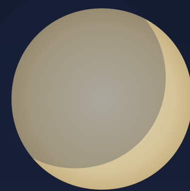
ANTADDICT FIELD LIBRARY



# The Nuptial Flight

*How ant colonies are born – and how to predict the flight, catch a queen, and found a colony of your own*

SABRI HAYOUNI

ANTADDICT.COM

# *The Nuptial Flight*

# *The Nuptial Flight*

*How Ant Colonies Are Born – and the Keeper's Guide to Predicting the Flight, Catching a Queen, and Founding a Colony*

SABRI HAYOUNI

ANTADDICT FIELD LIBRARY · ANTADDICT.COM

*The Nuptial Flight: How Ant Colonies Are Born – and the Keeper's Guide to Predicting the Flight, Catching a Queen, and Founding a Colony.*

First edition. Published by Antaddict (antaddict.com). Written and produced by Sabri Hayouni.



This book is an educational field and reference guide. It reflects peer-reviewed research current to its date of writing together with the author's hands-on keeping experience. Nature is variable; local timing, species behavior, and outcomes differ. Collect responsibly and legally: know and follow the

wildlife, collection, and invasive-species regulations in your jurisdiction, and never release non-native ants. Where sources are cited, claims are drawn from the works listed in the References. Any errors are the author's own.

Cover and interior design by the author. Set in Fraunces, EB Garamond, and Poppins.

Reviewed and revised: 2026. For corrections and updates, visit antaddict.com.

*“The vast majority of virgin queens die within hours of leaving the mother nest. And yet, on the right afternoon, the sky fills with them anyway.”*

ON THE ECONOMICS OF THE FLIGHT

# Contents

A FIELD AND REFERENCE GUIDE IN SIX PARTS

## BACK

INTRODUCTION

# The One Day Everything Begins

*Every mature ant colony on Earth exists because, on one specific afternoon, a single winged female left home, mated in mid-air, tore off her own wings, and sealed herself in the dark to gamble everything on a first brood. This is the story of that afternoon – and how to be standing under it when it happens.*

Walk outside on the right muggy afternoon in July and you may witness one of the strangest mass events in the natural world. The pavement cracks begin to churn. Winged insects pour upward from a thousand hidden doors at once, rise into warm columns of air, and vanish. Within an hour it is over. By evening the ground is littered with discarded wings, and here and there a lone female is walking with purpose, looking for a crack in which to disappear.

Most people call this a nuisance and reach for the vacuum. What they are actually watching is a wedding, a funeral, and the founding of nations, all compressed into sixty minutes. This event is the *nuptial flight*, and it is the single hinge on which the entire life of an ant colony turns.

I have spent six years watching ant colonies up close – feeding them, founding them, losing some, and learning to read the small signals that separate a good founding from a dead test tube. In that time I have come to believe that the nuptial flight is the most misunderstood and underserved subject in the whole hobby. It is treated as a footnote: a paragraph in a care sheet, a single line on a calendar. Yet it is where colonies come from. Understand the flight and you understand ants. Miss it and you spend every spring buying queens instead of catching them.

## What this book is

This is a field and reference guide with two ambitions running side by side. The first is to explain the **science** of the nuptial flight honestly and in depth – what actually triggers it, how thousands of colonies coordinate a single afternoon, why males are built to die and queens to live for decades, and what happens inside a foundress in the weeks after she lands. The second is to make that science **useful**: to turn the flight from an event that happens *to* you into an event you can predict, meet in the field, and act on with a captured queen in a tube.

Those two ambitions are not in tension. The reason so much popular advice about catching queens is unreliable is precisely that it floats free of the biology. "Look for warm days after rain" is true and nearly useless, because it does not tell you *which* warm day, for *which* species, or *why* the rain matters. When you understand the mechanism, the practical rules stop being folklore and start being predictions you can test.

> **HOW THIS BOOK IS BUILT**
>
> Throughout, you will find three kinds of boxes. **The Science** boxes go one layer deeper into a mechanism – the part most guides skip. **Field Notes** give you the practical, do-this-now version. **Keeper's Take** boxes are my own opinions and hard-won mistakes, clearly marked as such so you can weigh them against the evidence.

## A promise about honesty

Ant science is full of confident-sounding claims that dissolve when you chase the source. This book tries hard not to add to that pile. Where something is well established, I say so and cite it. Where the evidence is thin, contested, or frankly anecdotal – and a surprising amount of flight-timing lore is exactly that – I tell you plainly, and I try to explain *why* we don't yet know. Honest hedging is more useful in the field than false certainty, because it tells you which rules to trust with your only queen of the season and which to treat as a hunch.

The species examples lean toward North America, because that is where most readers are standing when they go out to catch a queen. But the biology is universal, and the prediction framework in Part III works anywhere you can read a thermometer and a rain gauge.

---

*Understand the flight and you understand ants. Miss it and you spend every spring buying queens instead of catching them.*

---

## How to read it

You can read this book front to back, and the parts are ordered to build on each other: the flight, the triggers, the prediction, the catch, the founding, and the wider picture. But it is also built to be raided. If a flight is happening in your yard *right now*, skip to Part IV and come back for the theory later. If you have a queen in a tube and something looks wrong, Chapter 24 is the emergency room. The appendices – a flight log you can copy, a regional quick-reference, and a field checklist – are meant to be photographed and carried.

What I hope you take from it is a shift in how you see that muggy July afternoon. Not a nuisance. A once-a-year window into how one of the most successful forms of life on the planet remakes itself – and, if you are ready, an invitation to catch a piece of it and watch a colony begin.

PART ONE

# I

# The Flight

*What a nuptial flight is, how thousands of colonies agree on a single afternoon, and why the whole thing is built around death.*

CHAPTER ONE

1

# What a Nuptial Flight Actually Is

> *Strip away the folklore and a nuptial flight is a very precise thing: a synchronized, one-time dispersal-and-mating event that exists to solve two problems at once – finding a mate, and moving your genes away from home.*

A nuptial flight is the mating flight of ants. On a suitable day, a mature colony releases its winged reproductive ants – the virgin queens and the males, known collectively as *alates* – into the air, where mating takes place. The mated females then land, shed their wings, and attempt to found new colonies of their own. That is the whole event in one sentence. Everything else in this book is an unpacking of it.

It helps to be exact about the vocabulary, because loose terms cause most of the confusion in the hobby. A *gyne* is a virgin winged female – a queen-in-waiting who has not yet mated. A *male*, or drone, is a winged male whose only biological job is to deliver sperm and then die. An *alate* is any winged reproductive, male or female. A *foundress* is a female who has mated, shed her wings, and begun founding. And *dealation* is the shedding of those wings, a hinge moment we will return to often. When a keeper says "I caught a queen," what they almost always mean is that they caught a dealate foundress: a female who has already been through the flight.

## Two problems, one event

Why fly at all? Ants are superb walkers; a colony could in principle produce reproductives that simply walk out the front door and mate with the colony next door. A handful of species essentially do exactly that. But the winged nuptial flight is overwhelmingly the dominant strategy, because flight solves two problems that walking cannot.

The first is **outbreeding**. If reproductives mated with nestmates or near neighbors, colonies would rapidly inbreed, and in the haplodiploid genetic system of ants inbreeding carries a specific, severe penalty: it produces sterile or inviable diploid males instead of workers. Getting airborne and mixing with alates from distant colonies is the cleanest way to avoid mating with a relative.

The second is **dispersal**. A new queen cannot found a colony on top of her mother's; she would be competing with an established superorganism that will simply kill her. She needs distance. Flight buys that distance cheaply. In the fire ant *Solenopsis invicta*, radar and mark-recapture work by Markin and colleagues showed queens climbing hundreds of meters into the air, with most settling within a mile or two of home (about 2 km) but a few carried as far as ten miles or more (up to 16 km), sometimes over open water (Markin et al., 1971; Vogt et al., 2000). That single afternoon can seed a landscape.

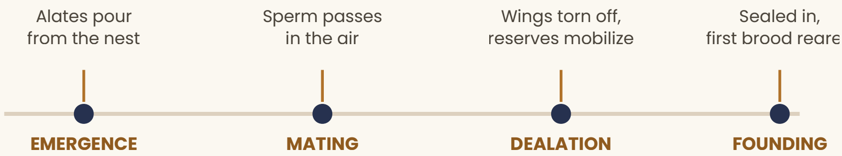



**FIGURE 1.1** The four-stage arc of the flight. Every chapter in this book sits somewhere on this line.

## Why it looks like an explosion

To a bystander the flight seems to come from nowhere: nothing, nothing, then sudden clouds of insects. That abruptness is not an accident. It is the visible signature of *synchrony*. When many colonies of the same species release their alates in the same short window, three good things happen at once. Mates are abundant, so a queen aloft for only a few minutes has a real chance of finding a partner from another colony. Predators are swamped; a bird or a dragonfly can eat only so many ants in an hour, so flooding the sky dilutes each individual's personal risk. And the timing itself becomes a filter, because only alates that respond to the same environmental cue end up in the same airspace. We will spend all of Part II on the cues that make this synchrony possible.

**THE SCIENCE · NOT EVERY COLONY FLIES THE SAME WAY**

"Nuptial flight" is a category, not a single behavior. In some species males leave first and form aerial swarms that females fly into; in others a female lands and "calls" with pheromone while males search for her on the wing. Some species mate at 300 meters; others mate on the ground a few centimeters from the nest entrance. Chapter 4 sorts these into two broad syndromes. For now, hold the general shape loosely: fly, mate, land, found.

## A one-time transaction

The most important and least intuitive fact about the flight is that, for the queen, it happens *once*. Ant queens mate during a single brief episode early in adult life, acquire their entire lifetime supply of sperm in that episode, and never mate again (Boomsma et al., 2005). A queen may then live and lay fertile eggs for a decade or more – in some species several decades – drawing on sperm banked on that one afternoon. The males, meanwhile, are built for the opposite life history: they exist to deliver sperm and typically die within hours or days of the flight. This asymmetry – a female investing in a very long future, a male investing in a single transaction – shapes almost everything about how the flight is designed. It is why males are cheap and disposable and queens are expensive and cautious, and it is a thread we will pull on repeatedly.

### THE BOTTOM LINE

A nuptial flight is a synchronized, once-in-a-lifetime dispersal-and-mating event. It exists to outbreed and to disperse, its sudden mass appearance is the fingerprint of synchrony, and its whole architecture follows from one fact: the queen mates once and lives on that transaction for years.

CHAPTER TWO

2

# The Alates: Building a Winged Generation

> *Before a colony can fly, it has to decide to build reproductives instead of workers – a costly, seasonal gamble made months in advance, at the expense of the colony's own growth.*

For most of the year an ant colony makes only workers: sterile females that forage, nurse, dig, and defend. Workers are the colony growing. Alates are the colony reproducing, and the two goals compete for the same finite budget of eggs, food, and nursing effort. A colony that pours resources into winged reproductives this year is a colony that grows more slowly, so the decision to build a flying generation is never trivial. It is made only when the colony is mature enough, well-fed enough, and cued by the season.

## How a female becomes a queen instead of a worker

In ants, sex is decided by genetics but caste is decided by *development*. Fertilized (diploid) eggs can become either workers or queens; which one they become is settled during the larval stage by the food and care they receive, and by hormonal signals – especially juvenile hormone – that respond to nutrition, temperature, and the colony's needs. A larva placed on the queen track is fed richly and grows into a large-bodied gyne packed with the flight muscles and fat reserves she will later cannibalize to found a colony. Males, by contrast, develop from unfertilized (haploid) eggs; a colony makes males simply by laying eggs it does not fertilize.

> **THE SCIENCE · HAPLODIPLOIDY IN ONE PARAGRAPH**
>
> Ants are haplodiploid: females develop from fertilized eggs and carry two sets of chromosomes; males develop from unfertilized eggs and carry one. A queen therefore controls the sex of each egg by choosing whether to release stored sperm as it passes. This is why males can be produced without any mating, why a queen's stored sperm sets a hard ceiling on how many daughters she can ever make, and why inbreeding is so costly – it can push diploid eggs that should become workers into becoming sterile diploid males instead.

## The overwintering strategy

In temperate species the winged generation is often built the summer or autumn *before* it flies, then held in the nest through winter and launched the following spring. This is easy to miss and important to understand, because it means the alates you see on a warm April afternoon were finished months earlier and have simply been waiting for a cue. The winter ant, *Prenolepis imparis*, is the textbook case: its males and queens mature in late summer, overwinter underground with the colony, and emerge on the first warm days of spring – which is exactly why it is the earliest ant to fly across temperate North America (AntWiki; BiodiversityWorks). Holding a finished, energetically expensive generation through the cold is itself a bet: the colony is storing next year's reproduction in living tissue and hoping to survive to spend it.

## Sex ratios and the timing of the sexes

Colonies do not simply make "alates." They make a particular ratio of males to females, and they often release the two sexes on slightly different schedules. A very common pattern is for **males to leave first**, staging in the air or on landmarks, with females following once male signals are detectable (Hölldobler & Wilson, 1990). This is why, days before you find a single queen, you may notice males clustering at porch lights or spiraling around a tall tree: the male vanguard is a genuine early-warning sign that a flight is close, and a useful one to a keeper who is paying attention.

> **FIELD NOTE · MALES AT THE LIGHTS**
>
> Male ants at outdoor lights in the evening are one of the most reliable free forecasts you have. Many species send males out a day or several days ahead of the main female flight. If you start seeing drones of a species you want – small, dark, big-eyed, narrow-waisted – treat it as a countdown clock and get your tubes ready. Note the date; over a few seasons your own light-trap records will out-predict any generic calendar.

