

## Sky Hunters and their Territories

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### SUMMARY

Territoriality is a pronounced marking behavior observed in non-social insects orders like Odonata. The mating tactics of species decide their territoriality behavior. It affects the survival and evolution of odonate species. There are several factors that govern territoriality ranging from body size to the sex ratio. Huge cost is paid by the species to establish territories and find mates. However, the genetic mechanisms lying underneath are not yet completely studied.

### INTRODUCTION

On this earth, there are many organisms with the tendency to mark the place where they carry out various activities, a tiger using glandular secretions or its claws to scratch the trees and many more like cats, dogs etc. In insects this marking behavior is predominantly seen in social insects like ants, termites, honey bees etc. Few non-social insects also show this behavior and one such group is order Odonata with 3 sub-orders, Anisoptera (dragonflies), Zygoptera (damselflies) and Anisozygoptera. They are general predators both in their immature and adult stages hunting on aquatic and flying prey, respectively.

### Biology and mating behaviour:

Females lay eggs in groups that hatch into “pro-larvae” in 2-5 weeks and enter “naiad” stage in few hours. These naiads after completion of their developmental period of 1-2 years climb out of their habitats and start emerging into “tenerals” with transparent wings. The adult longevity is 1-2 weeks and it varies with the species. Adults and young ones inhabit different habitats to reduce competition for resources. After finding a suitable mate, the male holds the willful female’s prothorax with his claspers forming a ‘mating wheel’ during copulation. The males of a few species can be seen still holding the female prothorax in a ‘tandem position’ till they find a suitable visit. They may oviposit on leaf surface, beneath water surface, on plant stem, on plants under water, under tree bark, on rock surface, on rotten wood which varies with the species and resource availability.

### Alternative mating tactics:

The males of Odonata have alternative mating tactics like territoriality, non-territoriality, and reversing switches between the two. In the first case, the males will hold the ownership of a territory and mate with the females which enter that area. In the second strategy, male will be either a *sneaker* who hides from the owner of the territory and mates with the incoming females willingly or forcibly or will be a *wanderer* who actively searches for females with or without entering the territory of the owner. In the last tactic, the male will maintain its territoriality for some duration of time and switches to non-territoriality whenever required based on the prevailing conditions in that area (Suhonen *et al.*, 2008).

### Territoriality:

A territory is a limited area in which the individual insect roams, within which no other similar insect is tolerated, and which is occupied for some space of time (Quentin, 1934). According to many evolutionary biologists, in Odonata, males guard the places which are preferred by females for mating and oviposition, for assured mating. In a territory, male majorly exhibits sexual/ mating and/ or aggressive behaviors where he might display his abdomen, chase or fight to keep the intruder away (Moore, 1952). Odonates have a complex variety of territorial systems ranging from aggressive behavior without residentiality to complete intolerance of conspecific males and strong site attachment as males of this species leave the breeding pond each evening and re-establish territories in new locations the following morning.

**Factors influencing territoriality:**

1. **Body size**, order of arrival of males, age determination, food resource availability, male migration among habitats, presence of sunlight are few factors
2. **Internal parasites:** Gregarine is a protozoan internal parasite affecting hindgut, fat reserves and flight muscles. Males in good condition are able to occupy and defend territories. High gregarine incidence and intensity in *Libellula pulchella* males lead to shift towards non-territoriality as these non-territorial males can compensate for metabolic disorders by spending less time in search of mates or in challenging territorial owners (Suhonen *et al.*, 2008).
3. **Sex ratio:** The sex ratio at breeding sites is highly male-biased in Odonata. Only a few males achieve most of the matings in territorial species, as females prefer to mate with territorial males. If females are abundant in relation to males at the breeding sites, it may be more profitable for territorial males to adopt non-territorial tactics as it saves time and energy otherwise spent in territoriality.

**Benefits of territoriality:**

Both males and females derive benefits from territoriality. For males, the main benefit of defending a territory is increased access to females along with proper defense and distribution of critical resources and special distribution of both the sexes and their young ones. For females, mating with a territory owner reduces harassment during copulation or oviposition. It also reduces the risk of predation for the female herself and/or her offspring. High quality of a territory is associated with high egg hatching success and offspring survival which finally leads to overall reproductive and foraging success of the individuals. Mating success in territorial individuals has been found to be considerably higher than in non-territorial ones and is one of the important benefits of territorial behavior.

**Costs of territoriality:**

The potential costs of agonistic interactions, and therefore of perch defense, are those commonly enumerated

1. **Energetic and other physiological costs-** Heightened aggressiveness reduces the flow of energy towards immunity building which further makes the individuals prone to parasites and pathogens.
2. **Injury cost-** In severe cases, might result in mortality.
3. **Opportunity cost-** Loss of time and energy, loss of mate, a nonterritorial male may capture a female that has arrived in a territory while the territory owner is currently engaged in a contest and increased predation risk as male while fighting may get disoriented and attract predators like birds, spiders and other dragonflies while in air.
4. **Cost for females-** Mating with highly successful males may reduce the rate of egg fertilization, possibly because these males allocate fewer sperm to each particular copulation when mating repeatedly over a relatively short time.

**CONCLUSION**

Male territoriality is the result of natural selection where males with adaptive potential are chosen. The male who is stronger, comes first to the perch and guards ovipositing female has better hold on his territory and high reproductive success. Age, parasites, population density and competition from other species along with many environmental factors influence the outcome of aggressive contests. Holding the ownership of a territory is expensive but it's compensated by the reproductive success. Study of the factors governing the outcomes of territorial conflicts helps in understanding the evolution of territoriality and mating behavior. Knowledge about behavior, habit and habitat helps in conservation. For a male odonate, getting the ownership of the territory of its father is not a rule but a chance. They fight for what they want.

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