. As our data shows, there was a significant cold front between 06/19/2026 and 06/24/2026, with a difference of 14ºC. This corresponds with the winter solstice that occurred on 06/21/2026.

III. Findings

Over the course of these 11 days, four raids were observed, two of *Eciton burchellii* and two of *Eciton hamatum*, and in total twelve movements/bivouacs were observed, seven of *Eciton burchellii* and five of *Eciton hamatum.* Among the four raids, with the exception of one termite nest raid, all prey that was observed and captured for further observation was of other ant species.

III.a. Prey Specificity

From our data, we found that army ants primarily preyed on other species of ants. Unfortunately, we were unable to identify the genus or family of prey ants, however as shown in *fig. 5.,* direct observation of other ant species being prey to our target species was documented.

However, our observations do in fact correlate with findings from a large study on army ant prey in the neotropics, conducted in Ecuador and compared to data from Costa Rica. This study consisted of the researchers collecting "*...2156 prey items from 180 army ant raids/emigrations* [and identifying] 1945 prey items to the family level, 1313 to the genus level, and 664 to the species level….". After analyzing these prey items, they found that "prey consisted primarily of other ants (1843 prey items; 153 ant

species)" and that "...most army ant species chiefly plundered the nests of other ants…" (Hoenle et al., 2024).

III.b. Movement Patterns

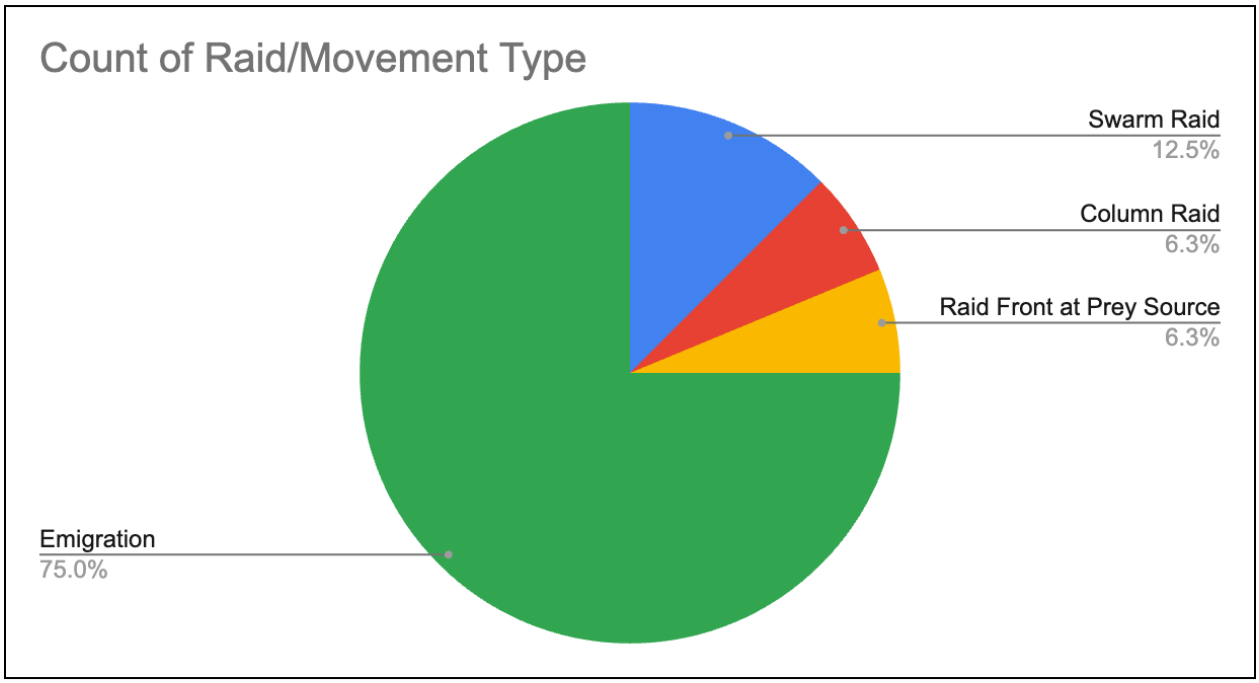


Fig. 8. Visual representation of movement styles percentages– four raids (two swarm raids, one column raid, and one raid at prey source) out of nine-teen total movements documented.

As this graph shows, the majority of movements recorded from our investigation was emigration, with worker ants carrying their own larvae and calmly walking from point A to point B.

III.c. Raid behavior

The difference between raid behavior and movement behavior was noticeable. During an active raid, the Eciton ants were much more aggressive, fast paced, and would swarm any and everything in their path (including us.) Whereas when in emigration, the ants moved at a slower pace, and in mostly a

straight line/column, with some worker ants carrying full sized larvae. Here is where we also witnessed them bivouac, a form of movement necessary for these nomadic species (*Fig. 4.*)

IV. Conclusion

This project investigates prey specificity, raid behavior, and habitat use among army ant species in the vicinity of Manu Biological Station in southeastern Peru. Our study focused on two conspicuous Neotropical army ants commonly associated with large-scale coordinated foraging raids within tropical rainforest ecosystems: *Eciton burchellii* and *Eciton hamatum*.

Our study, over the course of these eleven days, resulted in four documentable raids, two of *Eciton burchellii* and two of *Eciton hamatum*, and in total twelve movements/bivouacs were observed, seven of *Eciton burchellii* and five of *Eciton hamatum.* Among the four raids, with the exception of one termite nest raid, all prey that was observed and captured for further observation was of other ant species– this fact being in congruence with a major study conducted over a large geographical area and on a much larger scale (Hoenle et al., 2024). We found that prey specificity for *Eciton burchellii* and *Eciton hamatum* was high, preying on primarily other ant species; there is low variability. Swarm raids were the majority of the raid movement patterns observed, at a 12.5% (*fig. 8.*). Lastly, raid behavior was starkly different from emigration movement; raid behavior was much more aggressive and fast paced, whereas emigration was slower and in mostly a straight line/column, with some worker ants carrying full sized larvae.

Our data contributes to the knowledge pool of *what* these neotropical army ant species target as their prey, as well as their movement patterns. This data, while small, can help add another perspective for future interpretations of the behavior and dietary habits of these under-understood ants. Given their vital

importance to the health and ecology of the rainforest as a whole, any amount of data that can be applied to a greater understanding is of value. For conservation efforts, soil and insect population health, and for the hidden ecology of the elusive rainforest understory of Central and South America.

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