## Why maturity matters

A young colony does not fly. Producing reproductives is gated behind size and age because a small colony that spent its budget on alates instead of workers would simply be outcompeted and die. Depending on the species this threshold ranges from a couple of years to many; large, long-lived species may take three to five years or more before releasing their first alates. For the keeper this cuts two ways. It is why you cannot rush your own captive colony into producing queens, and it is why a wild flight, when it comes, represents years of a mother colony's accumulated surplus spent in a single hour.

### THE BOTTOM LINE

Alates are a colony's deferred, seasonal investment in the future, built at the cost of its own growth. Caste is set by larval feeding and hormones, males come from unfertilized eggs, and in temperate species the whole winged generation is often built months ahead and overwintered – which is why watching for early males is one of the sharpest tools a keeper has.

CHAPTER THREE

3

# The Synchronization Problem

> *A single colony flying alone is a genetic dead end. Solving that – getting thousands of independent colonies to launch within the same hour, without any central coordinator – is the deep puzzle at the heart of the flight.*

Imagine you are a colony with a batch of winged queens ready to go. If you launch them on a random Tuesday and no other colony happens to launch that day, your queens rise into an empty sky, find no unrelated mates, and the entire year's reproductive investment is wasted. The only winning move is to fly when everyone else of your species flies. But there is no committee, no signal tower, no colony in charge. So how does the synchrony happen?

## A shared clock nobody owns

The answer is that colonies do not coordinate with each other directly. They each read the same external environment and respond to the same thresholds. If every colony of a species is wired to fly when, say, the afternoon is warm enough *and* humid enough *and* it is the day after rain *and* the wind is calm, then all of them will independently arrive at "go" on the same afternoon – not because they agreed, but because they are reading the same sky. The weather is a clock that no single colony owns but all of them can see. This is why the flight feels like an explosion: a large population crossing a shared threshold at nearly the same moment.

*The weather is a clock that no single colony owns but all of them can see.*

This insight is the entire basis of flight prediction, so it is worth stating plainly: **if you can read the same cues the colonies read, you can stand under the flight before it happens.** The colonies are not being mysterious. They are running a threshold rule on public data. Part II is devoted to identifying those cues; Part III turns them into a forecast.

## Why a single trigger is not enough

You might ask why colonies use a stack of conditions rather than one simple cue like temperature. The reason is that any single cue is too noisy. Plenty of warm afternoons are terrible for flying: bone dry, or windy, or with a storm about to break. A colony that flew on temperature alone would frequently launch its queens into conditions that kill them. By requiring several conditions to line up – warmth *and* moisture *and* calm *and* often a recent rain – the colony filters out the false alarms and concentrates its flight on the rare afternoons that are genuinely good for both flying and, crucially, for the founding that follows. The stack is a noise-reduction system.

> **THE SCIENCE · RAIN AS A SYNCHRONIZER AND A SOIL-SOFTENER**
>
> Rain does double duty. As a synchronizing cue, a shared rainfall event gives many colonies the same reference point, tightening the flight into a narrow window afterward. As a practical enabler, rain softens and humidifies the soil, making it far easier for a newly landed queen to dig the founding chamber she must seal herself into. A study of leaf-cutting ants found flights keyed to accumulated rainfall – on the order of tens of millimeters in the preceding month – together with temperatures above roughly 22 °C, a neat illustration of a multi-condition rule at work.

## Staggering: the colony's own hedge

Synchrony is powerful but risky. If a species put every colony's entire reproductive output into one perfect afternoon and a freak storm hit, a whole region could lose a generation. So real flights are usually a compromise: a strong central peak, plus a tail. Many colonies hold back some alates rather than committing all of them at once, and “Flying Ant Day” in practice is rarely a single day – it is a main pulse with smaller flights before and after, spread across days or weeks depending on the weather (Natural History Museum). The colony is hedging its bet: fly mostly with the crowd, but keep a reserve in case the crowd is wrong.

#### FIELD NOTE · THE PEAK IS NOT THE ONLY CHANCE

Because flights are staggered, missing the big day is not the disaster it feels like. Keep watching for a week or two on either side of the main pulse, especially after each subsequent rain-then-warmth sequence. Some of my best single-queen catches have come on the quiet secondary flights a few days after everyone else declared the season over.

### THE BOTTOM LINE

Colonies synchronize not by talking to each other but by all reading the same weather and crossing the same multi-condition threshold together. That shared, public clock is exactly what makes the flight predictable – and the staggering around the peak means a keeper who keeps watching gets more than one shot.

CHAPTER FOUR

4

# Two Ways to Marry

> *Ant mating falls along a continuum between two strategies: females that advertise and wait, and males that gather and compete. Knowing which one your target species uses tells you where to stand and what to look for.*

In 1985 Bert Hölldobler and Stephen Bartz proposed a framework that still organizes how biologists think about ant mating. They described two *mating syndromes* – recurring packages of behavior, timing, and anatomy – and argued that most ant species sit somewhere between them (Hölldobler & Bartz, 1985; Hölldobler & Wilson, 1990). The two poles are the **female-calling syndrome** and the **male-aggregation syndrome**, and the difference between them is essentially a question of who advertises.

## Female calling: advertise and wait

In the female-calling syndrome, a virgin queen leaves the nest (or simply climbs to a perch nearby), assumes a calling posture, and releases a sex pheromone. Males, flying or walking, search for that scent and home in on her. Mating happens where she is, often on the ground or on low vegetation, sometimes only centimeters from her natal nest. Flights in this syndrome tend to be poorly synchronized: because each female is a private beacon rather than part of a crowd, there is less pressure for the whole population to launch at the same instant (AntWiki). This is thought to be the more ancestral pattern, closer to the solitary wasps from which ants descend, and it is associated with longer-lived males who must survive while searching for scattered, patchily distributed females (Shik et al., 2013).

## Male aggregation: gather and compete

In the male-aggregation syndrome, the dynamic flips. Males leave first and gather – in aerial swarms, over landmarks, or massed on the ground – often producing their own aggregation pheromone that pulls in still more males and, eventually, females. Females fly into these swarms to mate. Here synchrony is tight and essential: a swarm only works if enough males show up at once, so both within-colony and among-colony timing are sharply coordinated (AntWiki). Males in this syndrome are typically short-lived, ephemeral sperm-delivery vehicles – they mate and die within hours – because there is no premium on longevity when your entire reproductive life is one afternoon in a crowd (Shik et al., 2013).

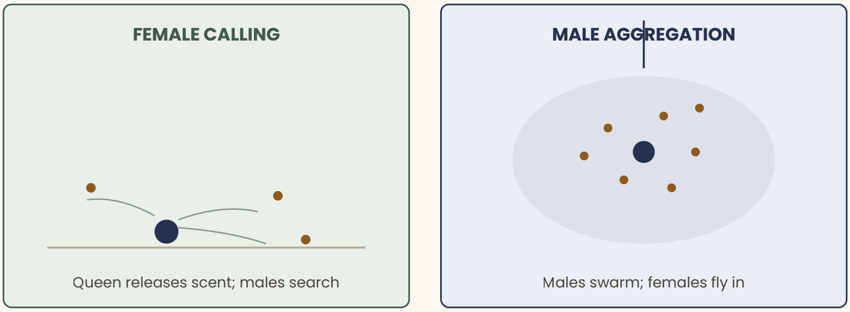



**FIGURE 4.1** The two mating syndromes as poles of a continuum. Most species fall somewhere between them.

## A continuum, not a switch

It is tempting to sort every species neatly into one box, but the honest picture is a spectrum. Some species show intermediate behavior, and the same genus can contain both extremes: in *Formica*, for example, female calling and male aggregation both occur in different species (Shik et al., 2013). What varies between the poles is not just behavior but body plan – aggregation males tend to have the large eyes and flight equipment suited to finding a swarm fast, while calling males are built for a longer, searching life. The framework's value to a keeper is not taxonomic tidiness; it is that it tells you *where the mating happens*, and therefore where to look.

**TWO SYNDROMES, COMPARED**

| FEATURE | FEMALE CALLING | MALE AGGREGATION |
|---|---|---|
| Who advertises | Female (sex pheromone) | Male (aggregation pheromone / swarm) |
| Where mating happens | On or near the ground, often close to nest | In aerial swarms or at landmarks |
| Synchrony | Loose | Tight, essential |
| Male lifespan | Longer; searching life | Very short; mate and die |
| Where a keeper looks | Ground, low vegetation, near nests | Landmarks, lights, hilltops, open arenas |

#### KEEPER'S TAKE

*When I target a new species, the first thing I try to learn is which end of this continuum it sits on, because it changes my entire approach. For calling species I work the ground near known nests at the right hour. For aggregation species I go to structure – a hilltop, a lone tall tree, a bright light – and let the males' own gathering behavior show me where the females will arrive. Standing in the wrong kind of place is the most common reason a keeper watches a flight happen and still goes home empty-handed.*

---

#### THE BOTTOM LINE

Ant mating runs along a continuum from female calling (she advertises, mating near the ground, loose timing) to male aggregation (males swarm, mating aloft, tight timing). Knowing your target's position on that continuum tells you where the mating actually occurs – and that is where you need to be standing.

CHAPTER FIVE

5

# Leks in the Desert

> *The most extreme version of male aggregation is a true lek: a fixed arena, used year after year, where males compete for females on completely featureless ground. The harvester ants of the American Southwest built the best-studied example.*

In the deserts near Portal, Arizona, Bert Hölldobler documented something that sounds almost impossible. The harvester ant *Pogonomyrmex rugosus* gathers to mate at specific sites – and returns to the *same* sites in successive years, even though the ground carries no obvious landmark to distinguish it from the flat desert all around (Hölldobler, 1976; AntWiki). In one survey, a single mating arena of roughly 4,800 square meters was the only such site Hölldobler could find across an area of about 120,000 square meters. On the right morning it fills with competing males; virgin queens fly in, and the males scramble for access to them. Biologists call this a lek, borrowing the term from the display grounds of grouse and other vertebrates, because it has the same defining features: a traditional site, males gathered to compete, and females arriving to choose among them.

## How the arena stays fixed

The puzzle of a lek on featureless ground is how the location is transmitted across generations that never meet. The reproductives that gather this year hatched in colonies scattered across the desert; none of them attended last year's lek. Yet they converge on the same patch. Pheromones laid down by the first arrivals are a large part of the answer: early males scent-mark the arena, and later reproductives orient to that chemical signal, so the site amplifies itself once anyone shows up (Hölldobler, 1976). Underlying landscape features that are invisible to us – subtle topography, soil, vegetation edges – may bias where that first marking happens, giving the tradition a stable anchor.

> **THE SCIENCE · WHY LEK AND WHY COMPETE**
>
> Leks concentrate mating in space, which for a male-aggregation species solves the same problem synchrony solves in time: it guarantees that when a female arrives, plenty of unrelated males are present. The cost is ferocious male competition – balls of males wrestling for a single female are a common sight at harvester-ant leks. That competition is precisely why aggregation males are built the way they are, and why they are disposable: selection has favored getting to the arena and winning the scramble, not living long afterward.

## Hilltopping and other landmark mating

The desert lek is the extreme, but landmark-based mating is widespread and comes in gentler forms. Many ants practice *hilltopping*: reproductives converge on the highest point in the local landscape – a ridge, a hilltop, a lone tall tree, even a building – because “fly to the high point” is a simple rule that different individuals can follow independently and still end up in the same place (LePrince & Francoeur, 1986). A tall isolated tree humming with circling males on a summer evening is landmark mating in action, and it is one of the most useful patterns a keeper can learn to recognize.

> **FIELD NOTE · HUNT THE HIGH POINT**
>
> If your target species aggregates, think like an alate looking for a landmark. On flight afternoons, head for the most prominent feature around: the top of a hill, a ridgeline, the tallest solitary tree, a water tower, even the roof deck of a tall building. Reproductives pile up on these points, and a landmark that draws them one year will often draw them again. Over time you can build a personal map of local aggregation sites that is worth more than any published calendar.

---

### THE BOTTOM LINE

Leks and hilltops are male aggregation taken to its logical end: mating concentrated at a traditional place, held together by pheromone and landscape rather than memory. For the keeper the lesson is practical – aggregating species gather at predictable high points, and finding those points is half the catch.

CHAPTER SIX

6

# The Odds: Why Almost Every Queen Dies

> *The flight is a slaughter. Understanding just how few queens survive it reframes everything – the colony's strategy, the queen's caution, and your own responsibility when you pick one up.*

It is easy to romanticize the flight, and this book has done its share. But the defining statistic of a nuptial flight is death. The overwhelming majority of virgin queens that leave the nest are dead within hours (Hölldobler & Wilson, 1990). They are picked off by birds, dragonflies, spiders, and other ants; they are drowned in puddles and pools; they overheat on pavement; they desiccate in dry air; and enormous numbers are simply killed by the workers of established colonies when they land in already-occupied territory. For the winter ant *Prenolepis imparis*, keepers and researchers estimate wild founding mortality as high as 95 to 100 percent (Tar Heel Ants). Producing a successful new colony is a lottery with a catastrophic loss rate, and the flight is the moment the tickets are drawn.

## Overproduction as strategy

Given those odds, the colony's strategy makes brutal sense: overproduce, wildly. A single mature colony of a large-nested species – leaf-cutters or fire ants, say – can release hundreds or thousands of winged queens in under an hour (Hölldobler & Wilson, 1990). The colony is not expecting most of them to survive. It is buying lottery tickets in bulk, because the payoff for even one success is an entire new colony that may itself live for decades and launch its own flights. This is the same logic behind the vast egg output of many marine animals: when each offspring's survival probability is tiny, the winning move is enormous numbers.

---

*The colony is not expecting most of them to survive. It is buying lottery tickets in bulk.*

---

## The gauntlet, stage by stage

It is worth walking the queen's gauntlet explicitly, because each stage is a filter and each explains a piece of her behavior:

- **In the air:** predators swarm the flight. Being one of thousands is the queen's only defense – the same predator dilution that synchrony provides.
- **Landing:** the moment of touchdown is deadly. Open ground exposes her; she must find cover fast, which is why queens land and immediately run for a crack, a leaf, a stone.
- **Dealation and digging:** shedding wings and excavating a chamber takes time she does not have in the open. Softened, humid soil after rain is the difference between a chamber dug in minutes and a queen caught exposed.

- **Founding:** even sealed in, most foundresses fail – from depleted reserves, disease, flooding, or discovery. The claustral weeks are a slow filter that continues killing long after the flight is over.

Every cautious thing a captured queen does – bolting for darkness, refusing food, panicking at vibration, abandoning eggs when disturbed – is a rational response to a life in which exposure means death. She is not being fussy. She is running the only program that has ever worked.

> **KEEPER'S TAKE**
>
> *Knowing the odds changed how I handle a caught queen. In the wild she had a single-digit chance of surviving the week. In a tube on my shelf, shielded from predators, weather, and rival colonies, her odds flip almost completely – if, and only if, I give her the darkness and stillness her instincts are demanding. That is the deal a keeper offers: I remove the gauntlet, and in exchange she does the one thing she was built to do. Treat that as the responsibility it is.*

> **FIELD NOTE · TAKE FEWER, KEEP THEM BETTER**
>
> Because a sheltered queen's survival odds are so much higher than a wild one's, you do not need to collect dozens. A handful of healthy, well-housed foundresses will out-produce a jar full of stressed ones. Collect responsibly, within your local laws, take only what you can properly care for, and never move non-native species around the landscape. The flight is generous, but it is not yours to strip-mine.

### THE BOTTOM LINE

Almost every queen dies, and fast – which is exactly why colonies overproduce and why queens are so cautious. For the keeper this is the whole opportunity: by removing the gauntlet of predators and weather, you can turn a near-hopeless wild bet into a very good one, provided you respect what the queen's instincts are asking for.

PART TWO

# II

# The Triggers

*The environmental cues that colonies read to decide when to fly – temperature, moisture, pressure, wind, and light – and how they stack them into a decision.*

CHAPTER SEVEN

7

# Temperature: The Master Switch

> *Of all the cues, temperature is the one closest to a master switch. It gates whether flight muscles can work at all, it sets the season, and its daily rhythm often sets the very hour of the flight.*

Ants are ectotherms: their body temperature, and therefore the power output of their flight muscles, tracks the air around them. Below a species-specific threshold the muscles simply cannot generate enough lift, and no amount of readiness will get a queen airborne. Above another threshold the risk of overheating and desiccation aloft becomes lethal. Between those bounds lies a flight window, and much of a species' seasonal and daily timing is just the colony waiting for the air to sit inside that window.

## The species-specific window

There is no universal flight temperature, only species-specific ranges, and this is the first thing to internalize. The red imported fire ant, *Solenopsis invicta*, flies across a broad band of roughly 21 to 33 °C (about 70 to 91 °F), which is one reason it can fly in almost any month when conditions allow in the warm south (Vogt et al., 2000). British populations of the black garden ant, *Lasius niger*, by contrast, key their big summer flights to spells of hot, humid weather, with mass flights associated with warmth well above the low-twenties Celsius (Natural History Museum). And at the cold extreme, the winter ant *Prenolepis imparis* flies in early spring on days that would ground almost every other ant, with workers active around 4 °C (about 40 °F) when the sun is out (BiodiversityWorks). The same thermometer reading that means "go" for one species means "stay home" for another.

**ILLUSTRATIVE FLIGHT-TEMPERATURE TENDENCIES**

| SPECIES | TYPICAL FLIGHT TEMPERATURE | SEASON / NOTES |
|---|---|---|
| *Prenolepis imparis* (winter ant) | Cool; flights on the first mild spring days | Late winter to early spring; afternoon |
| *Solenopsis invicta* (fire ant) | ~21–33 °C (70–91 °F) | Spring–summer peak; day after rain |
| *Lasius niger* (black garden ant) | Hot, humid spells; warmth well into the 20s °C | Mid–late summer; "Flying Ant Day" |
| *Camponotus* (carpenter ants) | Warm evenings | Late spring–summer; often dusk |

Values are tendencies drawn from the literature and keeper records, not guarantees. Your local populations will vary; log your own.

## Temperature sets the hour

Because the air warms and cools through the day, temperature does not just choose the day – it often chooses the hour. Species with warm thresholds tend to fly in the afternoon, when the air peaks. Species pushing against the cool end fly when it is warmest, which in early spring is also the afternoon – the winter ant, tellingly, flies in the afternoon rather than at dawn (Formiculture care sheet). Many carpenter ants (*Camponotus*) and other warm-evening fliers wait for the softer heat and rising humidity of dusk, which is why their males appear at lights after dark. When you are trying to catch a flight, “what time of day” is largely a temperature question in disguise.

**THE SCIENCE · THE URBAN HEAT ISLAND AS A NATURAL EXPERIMENT**

Cities are warmer than the countryside around them – the urban heat island effect – and ant flights respond accordingly. In Britain, winged ants tend to appear earlier in urban areas than in rural ones, precisely because the warmer city air crosses the flight threshold sooner (Natural History Museum). This is strong, everyday evidence that temperature is doing real causal work: change the temperature, and you change the timing of the flight, holding the species constant.

**FIELD NOTE · LEARN YOUR TARGET'S NUMBER, THEN WATCH THE FORECAST**

Turn temperature into a concrete rule for each species you want. If your target flies around, say, the high 20s °C in the afternoon, then a forecast showing an afternoon high in that band – especially the first such afternoon after a cooler or wetter spell – is your green light to be outside. You will refine the number every season from your own log, but you cannot even start without treating temperature as the first gate.

## THE BOTTOM LINE

Temperature is the master switch: it decides whether flight is physically possible, it sets the season, and its daily rise and fall usually sets the hour. There is no universal number – only species-specific windows – so the keeper's job is to learn the window for each target and watch the forecast cross into it.

CHAPTER EIGHT

8

# Humidity and Rain: Softening the World

> *If temperature decides whether a queen can fly, moisture decides whether she can survive landing and found a colony. That is why rain is the single most reliable flight cue in the keeper's toolkit.*

Ask any experienced queen-hunter for one rule and they will almost always say the same thing: fly on warm, humid days, ideally the day after rain. That rule is folklore only in the sense that it was learned by watching; the biology behind it is solid, and it rests on two distinct jobs that moisture performs.

## Job one: keeping small bodies from drying out

Alates are small and have a large surface area relative to their volume, which makes them acutely vulnerable to desiccation. Flying in dry air is dangerous; landing on hot, dry ground and then trying to dig a chamber is worse. High humidity buys the queen time by slowing water loss during the most exposed minutes of her life. This is why flights cluster on muggy afternoons and evenings, and why a dry heat wave, however warm, often produces no flight at all: the temperature gate is open but the moisture gate is shut.

## Job two: softening the soil for founding

The second job is the one most keepers underrate. A newly mated, ground-nesting queen must dig. Baked, dry earth is nearly impossible to excavate quickly; rain-softened soil can be worked in minutes. Rainfall softens and humidifies the ground exactly where the queen needs to disappear, which is why so many species time flights to *follow* rain rather than to coincide with it (Birdhouse.farm; Best Ants UK). The colony is not just launching into good flying air; it is launching its daughters into a world where the founding chamber can actually be dug before a predator arrives.

> *The colony launches its daughters into a world where the founding chamber can actually be dug before a predator arrives.*

**THE SCIENCE · RAIN AS A THRESHOLD, NOT A GARNISH**

For some species, accumulated rainfall is not a nice-to-have but a genuine precondition. Work on leaf-cutting ants found that flights began only after the colony's environment had received a substantial rainfall total in the preceding month – on the order of tens of millimeters – in combination with temperatures above roughly 22 °C (Best Ants UK, summarizing leaf-cutter data). That is a two-condition rule with rain as a hard gate, and it is a clean example of why single-cue thinking fails: the warmth alone was never sufficient.

## The rhythm that works: rain, then warm

Putting the two jobs together gives the pattern that predicts more flights than any other single heuristic: **a soaking rain, followed by a warm, humid, calm day.** The rain charges the system – softening soil, lifting humidity, and giving every colony in the area a shared reference point. The warm still day that follows opens the temperature and wind gates. When those line up, especially for the first time after a dry or cool spell, colonies fly. Fire ant flights, for instance, characteristically occur the day after precipitation, given low wind and warm temperatures (Markin et al., 1971).

> **FIELD NOTE · THE 24-TO-48-HOUR POST-RAIN WINDOW**
>
> Operationally, this means your best odds are often not during the rain but in the day or two after it, once the sun is back and the air is warm and heavy. When I see a summer forecast with an afternoon or evening of rain followed by a warm, muggy, still day, I clear my schedule for the day after. Watch soil that stays damp under leaf litter; that is where a landing queen will head, and where you will find her.

---

### THE BOTTOM LINE

Moisture does two things temperature cannot: it protects small bodies from drying out during the flight, and it softens the ground so a landed queen can dig in before she is eaten. That double role is why "warm and humid, the day after rain" is the most dependable flight rule there is – and why the post-rain window is where a keeper should aim.

CHAPTER NINE

9

# Pressure, Wind, and Light

*Beyond heat and moisture sit three secondary cues: barometric pressure, wind, and light. Two of them are well established. The third is one of the hobby's most cited beliefs and one of its least proven.*

Temperature and humidity do most of the predictive work, but they are not the whole story. Colonies also read wind, light, and – probably – air pressure. It is worth being precise about which of these rest on solid ground and which are informed speculation, because a keeper betting a season's only flight on a cue deserves to know how firm it is.

## Wind: the veto

Wind is best understood as a veto. Even when temperature and humidity are perfect, a stiff breeze grounds most flights. The reasons are obvious once stated: alates are tiny and weak fliers, wind scatters them away from mates and swarms and makes controlled landing dangerous, and it disperses the pheromone plumes that both calling females and aggregating males rely on to find each other. Descriptions of good flight conditions almost always include "little or no wind" and "calm" (Natural History

Museum; Markin et al., 1971). In practice, treat wind as a gate that can shut down an otherwise ideal afternoon.

## Light and time of day

Light interacts with temperature to set the hour, and different species partition the day. Many fly in the afternoon, when it is warmest. Others are dusk or night fliers – carpenter ants (*Camponotus*) are classic evening fliers whose males gather at lights after dark, and several genera fly at or after sunset when the air is still warm but humidity is climbing and diurnal predators are standing down (Formiculture). The artificial lights we leave on at night intercept these night-flying males, which is why porch and street lights are such reliable places to detect an aggregation-style flight in progress. Light is less a trigger you predict than a channel you exploit.

> **THE SCIENCE · BAROMETRIC PRESSURE – PLAUSIBLE, POPULAR, UNPROVEN**
>
> Antkeepers very widely believe that ants sense falling or low barometric pressure and use it to anticipate rain, timing flights to approaching or just-passed weather systems. It is biologically plausible – other insects do respond to pressure changes – and it would neatly explain flights that seem to precede rain. But within the hobby it is repeatedly described as *speculation*, and rigorous, ant-specific evidence pinning flight decisions to barometric pressure is thin (Formiculture). The honest position: pressure may well be a real cue, it correlates with the rain and humidity signals we already know matter, and you should not stake your only flight of the season on a pressure reading when temperature, humidity, and recent rain are doing the reliable work.

### FIELD NOTE · HOW TO WEIGHT THE SECONDARY CUES

My working hierarchy: temperature and recent rain first (strong, predictive), wind as a hard veto (ignore at your peril), time of day matched to species (afternoon vs dusk vs night), and barometric pressure last – a tiebreaker at most. If an app shows falling pressure ahead of a front, I take it as a hint to watch, not as a green light on its own.

## THE BOTTOM LINE

Wind is a veto that can ground a perfect day; light and time-of-day channel each species into its hour and give you the porch-light trick for detecting flights. Barometric pressure is plausible and beloved but poorly proven for ants specifically – treat it as a hint, not a guarantee, and let the well-established cues carry the decision.

CHAPTER TEN

10

# The Calendar Inside the Colony

> *Weather cues fire the flight, but only when the colony's internal calendar has already loaded the gun. Photoperiod, overwintering, and physiological readiness decide which weather windows the colony is even willing to act on.*

A perfect flight afternoon in the wrong month produces nothing. You can have ideal warmth, humidity, and calm in October and watch a species that flies only in June do absolutely nothing, because its alates are not built, not mature, or not primed. Weather is the trigger; the colony's internal state is the loaded chamber. Both must be ready.

## Photoperiod: the seasonal anchor

Day length is the most reliable calendar in nature. Unlike temperature, which fluctuates unpredictably, photoperiod changes on an exact astronomical schedule, so many organisms use it to anchor seasonal decisions. For ants, day length – interacting with temperature – helps set when reproductives are produced and when the colony becomes willing to fly. This is why a species has a *season* at all, rather than flying on every warm, wet day year-round. Photoperiod defines the window; weather chooses the day within it.

## Overwintering and the stored generation

As we saw in Chapter 2, many temperate species build their winged generation months ahead and overwinter it. This creates a two-stage timing system. First, over the previous season, the colony must produce and provision the alates. Second, those alates must be held in reserve until a spring or summer trigger releases them. The winter ant makes this vivid: its reproductives mature in late summer, wait out the cold, and launch on the first mild spring afternoons (AntWiki). A keeper who understands this will not waste effort hunting a species before its stored generation has had time to mature and be released.

> **THE SCIENCE · PHYSIOLOGICAL READINESS**
>
> Even a mature, overwintered alate needs to be internally ready to fly – hydrated, provisioned, hormonally primed, and in some cases past a required cold period. Diapause and post-diapause development in the reproductive caste can gate the response to warmth, so that the same warm day triggers flight only after the colony has completed its internal seasonal program. This is why flights track the calendar as well as the thermometer, and why the "first suitable day of the season" so often produces the biggest flight: the whole primed reserve goes at once.

## Putting the two clocks together

The practical model to carry is two clocks running at once. The **slow clock** is the internal calendar: photoperiod and overwintering decide the weeks in which a species is willing to fly. The **fast clock** is the weather:

within those weeks, temperature, moisture, and wind decide the specific afternoon. Prediction fails whenever a keeper watches only one clock – hunting on a warm day outside the season, or waiting for the season while ignoring the weather within it. You need both to align.

> **FIELD NOTE · BUILD A TWO-COLUMN SEASON**
>
> For each target species, write down two things: its flight *season* (the weeks it is even possible) and its flight *triggers* (the weather within those weeks). Then you only go hunting when the calendar says "possible" and the forecast says "today." This simple two-column discipline eliminates most wasted trips.

---

### THE BOTTOM LINE

The colony runs two clocks. The slow internal clock – photoperiod, overwintering, physiological readiness – decides which weeks flight is possible; the fast weather clock decides the day. A trigger only works when the calendar has already primed the colony to respond to it, so predict with both clocks or neither.

CHAPTER ELEVEN

11

# Reading the Sky: The Trigger Stack

> *No single cue predicts a flight. What predicts it is a stack of conditions clearing together. This chapter assembles the cues from Part II into one mental model you can run on any forecast.*

Everything in Part II points to the same conclusion: a colony does not fly on one signal, it flies when a whole stack of gates opens at once. Reproducing that stack in your own head is the core skill of flight prediction. Think of it as a checklist the colony is silently running, and that you can run alongside it.

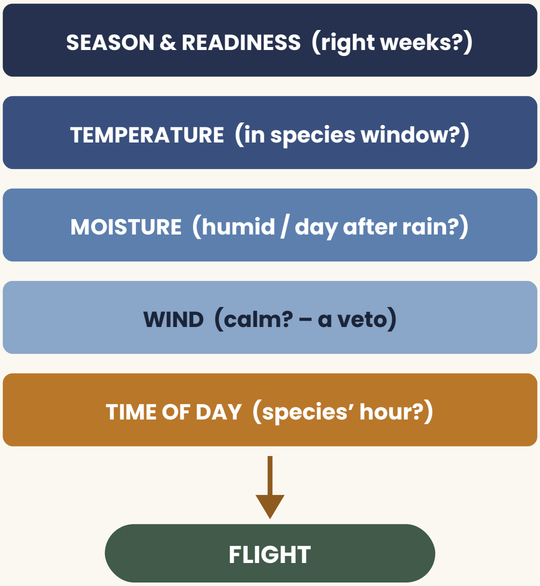



**FIGURE 11.1** The trigger stack. Every gate must open for the flight to fire; the wind gate can veto all the others.

## The gates, in order

Run the gates roughly top to bottom, because earlier gates dominate later ones:

- **Season and readiness.** Is it a week when this species can fly at all? If not, stop – nothing else matters.
- **Temperature.** Is the forecast pushing the air into this species' flight window on the target day?
- **Moisture.** Is it humid, and ideally the day or two after a soaking rain?
- **Wind.** Is it calm? A stiff wind vetoes everything above it.
- **Time of day.** Are you in position during this species' hour – afternoon, dusk, or after dark?

When every gate reads "yes," you are looking at a flight day. When one reads "no," the probability collapses – and the higher the failed gate sits in the stack, the harder the collapse. A cool day in the wrong season is hopeless regardless of humidity; a perfect warm, humid afternoon ruined by wind is merely unlucky.

**THE SCIENCE · WHY A STACK BEATS ANY SINGLE CUE**

Each individual cue is a noisy predictor of "good flight-and-founding conditions." Warm days are often dry; humid days are sometimes windy; calm days are sometimes cold. Requiring several independent cues to agree filters out the false positives that any one cue would generate, which is exactly why colonies evolved multi-condition rules rather than hair-triggers. You are not overcomplicating things by stacking cues; you are matching the logic the colony itself uses.

**KEEPER'S TAKE**

*I keep the stack as five mental checkboxes and glance at them every time a promising forecast appears. Season, temperature, moisture, wind, hour. If four are green and the fifth is amber, I go anyway – being out and wrong costs me an afternoon, but being in and right is a colony. The stack is not there to keep me home; it is there to tell me which afternoons are worth clearing the calendar for.*

### THE BOTTOM LINE

A flight fires when a stack of gates – season, temperature, moisture, wind, and hour – opens together, with wind able to veto the rest. Learn to run that five-gate stack on any forecast and you are reading the same signals the colonies read. Part III turns this model into a working forecast and a field routine.

PART THREE

# III

# The Prediction System

*Turning the trigger stack into a working forecast, a field routine, a species calendar, and the tools that make you sharper every season.*

CHAPTER TWELVE

12

# From Triggers to Forecast

> *The trigger stack tells you what to look for. A forecast turns it into a probability for a specific day. This chapter builds a simple, honest scoring method you can run in five minutes.*

Prediction is not fortune-telling. It is taking the five gates from Chapter 11 and asking, for a specific upcoming day, how many of them the forecast says will be open. You will never reach certainty – nature keeps a veto – but you can absolutely separate the afternoons worth clearing your calendar for from the ones that are not. The goal is a repeatable habit, not a magic formula.

## A five-gate score

For a target species on a target day, score each gate as open (1), marginal (½), or shut (0):

- **Season/readiness** – is the day inside this species' known flight weeks for your area?
- **Temperature** – does the forecast high fall inside the species' flight window during its active hour?
- **Moisture** – is it humid, and within a day or two of a soaking rain?
- **Wind** – is it forecast calm during the flight hour?

- **Hour** – can you actually be in the field during the species' window (afternoon, dusk, night)?

A day scoring 4–5 is a clear go. A 3 with a soaking rain the day before is worth a look, because moisture punches above its weight. Anything with a shut season gate or a shut wind gate during the flight hour is a stay-home, no matter how the other gates read. The scoring is deliberately crude; its value is that it forces you to check all five gates instead of fixating on the one you happen to notice.

**THE SCIENCE · WHY MOISTURE IS WEIGHTED HEAVILY**

Recall from Chapter 8 that rain does double duty – it protects the flying alates and softens the founding soil – and that for some species accumulated rainfall is a hard precondition, not a bonus. That is why a recent soaking legitimately upgrades a marginal day: it is simultaneously raising humidity, providing a shared synchronizing cue for the whole population, and preparing the ground for the founding that follows. A dry "perfect" day and a humid post-rain day with the same temperature are not equal bets.

**FIELD NOTE · THE FIVE-MINUTE FORECAST RITUAL**

Once your season gate is open for a species, check the forecast each evening for the next two days. Read the afternoon/evening temperature, the humidity, the wind, and – crucially – whether rain is passing through. Score the five gates. If tomorrow scores a go, prep tonight: tubes ready, kit by the door, alarm set for the flight hour. The whole ritual takes five minutes and is the difference between catching a flight and hearing about it afterward.

### THE BOTTOM LINE

Turn the trigger stack into a five-gate score you run against the forecast for a specific day. It will not give you certainty, but it reliably separates go-days from stay-home days – and weighting moisture heavily, especially the post-rain window, matches the biology and improves your hit rate.

CHAPTER THIRTEEN

13

# The 72-Hour Window

> *Most flights are won or lost in a three-day sequence: the rain, the recovery, and the launch. Here is that window as a concrete, hour-by-hour field routine.*

The single most productive pattern in queen-hunting is a short sequence: a soaking rain, then a warm, humid, calm day, and the flight on that day or the next. Learning to recognize and work this roughly seventy-two-hour window is worth more than memorizing any calendar, because it is the shape most flights actually take.

## Day 0 – the rain

The window opens with a proper soaking, not a passing sprinkle. The rain recharges soil moisture, lifts humidity, and gives every colony in the area the same reference point. You are not hunting today; you are noting the rain and checking whether the season gate is open for any target species. If it is, the clock has started.

## Day 1 – the recovery

The rain clears and the sun returns to warm, muggy, still conditions. This is frequently *the* day, especially the first such day after a cooler or drier spell, because the colony's whole primed reserve tends to go on the first good opportunity. Be in the field during the species' hour. For afternoon fliers that means being out by early-to-mid afternoon; for dusk and night fliers, be watching lights and landmarks from late afternoon onward. If nothing flies, do not write the window off – go again tomorrow.

## Day 2 – the second chance

Staggering (Chapter 3) means the peak is not the only chance. If conditions hold warm and humid, secondary flights commonly occur on the second day, and these quieter flights face less competition from other hunters. Some of the calmest, most productive catches happen here, after the crowd has declared the event over.


**FIGURE 13.1** The 72-hour window. The peak usually falls on the warm, calm recovery day, with a real second chance behind it.

#### FIELD NOTE · A GO-DAY CHECKLIST

- ✓ Tubes set up and hydrated the night before (Chapter 22)
- ✓ Small containers or an aspirator for collection
- ✓ Phone for photos, notes, and the flight log
- ✓ Knowledge of two or three nearby hotspots for your target's syndrome
- ✓ An hour of clear time inside the species' flight window

#### KEEPER'S TAKE

*I treat the 72-hour window as a standing appointment with the weather. When the forecast lines up a rain-then-warm sequence in season, those days go in my calendar like meetings. Most produce nothing, and that is fine – the cost of showing up is an hour outdoors, which is hardly a punishment. The window rewards patience and presence far more than cleverness.*

---

### THE BOTTOM LINE

Work the flight as a three-day window: the soaking rain on Day 0, the warm calm recovery on Day 1 where the peak usually falls, and the staggered second chance on Day 2. Prep the night before, be present during the flight hour, and do not quit after one day.

CHAPTER FOURTEEN

14

# Species Timing: A Field Calendar

> *A working, if approximate, calendar of when common North American genera fly – built to be corrected by your own local records, which will always beat any table.*

What follows is a starting map, not a timetable. Flight timing varies enormously with latitude, elevation, and year, and the same genus can fly weeks apart in Georgia and Michigan. Treat this calendar as a hypothesis you test and refine, and remember that a single season of your own logged sightings for your own yard will out-predict everything below.

### APPROXIMATE FLIGHT SEASONS, COMMON NORTH AMERICAN GENERA

| GENUS / SPECIES | TYPICAL SEASON | HOUR & NOTES |
|---|---|---|
| *Prenolepis imparis* (winter ant) | Late winter–early spring | Afternoon; first mild days; earliest flier in temperate N. America; often multiple queens found together |
| *Camponotus* (carpenter ants) | Late spring–summer | Often dusk/evening; males at lights; large, sought-after queens |
| *Tetramorium immigrans* (pavement ant) | Early–mid summer | Warm days; common in urban/suburban paving; abundant |
| *Lasius* (incl. black garden ants) | Summer–early fall | Warm, humid spells; big synchronized flights; some parasitic species need a host |
| *Solenopsis invicta* (fire ant) | Spring–summer (warm south: most months) | Day after rain, calm, ~21–33 °C; invasive – do not keep or move |
| *Pheidole* (big-headed ants) | Summer | Often after rain; warm evenings in many species |
| *Crematogaster* (acrobat ants) | Late summer–fall | Warm afternoons/evenings |
| *Formica* (field/wood ants) | Late spring–summer | Variable; both calling and aggregation species; some need a host |
| *Pogonomyrmex* (harvester ants) | Summer (monsoon in SW) | Midday leks; keyed to summer rains; can sting |
| *Brachymyrmex* (rover ants) | Summer | Tiny; easy to overlook; often after rain |

Seasons shift earlier in the south and at low elevation, later in the north and at altitude. Verify against local records every year.

## Two special cases worth knowing

**The winter ant is the season opener.** *Prenolepis imparis* flies before almost everything else, on the first genuinely mild afternoons of spring – as early as February in Florida, later as you move north (Formiculture; AntWiki). If you want a jump on the season and a forgiving beginner queen, this is where the calendar starts. It also frequently founds with multiple queens together, a behavior worth knowing before you separate captured foundresses.

**The fire ant is the cautionary tale.** *Solenopsis invicta* flies readily and abundantly across much of the warm south, but it is a destructive invasive species. Do not collect, keep, or transport it, and be aware that in infested regions it can dominate the flights you see. Learning to recognize and avoid it is part of responsible hunting.

> **WATCH OUT · KNOW THE LAW AND THE INVASIVES**
>
> Collection rules vary by country, state, and land ownership, and moving live ants across regions can be illegal and ecologically damaging. Never keep or relocate invasive species such as the red imported fire ant, and never release captive ants of any species into the wild. When in doubt, identify first and check local regulations before you collect.

**THE BOTTOM LINE**

Use this calendar as a first map: winter ants open the season, carpenter and pavement ants fill spring and summer, *Lasius* and acrobat ants run into fall, and harvester ants ride the southwestern monsoon. Then overwrite all of it with your own logged local records, which are always more accurate than any general table.

CHAPTER FIFTEEN

15

# Tools of the Trade

> *Prediction gets sharper with the right instruments: a weather app read the right way, community flight trackers, identification tools, and above all your own growing log.*

You do not need expensive equipment to predict flights, but a few tools compound over seasons into real skill. The most valuable of them is not a gadget at all; it is the record you keep of your own sky.

## The weather app, read correctly

Any decent forecast app can run the five-gate stack if you read the right fields: the daytime and evening temperature curve (not just the headline high), humidity or dew point, wind speed during the flight hour, and precipitation over the previous and coming days. Dew point is quietly the most useful humidity number, because it tracks the actual moisture in the air rather than a percentage that swings with temperature. Learn to glance at temperature, dew point, wind, and recent rain as a set.

## Community flight trackers

You are not the only person watching. Crowd-sourced tools aggregate real-time sightings so you can see what is flying near you right now.

Antflights.com maintains a worldwide registry of ant mating flights searchable by species and location, and it is one of the fastest ways to learn that your target has started (Antflights.com). iNaturalist observations and regional antkeeping forums – Formiculture and the AntsCanada community among them – carry "what's flying" threads that function as a live map during the season. When a nearby keeper reports a species you want, your own window has almost certainly opened too.

> **FIELD NOTE · TURN OTHER PEOPLE'S SIGHTINGS INTO YOUR ALERTS**
>
> Follow the flight registry and the local "nuptial flight sightings" threads for your region, and check them on every promising forecast day. A report of your target from twenty miles away, under similar weather, is a strong signal to get outside immediately. Contribute your own sightings too – the tools only work because keepers feed them.

## Identification tools

Catching a queen you cannot identify limits how well you can care for her, so pair collection with identification. AntWiki and AntMaps for range and biology, iNaturalist's suggestions and community IDs for a first pass, and regional keys or knowledgeable forum members for confirmation will get most catches to at least genus. Knowing the genus tells you the founding strategy, the diet, and whether you are holding something you should not be keeping at all.

## The log that beats every calendar

The single highest-return tool is your own flight log. For every flight you witness or miss, record the date, time, species or genus, the weather (temperature, dew point, wind, recent rain), the location and its landform, and the outcome. After even one season these records begin to reveal your local patterns with a precision no published calendar can match, because they are specific to your species, your microclimate, and your hunting grounds. Appendix A gives a ready-to-copy log template built for exactly this.

---

*The single highest-return tool is your own flight log – it becomes more accurate than any book, including this one.*

---

**KEEPER'S TAKE**

*Three seasons of logging turned me from someone who chased rumors into someone who knew, within a day or two, when my local carpenter ants would fly. The log did that, not any table. Start yours this season, log even the failures, and let it quietly make this book obsolete for your own back-yard.*

---

**THE BOTTOM LINE**

Read a weather app as temperature, dew point, wind, and recent rain; use flight registries and community threads as a live map; identify what you catch; and above all keep your own log. The tools compound – and the log, in particular, becomes the most accurate flight predictor you will ever own.

PART FOUR

# IV

# The Catch

*Where landed queens go, how to tell a mated foundress from a wasted gyne, what dealation really signifies, and how to collect and carry a queen without harming her.*

CHAPTER SIXTEEN

16

# Where Queens Land

> *A flight in the sky is a spectacle. A queen on the ground is the catch. Knowing where mated females come down – and building a search image for a lone walking queen – is what converts a flight into a colony.*

Once a queen has mated, her entire behavior flips from "get airborne and find a mate" to "get out of sight and dig in." She lands, and within moments she is looking for cover. This is the window in which you catch her, and it is short, because a queen who does her job well is underground fast. The keeper's edge is knowing where she is heading before she gets there.

## The landing behavior

A newly mated fire ant queen is a good model for the general pattern: she lands, breaks off her now-useless wings, and searches for a place to dig a nuptial chamber, which she then seals herself into (UF/IFAS Featured Creatures; Markin et al., 1971). Every mated ground-nesting queen runs some version of this program. She favors edges and cover – the base of a wall, the seam where pavement meets soil, under leaf litter, beside a stone, along a curb – because open ground is lethal and she instinctively seeks a crack to disappear into. She moves with purpose, not the aimless wandering of a worker.

## Building a search image

Most catching is not netting ants from the air; it is spotting lone dealate queens walking on the ground in the minutes and hours after a flight. Train your eye for a specific silhouette: a female noticeably larger than the workers of her species, often with a visibly bulkier thorax (the muscle-packed mesosoma), sometimes still carrying wings, frequently with the four wing scars where they have just come off. She will be crossing open surfaces – sidewalks, patios, paths – because those are exactly the places she is trying to get across to reach cover, and exactly the places you can see her.

**HIGH-PROBABILITY LANDING AND SEARCH SPOTS**

| SPOT | WHY QUEENS GO THERE |
|---|---|
| Sidewalks, patios, drive-ways | Open surfaces queens must cross to reach cover; easiest place to spot a walker |
| Wall bases & pavement seams | Edges and cracks offer immediate cover and diggable soil |
| Under leaf litter & flat stones | Damp, shaded, easy to excavate – prime founding sites |
| Pool decks & light-colored surfaces | Queens strand here; also where drowned queens accumulate after flights |
| Around outdoor lights (dusk/night) | Night-flying species and their males concentrate here |

#### FIELD NOTE · WALK SLOWLY, WATCH THE GROUND, WORK THE EDGES

After a flight, walk pavements and path edges slowly with your eyes down, scanning for a single larger ant moving with intent. Check under nearby leaf litter and flat stones. Pool decks and building foundations are reliable. The best time is during and just after the flight hour, but stranded queens can be found for hours afterward, especially where cover is scarce and they are still searching.

---

### THE BOTTOM LINE

Mated queens land and immediately hunt for cover to dig in, favoring edges, cracks, and damp shade – and they betray themselves crossing open surfaces to get there. Build a search image for a lone, large, purposeful dealate female, work pavements and edges during and after the flight hour, and you will convert flights into catches.

CHAPTER SEVENTEEN

17

# Mated or Not? Reading a Queen

> *Not every queen you pick up is mated, and an unmated gyne will never produce workers. Learning to read the signs of a successful mating saves you weeks of hope invested in a dead end.*

The hard truth of queen-hunting is that a female in your hand may be a foundress carrying a lifetime of sperm, or a virgin who never found a mate and will lay only unfertilized eggs that become useless males, if she lays at all. You cannot see sperm in a spermatheca through the exoskeleton, so you read proxies – behavioral and physical signs that correlate with a completed mating. None is perfect; together they tilt the odds.

## The single best sign: shed wings

The most reliable field indicator is dealation – wings already shed. A mated queen typically removes her wings soon after mating as she transitions to founding, so a female who has already dropped hers, or who does so shortly after you collect her, has very likely mated. Look for the four small wing scars on the thorax where the wings detached. This is not an absolute guarantee – occasional unmated females dealate under stress –

but among quick field cues it is the strongest, and the next chapter is devoted to why.

> **THE SCIENCE · WHY SHED WINGS SIGNAL MATING**
>
> Dealation is tied to the physiological switch from dispersal to reproduction. In most independently founding species, wing loss triggers or accompanies the mobilization of the flight muscles and fat reserves the queen will metabolize to rear her first brood (see Chapter 21). A queen who has committed to tearing off her wings has, in effect, committed to founding – a decision normally made only after mating. That coupling is why dealation is such a useful proxy, even though it is not infallible.

## Supporting signs

- **Behavior.** A mated queen acts like a foundress: she seeks darkness and cover, settles, and (once tubed) may begin laying. A queen still trying to fly, climbing to high points, or holding a calling posture may not have mated yet.
- **Context.** A queen found walking on the ground after a flight, searching for a nest site, is far more likely mated than one intercepted still trying to get airborne.
- **Timing after collection.** Give a tubed queen a few days of stillness and darkness. A mated foundress will often lay a batch of eggs; that is your confirmation. Unfertilized clutches from a virgin will yield only males, which never become the workers that build a colony.

**FIELD NOTE · WHEN IN DOUBT, TUBE HER AND WAIT**

You cannot always tell in the field, and that is fine. Collect promising dealate females, house each properly (Chapter 22), and let a week or two of stillness answer the question. Eggs that develop into workers confirm a mating; a queen who lays nothing, or produces only males, was unmated. Do not keep prying open the tube to check – disturbance does far more harm than uncertainty.

**KEEPER'S TAKE**

*Early on I agonized over whether each queen was mated and disturbed several to death trying to find out. The discipline that fixed it was simple: prioritize dealate females found walking after a flight, tube them, and trust time. The tube and the calendar are better diagnostic instruments than my impatience ever was.*

## THE BOTTOM LINE

You cannot see the sperm, so read proxies: shed wings are the strongest field sign, backed by founding behavior and the post-flight context in which you find her. When uncertain, house her well and let time answer – a batch of eggs that becomes workers is the only proof that counts.

CHAPTER EIGHTEEN

18

# Dealation: The Wings Come Off

> *Tearing off her own wings is the most decisive act of a queen's life – the irreversible moment she stops being a disperser and becomes a foundress. It is also the keeper's clearest signal.*

There is something startling about watching a queen dealate. She braces, works a leg or the ground against a wing base, and detaches the wings she grew, provisioned, and used just once. There is no going back: a dealate queen cannot fly again. This is not damage; it is a deliberate, programmed transition, and understanding it clarifies both the biology and the field craft.

## A one-way door

Wings are metabolically expensive to build and to carry, and after the flight they are worse than useless – they snag in tunnels and waste the muscle and tissue tied up in them. So the mated queen sheds them and repurposes what is underneath. In the fire ant, the newly mated queen breaks off her wings and then digs her founding chamber; the discarded wings that litter the ground after a flight are the visible residue of thousands of queens all making this same irreversible choice at once (Markin et al., 1971; UF/IFAS

Featured Creatures). Crossing this threshold is what makes a queen a foundress.

## Wings off, engine on

Dealation is not an isolated event; it opens the founding program. As the wings go, the large flight muscles that powered them begin to be broken down and converted into the reserves that will feed the first brood – the process detailed in Chapter 21. In this sense the shed wings are the outward sign of an internal switch being thrown: dispersal machinery is being scrapped for parts, and those parts become the colony's first workers. Wings off, engine on.

> *Dispersal machinery is being scrapped for parts, and those parts become the colony's first workers.*

**THE SCIENCE · DEALATION AS A COORDINATED SWITCH**

Wing loss in independently founding queens is coupled to a cascade: hormonal changes, the onset of flight-muscle histolysis, activation of the ovaries, and the behavioral shift to nest-founding. It is not merely "the queen removes an obstacle" but a synchronized reprogramming of her whole physiology from disperser to reproducer. This is why a female who has genuinely dealated is so likely to found: she has thrown the switch, not just dropped some wings.

**FIELD NOTE · LET HER KEEP OR SHED ON HER OWN SCHEDULE**

Never pull a queen's wings off for her. Some mated queens carry their wings for a while before shedding, and some shed only after settling into a tube; forcing it can injure her and tells you nothing reliable. Collect her as you find her – winged or not – give her a dark, still tube, and let her dealate in her own time. If she does, take it as a good sign; if she does not, judge her by whether she lays.

## THE BOTTOM LINE

Dealation is the irreversible act that turns a disperser into a foundress, coupled to the internal switch that converts flight muscle into the first brood's food. For the keeper it is the clearest signal that a queen has committed to founding – but let her do it herself, on her own schedule.

CHAPTER NINETEEN

19

# Collection and Transport

> *A queen who survived the flight can still die in your pocket. Gentle collection and calm transport are simple, and they are where a lot of promising catches are quietly lost.*

The catch is not finished when the queen is in your hand; it is finished when she is safely housed at home. The hours in between – picking her up, carrying her, getting her into a tube – are stressful for a small animal built to fear exposure, and rough handling here undoes everything. The good news is that doing it well requires almost nothing.

## Picking her up without harm

Do not pinch a queen with fingers or hard tweezers; her gaster is soft and easily ruptured. The gentlest methods are to let her walk into a small container or the mouth of a tube, or to coax her onto a leaf, a card, or a fingertip and transfer her. An aspirator (a simple mouth- or bulb-powered suction tube with a filter) is the tool experienced keepers reach for, because it lifts a queen with no pressure at all. Whatever you use, be calm and slow; a queen that feels trapped will run, and a chased queen is a stressed one.

**WATCH OUT · SOME QUEENS STING OR SPRAY**

Not every queen is harmless to handle. Harvester ants (*Pogonomyrmex*) and fire ants (*Solenopsis*) can deliver painful stings, and some species spray formic acid. Know your target before you scoop it barehanded, use a container or aspirator for anything that stings, and never handle fire ants at all – besides the sting, they are invasive and must not be kept.

## Transport: dark, still, and not too hot

For the trip home, less is more. A single queen in a small, dark container – or already in her test tube – kept out of direct sun and away from heat, will travel calmly. Darkness and stillness are what she wants; rattling her in a bright jar in a hot car is how catches die. Do not crowd multiple queens of unknown species together, as some will fight; keep them separate unless you know they found communally. Get her home and settled as soon as you reasonably can.

**FIELD NOTE · A MINIMAL, HUMANE KIT**

- ✓ A few small, clean containers or vials with lids (or pre-made test tubes)
- ✓ An aspirator for pressure-free pickup
- ✓ A card or leaf to coax queens onto
- ✓ A dark bag or box to keep containers shaded and calm
- ✓ Your phone for photos and log entries at the point of capture

## Straight into founding

The moment she is home, the priority is to get her into a proper founding setup and then leave her alone. That setup – the test tube with a water reservoir – is the subject of Chapter 22, and the founding process it kicks off is the whole of Part V. Collection done gently is simply the bridge between the flight and the founding: handle her as the fragile, valuable animal she is, and she will do the rest.

---

#### THE BOTTOM LINE

Collect with no pressure – a container, a card, or an aspirator, never a pinch – and transport dark, still, and cool. Keep unknown queens separate, respect the ones that sting, and move her into a founding tube and out of your hands as fast as you calmly can. The catch ends only when she is safely housed.

PART FIVE

V

# After the Catch

*What a foundress does in the dark: two founding strategies, the remarkable engine that fuels the first brood, the tube that supports it, and how to read trouble.*

CHAPTER TWENTY

20

# Claustral vs. Semi-Claustral

> *There are two fundamentally different kinds of foundress, and getting your queen's type wrong is the most common way keepers accidentally starve or expose a queen who would otherwise have thrived.*

Once a queen has landed, dealated, and dug in, she faces a stark problem: she must raise a first generation of workers with no workers to help her, and she must do it before she runs out of resources. Ants solve this problem in two broadly different ways, and which way your species uses dictates almost everything about how you should keep her during founding.

## Claustral founding: sealed in, living on reserves

The majority of familiar keeping species are *claustral* founders. A claustral queen seals herself into her chamber and never leaves; she does not forage. She rears her first brood entirely from her own body reserves – stored fat and, above all, the flight muscles she is now breaking down (Brown & Bonhoeffer, 2003; Hölldobler & Wilson, 1990). This strategy trades away the ability to gather more food in exchange for never exposing herself to the lethal risks of foraging. Because the great majority of ant species belong to a few large subfamilies (Formicinae, Dolichoderinae, Myrmicinae) in which claustral founding is the norm, most queens you catch will be of this type – and the correct care for them is to leave them completely alone.

## Semi-claustral founding: the queen who must forage

A minority of species, including many in the more ancestral lineages, are *semi-claustral*. These queens do leave the nest during founding to forage, because they do not carry enough reserves to raise a brood on their own body alone. A semi-claustral queen kept as if she were claustral – sealed in a tube with no food – will simply starve. She needs small prey or other food offered during founding.

> **THE SCIENCE · CAPITAL BREEDERS AND INCOME BREEDERS**
>
> Biologists describe the difference with an economic metaphor. Claustral foundresses are *capital breeders*: they raise the first brood on a fixed store of capital – histolyzed wing muscle and fat – laid down in advance. Semi-claustral (and non-claustral) foundresses are *income breeders*: they must earn resources by foraging as they go (Cronin et al., 2013). Claustral founding is derived from the ancestral non-claustral strategy uniquely within ants, and the reduced predation risk it offers is thought to be one of the traits behind the group's spectacular ecological success (Brown & Bonhoeffer, 2003; Peeters, 2020).

**FOUNDING STRATEGIES AT A GLANCE**

| | CLAUSTRAL | SEMI-CLAUSTRAL |
|---|---|---|
| Does she forage? | No – sealed in | Yes – leaves to hunt |
| Fuel for first brood | Body reserves (fat + flight muscle) | Reserves + foraged food |
| Economic type | Capital breeder | Income breeder |
| How common | Most keeping species | Minority; often ancestral lineages |
| Correct care | Dark tube, no food, do not disturb | Offer small food; more active setup |

**FIELD NOTE · IDENTIFY THE STRATEGY BEFORE YOU HOUSE HER**

Before you seal a new queen away and walk off, find out whether her species founds claustrally or semi-claustrally. Most common beginner queens – *Lasius*, *Camponotus*, *Tetramorium*, *Prenolepis* – are claustral and want to be left alone with no food. If your species is semi-claustral, plan to offer tiny prey during founding. Getting this one fact right prevents both starving a forager and needlessly disturbing a claustral queen.

## THE BOTTOM LINE

Claustral queens seal in and live on their own body; semi-claustral queens must forage. Most species you keep are claustral capital breeders that want darkness, stillness, and no food during founding – while semi-claustral queens need feeding. Identify which you have before you house her, because the two demand opposite care.

CHAPTER TWENTY-ONE

21

# The Engine Room: Flight-Muscle Histolysis

> *The most elegant piece of biology in this whole story: a claustral queen literally digests the muscles that flew her, converting yesterday's wings into tomorrow's workers.*

How can a queen sealed in the dark, eating nothing, produce a batch of hungry larvae and raise them all the way to adult workers? The answer was first glimpsed more than a century ago by the naturalist Charles Janet, and it remains one of the most striking metabolic feats in the insect world. She breaks down her own flight muscles and fat and feeds the products to her brood. Wings off, engine on – and now the engine itself becomes food.

## Histolysis: turning muscle into brood food

A young claustral queen carries enormous flight muscles relative to her body size, packed into the thorax, alongside a well-developed abdominal fat body (Peeters, 2020; Hölldobler & Wilson, 1990). After the flight, with the wings shed, those muscles are no longer needed – the queen will never fly again. So her body *histolyzes* them: the muscle tissue is enzymatically broken down and its proteins and lipids are mobilized as reserves. Together with the stored fat, these histolysis products supply the macronutrients –

proteins and lipids – that her first larvae need to grow (Matte & Billen, 2021; Johnson, 2006; Brown & Bonhoeffer, 2003). The queen is, in the most literal sense, spending her body to make her colony.

*The queen is, in the most literal sense, spending her body to make her colony.*

**THE SCIENCE · THE THORACIC CROP**

In some ants the mechanism is even more refined. Detailed work on *Lasius japonicus* queens showed that, as the flight muscles histolyze, the queen's esophagus expands into the space they vacate, forming a "thoracic crop" that fills with a yellowish, oily liquid used to feed the larvae. The team traced the timeline precisely: the foundress claustrally feeds her larvae from roughly weeks two to five after founding begins, with the first worker emerging around week six (Kurihara et al., 2022). The dorsal esophageal wall even develops pleated, thickened structures that let it expand rapidly into the freed thoracic space. It is a purpose-built internal food-delivery system, assembled on the fly from a disused engine bay.

## Why body condition is everything

If the first brood is built from the queen's reserves, then the size of those reserves sets a hard ceiling on how many workers she can produce. This is not a hobbyist's hunch; it has been demonstrated. Experimental feeding of *Lasius niger* foundresses – giving them extra resources despite their claustral nature – increased their brood size, showing that founding is genuinely limited by body condition (experimental feeding study, Biological Journal of the Linnean Society, 2024). A heavier, fatter, well-provisioned queen simply has more capital to spend, and tends to raise a larger, stronger first cohort. It is why the plump, freshly caught queens of a good flight are such prizes.

> **KEEPER'S TAKE**
>
> *Understanding histolysis rewired how I think about founding. A claustral queen refusing the food I offered was not being difficult – she was running an internal economy I could not improve by intruding on it, and every time I opened the tube to "help," I was taxing the very reserves she was carefully spending. The kindest, most productive thing I can do for a claustral foundress is nothing at all: darkness, humidity, stillness, and patience while her engine room does its work.*

---

### THE BOTTOM LINE

A claustral queen fuels her first brood by digesting her own flight muscles and fat – in some species even routing the products through a purpose-built thoracic crop – converting the machinery of dispersal into the colony's first workers. Because the brood is built from finite reserves, a queen's body condition sets the ceiling, and the keeper's job is simply not to interfere with the process.

CHAPTER TWENTY-TWO

22

# The Test-Tube Setup

> *The humble water-tube setup is the single most successful founding chamber ever devised for keepers. It works because it recreates exactly what a claustral queen's instincts are asking for: dark, damp, and undisturbed.*

For the overwhelming majority of claustral species, you do not need anything elaborate to found a colony. You need a test tube, some water, a plug of cotton, and the discipline to leave it alone. This setup has founded more captive colonies than every fancier apparatus combined, because it happens to reproduce the conditions of a natural founding chamber almost perfectly.

## How to build it

The classic water-tube is simple. Fill roughly a third of a test tube with clean water. Push a wad of cotton down against the water, compressing it so it holds the water back and forms a damp barrier – this creates a reservoir that will keep the tube humid for weeks or months. Place the queen in the dry section beyond the cotton, then plug the open end with a second piece of cotton to keep her in and let air exchange. That is the whole apparatus: a humid, dark tunnel with a queen at the closed end.


**FIGURE 22.1** The classic water-tube founding chamber: reservoir, cotton barrier, humid living space, and an outer plug.

## Where to keep it

Put the tube somewhere **dark, quiet, and free of vibration**, at a stable, moderate room temperature. Many keepers wrap the tube in foil or paper, or set it in a drawer or box, to keep it dark and to reassure the queen. Avoid direct sun (which cooks the tube), heat sources, and busy surfaces where it will be jostled. A claustral queen who feels safe settles and lays; one who feels exposed may pace, fail to lay, or even destroy her own eggs.

**WATCH OUT · THE URGE TO CHECK IS THE MAIN KILLER**

The most common way keepers lose founding queens is not neglect but the opposite – repeatedly unwrapping and inspecting the tube. Disturbed queens can abandon or eat their brood. Some species, such as *Prenolepis imparis*, are famously touchy and will drop their eggs at the slightest vibration or light (Tar Heel Ants). Decide on a check interval measured in weeks, not hours, and hold to it.

**FIELD NOTE · A FEW PRACTICAL REFINEMENTS**

- ✓ Use clean, dechlorinated or distilled water for the reservoir
- ✓ Pack the barrier cotton firmly so it does not leak or slide
- ✓ Keep claustral queens without food until the first workers arrive
- ✓ For semi-claustral species, offer tiny prey and a sugar source
- ✓ Label each tube with species, catch date, and location from your log

## THE BOTTOM LINE

A water tube – reservoir, cotton barrier, humid chamber, plug – recreates the dark, damp founding chamber a claustral queen's instincts demand, which is why it works so well. Keep it dark, stable, and vibration-free, resist the urge to check, and let the queen and her reserves do the work.

CHAPTER TWENTY-THREE

23

# The First Brood: Eggs to Nanitics

> *The weeks from first egg to first worker are the colony's most fragile. Knowing the normal timeline and the meaning of nanitic workers keeps you patient through the long, quiet wait.*

Once a claustral queen is settled, the founding sequence unfolds on its own schedule: eggs, then larvae, then pupae, then the first adult workers. It is slow, and the slowness is normal. The single biggest cause of founding failure among beginners is not any biological problem but human impatience – intervening during a wait that only ever needed to be left undisturbed.

## The timeline

Timing varies by species and temperature, but the shape is consistent. The queen lays a first clutch of eggs within days to a couple of weeks of settling. The eggs hatch into larvae, which she feeds from her histolysis products and thoracic-crop secretions; in *Lasius japonicus*, that claustral feeding runs across roughly weeks two to five (Kurihara et al., 2022). The larvae pupate, and the first workers emerge some weeks after founding began – around week six in that *Lasius* study, and about thirty days for fire ant nanitics (Kurihara et al., 2022; UF/IFAS Featured Creatures). Warmer temperatures within a species' safe range speed the whole sequence; cooler temperatures slow it.

**A REPRESENTATIVE FOUNDING TIMELINE (CLAUSTRAL, ROOM TEMPERATURE)**

| STAGE | ROUGH TIMING | WHAT YOU MAY SEE |
|---|---|---|
| Settling & first eggs | Days 1–14 | Queen calm; a small pile of tiny eggs |
| Larvae & claustral feeding | ~Weeks 2–5 | Grub-like larvae; queen tending brood |
| Pupae | ~Weeks 4–6 | Pale pupae (naked or cocooned by species) |
| First workers (nanitics) | ~Week 6+ (varies) | First small adult workers eclose |

## Why the first workers are so small

The first workers are called *nanitics*, and they are noticeably smaller than the workers a mature colony produces. This is not a defect; it is efficient rationing. Working from a fixed, finite pool of reserves, the queen makes the most of that capital by producing many small workers rather than a few large ones – getting a workforce on the ground as fast and cheaply as possible (UF/IFAS Featured Creatures). Nanitics are short-lived and undersized, but their job is simply to break the queen out of solitary confinement: once they can forage, the colony switches from spending capital to earning income, and later generations grow to full size.

*The nanitics' job is simply to break the queen out of solitary confinement.*

## The handoff: from capital to income

The emergence of the first nanitics is the turning point of the whole enterprise. From this moment the queen no longer bears the colony alone; the workers take over foraging, brood care, and nest maintenance, and the queen can settle into her long career as an egg-layer drawing on the sperm she banked at the flight. Now – and generally only now – is it time for the keeper to begin offering food: sugar water and small prey for the new workers to carry back. The claustral fast is over.

**FIELD NOTE · FEED WHEN THE WORKERS ARRIVE, NOT BEFORE**

For claustral species, resist feeding until you actually see workers. Offer a drop of sugar water and a small piece of insect near the tube opening once nanitics can forage, and keep disturbance minimal even then. Move the colony to a larger nest only when it has outgrown the tube – a young colony is almost always better off left in a setup that is working than rushed into a bigger one.

### THE BOTTOM LINE

Founding runs eggs → larvae → pupae → nanitics over roughly six weeks or more, all on the queen's reserves. The first workers are small by design, and their emergence flips the colony from spending capital to earning income – the moment to finally start feeding. Until then, the winning move is patience.

CHAPTER TWENTY-FOUR

24

# When Founding Goes Wrong

> *A troubleshooting chapter for the anxious keeper. Most founding failures trace to a handful of causes – and most of those causes are things the keeper did, or a queen who was never mated to begin with.*

Sooner or later a tube will worry you: no eggs, eggs that vanish, a queen who paces, mold creeping in. Before you intervene – and intervention is usually the wrong instinct – work through the common causes calmly. This chapter is a diagnostic, not a set of emergency surgeries, because for a founding queen the best emergency response is almost always to restore stillness and wait.

## No eggs after weeks

The most likely explanations, roughly in order: she was never mated (an unmated gyne may lay nothing or only male eggs); she is too disturbed (light, vibration, or repeated checking suppress laying); the temperature is too low for her species (cold slows or stalls the whole program); or, for some species, she needs a winter or diapause period before she will lay. Fixes are gentle: darken and stabilize the tube, stop checking, ensure a suitable temperature, and give it more time. If after ample time and perfect conditions there is still nothing, she was probably unmated – a disappointment, not a mistake you can fix.

## Eggs or larvae disappearing

A queen eating her own brood is alarming but often meaningful. Queens will cannibalize eggs and larvae under stress – disturbance is the usual trigger – and also, deliberately, when their reserves run dangerously low: rather than lose the whole clutch and herself, a queen may recycle some brood to keep the rest and her own body going. Touchy species such as *Prenolepis imparis* will drop or destroy eggs at the slightest provocation (Tar Heel Ants). The response is the same in almost every case: reduce disturbance to zero and let her recover. Do not start feeding a claustral queen in a panic; that is not what she needs.

> **WATCH OUT · MOLD AND MOISTURE PROBLEMS**
>
> Mold in a founding tube usually comes from introduced food (do not feed claustral queens) or from a fouled water reservoir. A little mold at the wet end is common and often harmless; spreading mold near the queen is a reason to move her, gently and once, into a fresh tube. Prevent it by keeping claustral tubes foodless, using clean water, and not over-handling. If you must transfer her, do it in dim light, quickly, and then leave the new tube strictly alone.

## A restless or dealation-refusing queen

A queen who paces constantly is usually telling you the setup does not feel safe: too much light, too much vibration, or too dry. Wrap the tube, move it somewhere still, and check the humidity. A queen who keeps her wings for a while is not necessarily a problem – some mated queens dealate late –

so judge her by laying, not by wings. Resist the urge to "do something"; in founding, doing something is usually the problem.

### FOUNDING TROUBLESHOOTING QUICK-REFERENCE

| SYMPTOM | LIKELY CAUSE | RESPONSE |
|---|---|---|
| No eggs after weeks | Unmated, disturbed, or too cold | Darken, stabilize, warm to species range, wait |
| Eggs/larvae vanishing | Stress or low reserves | Eliminate disturbance; do not feed claustral queens |
| Constant pacing | Light, vibration, or dryness | Wrap tube, move to still spot, check humidity |
| Spreading mold near queen | Food residue or fouled water | Gentle one-time transfer to a clean tube |
| Only male brood | Queen was unmated | Nothing to fix; unmated queens produce only males |

> **KEEPER'S TAKE**
>
> *Every founding queen I have lost to my own hands, I lost by intervening. The tubes I forgot about in a dark drawer are the ones that produced colonies. If I could give a new keeper one rule for Part V, it would be this: once a claustral queen is housed, treat checking on her as the risky act it is, and let boredom be your strategy.*

### THE BOTTOM LINE

Most founding failures come down to an unmated queen or a disturbed one, and most “emergencies” are solved by restoring darkness and stillness rather than intervening. Diagnose calmly, fix conditions gently and rarely, and remember that with a claustral foundress, patience is not passivity – it is the treatment.

PART SIX

# VI

# The Bigger Picture

*The lifetime consequences of one afternoon: banked sperm, the politics of one mate or many, the ants that skip the flight entirely, and a changing climate.*

CHAPTER TWENTY-FIVE

25

# Sperm for a Lifetime

> *Everything the flight is for comes down to one organ: the spermatheca, where a queen banks a single afternoon's sperm and draws on it, cell by cell, for decades.*

We keep returning to the strange economics of the flight – males cheap and disposable, queens expensive and long-lived – and it all converges on a single structure. Ant queens mate on one occasion early in life, store millions of sperm cells in a specialized sac called the spermatheca, and then use that stored sperm to fertilize eggs for the rest of their lives, which in many species means more than a decade and in some means several (Boomsma et al., 2005). A queen's lifetime output of daughters is, quite literally, capped by what she banked on her wedding afternoon.

## The numbers are staggering

The quantities involved defy intuition. A red imported fire ant queen stores on the order of seven million sperm (Tschinkel & Porter, 1988). A leaf-cutting ant queen, *Atta colombica*, stores on the order of *465 million* – enough to fertilize eggs for a colony that may grow to millions of workers over a decades-long reign (Baer et al., 2006). And critically, a queen's cumulative fecundity is limited by the number of sperm she initially stored, not by the number of eggs she can produce (Kraus et al., 2004). She can always make more eggs; she can never make more sperm. This single fact explains why the flight is worth dying for, why males are built solely to fill that reservoir, and why a queen is so cautious with her one and only mating.

**STORED SPERM: A FEW REFERENCE POINTS**

| SPECIES | APPROX. STORED SPERM | SOURCE |
|---|---|---|
| Fire ant, *Solenopsis invicta* | ~7 million | Tschinkel & Porter, 1988 |
| Honey bee, *Apis mellifera* | ~5.5 million | Baer et al., 2016 |
| Leaf-cutter, *Atta colombica* | ~465 million | Baer et al., 2006 |

## Keeping sperm alive for decades

Storing sperm for years is a formidable biological problem: sperm cells are metabolically demanding and prone to damage, yet a queen must keep hers viable for her entire life. Ants have evolved remarkable solutions. The spermatheca is a sealed, specialized environment that holds stored sperm at very low oxygen, in a low-metabolism, immobilized state that dramatically slows the damage which would otherwise accumulate (Gotoh et al., 2017). Seminal fluid contributes too, enhancing sperm viability from the moment of mating (den Boer, Boomsma & Baer, 2008). Maintaining this living archive costs the queen real metabolic energy, and it can trade off against other demands such as immunity (stored-sperm viability study, Proceedings of the Royal Society B, 2018).

#### THE SCIENCE · A SUSPENDED-ANIMATION LIBRARY

Think of the spermatheca as a library where the books must last a century and be checked out one page at a time. The low-oxygen, sealed environment is like keeping that library cold and dark: metabolism drops, damage slows, and the collection survives far longer than it otherwise could. When the queen fertilizes an egg, she releases just a few sperm from storage – a precisely metered withdrawal that, in a large leaf-cutter, must last hundreds of millions of eggs and many years without waste.

#### KEEPER'S TAKE

*This is the chapter that made me stop thinking of the flight as a spectacle and start thinking of it as the most consequential ninety seconds of an animal's life. When I watch a founding queen lay, I try to remember that every fertilized egg is a withdrawal from a bank she filled on one afternoon and can never top up. It makes the whole quiet business of a tube in a drawer feel a lot less quiet.*

---

#### THE BOTTOM LINE

The spermatheca is the point of the whole flight: a queen banks millions – sometimes hundreds of millions – of sperm in one mating and meters them out over a decades-long life, kept viable in a low-oxygen, sealed archive. Her lifetime output is capped by that single deposit, which is exactly why the flight is worth everything the colony pours into it.

CHAPTER TWENTY-SIX

26

# Polyandry, Monogyny, and the Keeper

> *How many males a queen mates with, and how many queens share a nest, are not academic details – they shape a colony's genetics, its temperament, and how you should house the queens you catch.*

Two numbers quietly define a colony's social structure: how many *mates* a queen takes, and how many *queens* a mature colony contains. The first is the difference between monandry (one mate) and polyandry (many); the second is the difference between monogyny (one queen) and polygyny (many). Both vary between and even within species, and both have consequences a keeper meets in practice.

## One mate or many

The ancestral condition in ants is monandry: a queen mates with a single male. Polyandry – mating with several – evolved secondarily, multiple times, from those monandrous ancestors (Boomsma et al., 2005; Hughes et al., 2008). Where it occurs, polyandry increases the genetic diversity of a queen's daughters, which can bring benefits such as improved disease resistance and a more varied workforce, at the cost of storing and managing sperm from several rival males in one spermatheca. The leaf-cutters, with their colossal sperm stores, are highly polyandrous; many other ants take a single mate. For the keeper this mostly matters as context, but it explains why some colonies show more within-nest variation than others.

## One queen or many

Colony queen number is the difference that keepers feel most directly. Monogyne colonies have a single queen; polygyne colonies tolerate several. The red imported fire ant is the textbook case of a species with both social forms, and they differ in far more than queen count – they diverge in queen longevity, dispersal, body weight, and how new colonies are founded (Ross, 1993; Tschinkel, 2006). Polygyne queens are often lighter and less able to found independently, tending instead to be adopted into existing nests.

> **THE SCIENCE · FOUNDING TOGETHER: PLEOMETROSIS**
>
> Some queens found colonies *together* even when the mature colony will end up monogyne – a strategy called pleometrosis. Multiple foundresses cooperate to raise a first brood faster and more successfully, after which, in many species, the association breaks down and a single queen prevails. The winter ant *Prenolepis imparis* commonly founds with multiple queens together, and keepers often deliberately house two or more *Prenolepis* foundresses to improve founding success (Tar Heel Ants). Knowing whether your species founds alone or in groups tells you whether to separate captured queens or leave them together.

#### FIELD NOTE · SEPARATE OR COMBINE – KNOW BEFORE YOU DECIDE

Before housing multiple queens of one species together, find out whether they found communally. For strictly single-founding species, two queens in a tube may fight to the death, so house them separately. For pleometrotic species such as *Prenolepis imparis*, combining foundresses can raise your success rate. This is a per-species decision, and getting it wrong in either direction costs queens.

---

### THE BOTTOM LINE

Mate number (monandry vs polyandry) shapes a colony's genetic diversity; queen number (monogyny vs polygyny) shapes its social structure and founding behavior. For the keeper the practical payoff is knowing whether your species founds alone or in groups – a fact that decides whether captured queens should be separated or combined.

CHAPTER TWENTY-SEVEN

27

# Ants That Skip the Flight

> *The nuptial flight is dominant but not universal. A significant minority of ants reproduce with little or no flying at all – and understanding them completes the picture and explains some of the hobby's hardest species.*

This whole book has centered on the winged nuptial flight because it is how most ants reproduce and disperse. But evolution rarely leaves a single strategy unchallenged, and a meaningful fraction of ant species have reduced or abandoned the flight in favor of alternatives. These are not curiosities; they include some of the most successful and troublesome ants on the planet.

## Budding and fission: walking, not flying

In *colony budding* (or fission), a new colony forms when a portion of an existing one – one or more queens plus a group of workers – simply walks away and sets up nearby, rather than sending lone queens into the air. Dependent colony foundation of this kind has evolved in more than fifty ant genera (Kurihara et al., 2022). It trades the vast reach of flight for near-certain local success: a budded colony arrives with workers already in hand, skipping the deadly solitary founding stage entirely. The Argentine ant, one of the world's worst invasive species, spreads largely this way, forming sprawling interconnected supercolonies with many queens and no need for risky mating flights.

## Cloning and other shortcuts

A few species have gone further and reduced their reliance on males and mating altogether. In some ants, workers or queens can produce female offspring by parthenogenesis – effectively cloning – and the little fire ant, *Wasmannia auropunctata*, is famous for an unusual reproductive system that incorporates clonal production of both queens and males (Fournier et al., 2005). These systems blur the tidy story of "fly, mate, found," and they are part of why ants as a group are so evolutionarily flexible and so hard to eradicate when they turn invasive.

**ALTERNATIVES TO THE WINGED NUPTIAL FLIGHT**

| STRATEGY | HOW NEW COLONIES FORM | EXAMPLE |
|---|---|---|
| Independent flight founding | Lone winged queen flies, mates, founds alone | Most keeping species |
| Budding / fission | Queen(s) + workers walk off to a new site | Argentine ant; many polygyne ants |
| Parthenogenesis / cloning | Females produced without fertilization | *Wasmannia auro-punctata* |

**FIELD NOTE · WHY SOME SPECIES RESIST THE TUBE**

If a species founds by budding rather than independent flight, catching a single lone queen and expecting a classic claustral founding may frustrate you – her natural path needs workers alongside her. This is one reason certain species are considered difficult for keepers who only collect solitary post-flight queens. Knowing your target's founding mode explains a lot of otherwise baffling failures.

---

### THE BOTTOM LINE

Not all ants fly. Budding and fission spread colonies on foot with workers in tow, and a few species clone themselves – strategies that skip the deadly solitary founding stage and power some of the worst invasives. Knowing whether your target flies or buds explains both its ecology and why some species defy the standard tube method.

CHAPTER TWENTY-EIGHT

28

# Climate and the Future of Flight

> *Flights are keyed to temperature and rain, so a changing climate is already reshaping when and where ants take wing. What that means for keepers, and for the ants, is only beginning to come into focus.*

If the flight is triggered by warmth and moisture, then anything that shifts warmth and moisture will shift the flight. That makes nuptial flights a sensitive, visible indicator of a warming and more variable climate – and it makes the timing you log today potentially different from what your predecessors saw a generation ago.

## Earlier and shifting flights

The clearest expected signature is a shift in *phenology* – the seasonal timing of the flight. Warmer springs push temperature thresholds earlier, so flights that once fell in high summer may creep forward. Forecasters in Britain, for instance, anticipated that alternating warm and wet conditions could trigger earlier and more synchronized emergence in recent seasons (Best Ants UK, 2026). The urban heat island effect offers a preview of the mechanism at local scale: warmer city air already makes urban flights earlier than rural ones (Natural History Museum). Scale that warming up across whole regions and seasons, and flight calendars – including the one in Chapter 14 – become moving targets.

## Range shifts and invasives

Temperature also sets the geographic limits of who can fly where. The red imported fire ant was long predicted to be barred from colder, higher-elevation areas by winter freezes, yet there is growing evidence that those cold limits are less fixed than once assumed, as researchers probe how the species tolerates and acclimates to lower temperatures. As minimum temperatures rise and cold snaps become less reliably lethal, the boundaries that once contained warm-climate and invasive species may loosen, letting flights – and the colonies they seed – reach places they could not before. For a keeper, this can mean new species appearing locally; for ecosystems, it can mean unwelcome arrivals.

**THE SCIENCE · SYNCHRONY UNDER A NOISIER CLIMATE**

Synchrony depends on many colonies reading the same reliable cues. A more variable climate – erratic rainfall, unseasonable heat, unpredictable fronts – could in principle disrupt that shared signal, smearing tight flights into ragged ones or causing mistimed launches into conditions poor for founding. Near the equator, where seasonal cues are already weak, some species may struggle to synchronize at all, with possible consequences for the population sizes needed to keep flights viable. How ant flights will hold up as their environmental clock grows noisier is an open and important question.

#### KEEPER'S TAKE

*I mention this not to editorialize but because it bears directly on the craft. If flight timing is shifting, then old calendars – again, including mine – will drift out of date, and the keeper's own year-by-year log becomes more valuable, not less. Your records are a small piece of climate data as well as a hunting tool. Log carefully, and you are watching the future of the flight arrive in your own backyard.*

---

#### THE BOTTOM LINE

Because flights track temperature and rain, a warming, more variable climate is already nudging them earlier, shifting where species can fly, and potentially disrupting the synchrony they depend on. The practical upshot for keepers is humility about fixed calendars and fresh value in personal, well-kept records – which double as a front-row log of a changing world.

• • •

# Appendix A · The Nuptial Flight Log

COPY THIS. FILL IT IN EVERY FLIGHT. IT WILL BECOME YOUR BEST PREDICTOR.

As argued in Chapter 15, your own records will out-predict any published calendar within a season or two, because they are specific to your species, your microclimate, and your hunting grounds. Photograph this page, redraw it in a notebook, or rebuild it in a spreadsheet – the format matters less than the discipline of recording every flight, including the failures.

**FLIGHT LOG – ONE ROW PER OBSERVATION**

| DATE | TIME | SPECIES / GENUS | TEMP | DEW PT / HUMIDITY | WIND | RAIN (LAST 48H) | LOCATION & LANDFORM | RESULT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### WHAT TO NOTE IN "RESULT"

Record whether you saw males only, a full flight, or nothing; how many queens you found; whether they were dealate; and, later, whether any went on to lay and produce workers. Over time, tie each successful catch back to its weather row – that is how you learn your own local trigger thresholds.

# Appendix B · Regional Quick-Reference (US)

A ROUGH STARTING MAP BY REGION. ALWAYS VERIFY AGAINST LOCAL RECORDS.

Flight seasons shift earlier in the south and at low elevation, and later in the north and at altitude. The table below is a coarse orientation only; the differences between a warm coastal city and a cold inland highland a hundred miles away can be weeks. Treat it as a hypothesis to correct with your log (Appendix A) and community trackers (Chapter 15).

**APPROXIMATE ACTIVE FLIGHT WINDOWS BY US REGION**

| REGION | SEASON OPENS | PEAK ACTIVITY | NOTES |
|---|---|---|---|
| Southeast | Late winter (winter ants); spring | Spring–summer | Long season; fire ants abundant (do not keep) |
| Northeast | Early–mid spring (winter ants) | Late spring–summer | Camponotus and Lasius prominent; fall Lasius flights |
| Midwest | Spring | Summer | Strong summer flights after storm systems |
| Southwest | Spring; summer monsoon | Summer (monsoon) | Harvester ant leks keyed to summer rains |
| West Coast | Late winter–spring (winter ants) | Spring–summer | Mild coastal timing; drier interior later |

The winter ant (*Prenolepis imparis*) opens the season almost everywhere it occurs, flying on the first mild afternoons well before other genera.

# Appendix C · Field Kit & Trigger Checklist

THE TWO LISTS TO PHOTOGRAPH AND CARRY.

### THE FIVE-GATE TRIGGER CHECKLIST

- ✓ **Season:** is it a week this species can fly for your area?
- ✓ **Temperature:** is the forecast in the species' flight window during its hour?
- ✓ **Moisture:** humid, ideally within a day or two of a soaking rain?
- ✓ **Wind:** calm during the flight hour? (a stiff wind vetoes everything)
- ✓ **Hour:** can you be in the field during the species' window (afternoon / dusk / night)?

Four or five gates open is a go. A shut season gate or a shut wind gate is a stay-home, whatever else reads.

### THE HUMANE FIELD KIT

- ✓ Pre-made test tubes (water reservoir + cotton), hydrated the night before
- ✓ Small clean containers or vials with lids
- ✓ An aspirator for pressure-free pickup
- ✓ A card or leaf to coax queens onto
- ✓ A dark bag or box to keep containers shaded and calm
- ✓ Phone for photos, IDs, and log entries at the point of capture

- ✓ Knowledge of two or three local hotspots matched to your target's syndrome

### THE FOUNDING GOLDEN RULES

- ✓ Identify the founding strategy (claustral vs semi-claustral) before housing
- ✓ Claustral queens: dark, humid tube, no food, do not disturb
- ✓ Semi-claustral queens: offer tiny prey and a sugar source
- ✓ Check in weeks, not hours – the urge to inspect is the main killer
- ✓ Feed claustral colonies only once the first workers arrive
- ✓ Collect legally and responsibly; never keep or move invasive species

# Glossary

THE WORKING VOCABULARY OF THE FLIGHT

### Alate

Any winged reproductive ant, male or female, before mating and dealation.

### Budding (fission)

Formation of a new colony when a queen (or queens) and a group of workers leave an existing colony on foot, rather than by nuptial flight.

### Claustral founding

A queen seals herself in and rears her first brood entirely from her own body reserves, without foraging. A capital-breeding strategy.

### Dealation

The shedding of the wings by a mated queen, marking her irreversible switch from disperser to foundress.

### Drone (male)

A winged male ant, developing from an unfertilized egg, whose role is to deliver sperm; typically short-lived.

### Female-calling syndrome

A mating strategy in which a female releases pheromone to attract searching males; loosely synchronized.

### Foundress

A mated, dealate queen in the process of founding a new colony.

### Gyne

A virgin winged female – a queen that has not yet mated.

### Hilltopping

Landmark-based mating in which reproductives converge on the highest local feature.

### Histolysis (flight-muscle)

The breakdown of the queen's flight muscles after the flight, converting them into reserves used to feed the first brood.

### Lek

A traditional mating arena where males gather to compete and females arrive to mate, reused across generations.

### Male-aggregation syndrome

A mating strategy in which males gather in swarms or at landmarks that females fly into; tightly synchronized.

### Monandry / Polyandry

Mating with one male (monandry) versus several (polyandry).

### Monogyny / Polygyny

A mature colony with one queen (monogyny) versus several (polygyny).

### Nanitic

A first-generation worker, smaller than later workers, produced from the founding queen's finite reserves.

### Nuptial flight

The synchronized dispersal-and-mating flight of an ant colony's winged reproductives.

### Pleometrosis

Colony founding by multiple cooperating queens.

### Semi-claustral founding

A foundress that leaves the nest to forage while rearing her first brood. An income-breeding strategy.

### Spermatheca

The queen's sperm-storage organ, holding a single mating's worth of sperm for her entire life.

### Thoracic crop

An expansion of the queen's esophagus into the space freed by flight-muscle histolysis, storing liquid food for larvae.

# References

PEER-REVIEWED AND AUTHORITATIVE SOURCES CITED IN THIS BOOK


Baer, B., et al. (2006). Sperm storage and sperm number in the leaf-cutting ant *Atta colombica*. (As cited in social-insect sperm-storage reviews.)

Baer, B., et al. (2016). Sperm number in the honey bee *Apis mellifera*. (As cited in social-insect sperm-storage reviews.)

Boomsma, J.J., Baer, B. & Heinze, J. (2005). The evolution of male traits in social insects. *Annual Review of Entomology*, 50, 395–420.

Brown, M.J.F. & Bonhoeffer, S. (2003). On the evolution of claustral colony founding in ants. *Ethology Ecology & Evolution*, 15, 249–261.

Cronin, A.L., Molet, M., Doums, C., Monnin, T. & Peeters, C. (2013). Recurrent evolution of dependent colony foundation across eusocial insects. *Annual Review of Entomology*, 58, 37–55.

den Boer, S.P.A., Boomsma, J.J. & Baer, B. (2008). Seminal fluid enhances sperm viability in the leaf-cutting ant *Atta colombica*. *Behavioral Ecology and Sociobiology*, 62, 1843–1849.

Fournier, D., Estoup, A., Orivel, J., Foucaud, J., Jourdan, H., Le Breton, J. & Keller, L. (2005). Clonal reproduction by males and females in the little fire ant, *Wasmannia auropunctata*. *Nature*, 435, 1230–1234.

Gotoh, A., et al. (2017). Transcriptome profiling of the spermatheca identifies genes potentially involved in the long-term sperm storage of ant queens. *Scientific Reports*, 7, 5972.

Hölldobler, B. (1976). The behavioral ecology of mating in harvester ants (*Pogonomyrmex*). *Behavioral Ecology and Sociobiology*, 1, 405–423.

Hölldobler, B. & Bartz, S.H. (1985). Sociobiology of reproduction in ants. In: B. Hölldobler & M. Lindauer (eds.), *Experimental Behavioral Ecology and Sociobiology*. Sinauer, Sunderland, MA, pp. 237–257.

Hölldobler, B. & Wilson, E.O. (1990). *The Ants*. Belknap Press of Harvard University Press, Cambridge, MA.

Hughes, W.O.H., Oldroyd, B.P., Beekman, M. & Ratnieks, F.L.W. (2008). Ancestral monogamy shows kin selection is key to the evolution of eusociality. *Science*, 320, 1213–1216.

Janet, C. (1907). Histolysis of the flight muscles following the nuptial flight in *Lasius niger*. Limoges. (Original description of flight-muscle histolysis.)

Johnson, R.A. (2006). Capital and income breeding and the evolution of colony-founding strategies in ants. *Insectes Sociaux*, 53, 316–322.

Kraus, F.B., et al. (2004). Sperm limitation and the evolution of extreme polyandry in social insects. (As cited in social-insect reproductive reviews.)

Kurihara, Y., Ogawa, K., Chiba, Y., Hayashi, Y. & Miyazaki, S. (2022). Thoracic crop formation is spatiotemporally coordinated with flight muscle histolysis during claustral colony foundation in *Lasius japonicus* queens. *Arthropod Structure & Development*, 69, 101169.

LePrince, D.J. & Francoeur, A. (1986). Hilltop swarming by ants (Hymenoptera: Formicidae) in southwestern Quebec. *The Canadian Entomologist*.

Markin, G.P., Dillier, J.H., Hill, S.O., Blum, M.S. & Hermann, H.R. (1971). Nuptial flight and flight ranges of the imported fire ant, *Solenopsis saevissima richteri*. *Journal of the Georgia Entomological Society*, 6, 145–156.

Matte, A. & Billen, J. (2021). Flight-muscle histolysis in founding ant queens. (Morphological study of colony foundation.)

Peeters, C. (2020). Independent colony foundation and the evolution of queen traits in ants. (Review.)

Ross, K.G. (1993). The breeding system of the fire ant *Solenopsis invicta*: effects on colony genetic structure. *The American Naturalist*, 141, 554–576.

Shik, J.Z., Donoso, D.A. & Kaspari, M. (2013). The life history continuum hypothesis links traits of male ants with life outside the nest. *Entomologia Experimentalis et Applicata*, 149, 99–109.

Tschinkel, W.R. (2006). *The Fire Ants*. Belknap Press of Harvard University Press, Cambridge, MA.

Tschinkel, W.R. & Porter, S.D. (1988). Efficiency of sperm use in queens of the fire ant, *Solenopsis invicta*. *Annals of the Entomological Society of America*, 81, 777–781.

Vogt, J.T., et al. (2000). Flight energetics and dispersal capability of the fire ant, *Solenopsis invicta* Buren. *Journal of Insect Physiology*, 46.

*Proceedings of the Royal Society B* (2018). Impact of immune activation on stored sperm viability in ant queens. 285, 20182248.

*Biological Journal of the Linnean Society* (2024). Claustral colony founding is limited by body condition: experimental feeding increases brood size of *Lasius niger* queens.

Antflights.com. Worldwide system for registration of ant mating flights.

AntWiki. *Nuptial Flights and Mating*; species accounts. antwiki.org.

BiodiversityWorks. Winter Ant (*Prenolepis imparis*).

Natural History Museum (London). Flying ant day: when winged ants take their nuptial flight. nhm.ac.uk.

Tar Heel Ants. *Prenolepis imparis*, the Winter Ant: nuptial flights and founding.

University of Florida IFAS, Featured Creatures. Red Imported Fire Ant, *Solenopsis invicta* (EENY-195).

Where a work is listed with “et al.” or by journal and year, the specific claim is drawn from that source as cited in the peer-reviewed literature; full author lists and page ranges can be located via the journal and year given. Popular and institutional web sources are cited for hobby practice and observational timing, and are distinguished from the peer-reviewed record.

# About the Author

ANTADDICT FIELD LIBRARY

## Sabri Hayouni

Sabri Hayouni is the founder and author of **antaddict.com**, an ant-keeping resource built on real observation and honest, sourced writing. He has spent six years keeping and observing ant colonies – founding queens, raising broods, and learning, often the hard way, what actually works. His approach across the Antaddict Field Library is the one you have just read: pair the real peer-reviewed science with hands-on keeper experience, hedge honestly where the evidence is thin, and never overclaim.

This book joins earlier Antaddict manuals on ant diapause and on ants and water. For articles, updates, corrections, and more of the Field Library, visit **antaddict.com**.

### A CLOSING WORD

The nuptial flight rewards attention more than expertise. You do not need rare equipment or a biology degree – you need to understand what the colonies are reading, to be outside on the right afternoon, and to treat the queen you catch as the improbable survivor she is. Log what you see, collect responsibly, and let your own backyard teach you what no book can. I hope this one gets you standing under the flight when it comes.

• • •