

# LEK DISPLAY

Authored by  
**mohammad looti**

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## Lek Display

**Primary Disciplinary Field(s):** Ethology, Behavioral Ecology, Evolutionary Biology

### 1. Core Definition

The **Lek Display** is a crucial concept in behavioral ecology describing an aggregation of males gathered at a communal site solely for the purpose of sexual display to attract visiting females. This site, known as a **lek**, is typically neutral--meaning it provides no resources (such as food, nesting sites, or safety) that the females would seek out other than the opportunity for copulation. The defining characteristic of the lek system is that mating success is highly skewed; often, a small percentage of dominant males secure the vast majority of matings.

Within the lek, males establish and rigorously defend small, temporary territories, which are usually only large enough to accommodate the male and the physical space required for his elaborate courtship performance. These territories lack tangible resources, distinguishing them sharply from resource-defense polygyny systems. The displays themselves are usually multimodal, involving complex visual presentations (e.g., bright plumage, specialized dances), intricate vocalizations, and sometimes olfactory signals, all intended to signal genetic quality, vigor, and fitness to choosy females.

### 2. Etymology and Historical Development

The term "lek" originates from the Swedish word *lek*, meaning "play" or "game," particularly referring to the courtship rituals or mating games of birds, such as the Black Grouse. The biological concept was formalized primarily through early 20th-century studies focusing on avian species. Pioneering ethologists recognized this unique mating system where males aggregated without providing parental care or resources, challenging traditional understandings of territory definition in resource-based systems.

The formal study of lekking intensified in the mid-to-late 20th century as researchers sought to understand the evolutionary pressures driving such high-density male aggregation, particularly when such behavior increases predation risk and competition intensity. Key advancements involved applying game theory and population genetics to model why joining a lek, rather than displaying solitarily, offered a fitness advantage, leading to the development of several competing hypotheses explaining lek formation. The recognition of lekking across diverse taxa--including mammals, insects, and fish--cemented its status as a fundamental mating strategy in evolutionary biology.

### 3. Key Characteristics

Lek mating systems are characterized by a specific suite of behaviors and ecological conditions that differentiate them from other forms of polygyny, particularly those involving resource defense or parental investment.

**Aggregation of Non-Resource Defending Males:** Lekking involves a group of males gathering at a specific, traditional location. The territory defended by each male contains no resources useful to the female, except for the male himself and the potential for fertilization.

**Female Choice Drives Selection:** Mating decisions are entirely determined by the visiting females, who typically survey multiple displays before choosing a partner. This intense female selectivity leads to strong sexual selection pressures on males, favoring exaggerated secondary sexual characteristics.

**Skewed Reproductive Success:** The distribution of mating success is highly unequal. Often, the male whose display territory is centrally located or whose display is the most vigorous, secures a disproportionately large share of copulations (the so-called 'hotshots'), sometimes accounting for over 90% of all matings recorded at the site.

**Elaborate Courtship Displays:** Males engage in energy-intensive, highly ritualized visual, acoustic, and behavioral performances (e.g., the elaborate dances of Birds of Paradise or the loud, booming calls of prairie chickens). These displays often involve the use of specialized structures or plumage, incurring significant metabolic costs.

**Absence of Paternal Care:** Once copulation occurs, the female usually leaves the lek and undertakes all subsequent parental responsibilities, including nesting, incubation, and raising offspring, alone, meaning males provide no direct benefits to the female or offspring beyond their genes.

**Traditional Display Sites:** Leks are often established at the same geographic location year after year, sometimes across generations, suggesting the stability of the site is crucial for female recognition and visitation predictability.

### 4. Evolutionary Hypotheses for Lek Formation

A central question in behavioral ecology is why males aggregate into leks, given the increased competition and visibility to predators. Several primary hypotheses attempt to explain the evolution and maintenance of this system, often operating concurrently in natural populations.

**The Hotspot Hypothesis:** This theory posits that leks form in areas (**hotspots**) through which females frequently travel, perhaps due to resource availability nearby, or along established migratory routes. By aggregating in these predictable locations, males collectively increase their encounter rate with females compared to displaying in isolation. This hypothesis emphasizes the role of environmental factors in determining lek location.

**The Hotshot Hypothesis:** This hypothesis suggests that subordinate or less attractive males aggregate around highly attractive, dominant males (the **hotshots**) to intercept females who are drawn to the superior display of the dominant male. Although they may only secure spillover matings, their collective success is often still greater than if they displayed alone elsewhere. This theory emphasizes the role of individual quality and social attraction in structuring the lek.

**The Female Preference Hypothesis (or Group Display Hypothesis):** This idea suggests that females prefer to visit groups of males because it facilitates rapid comparison shopping. By visiting a large aggregation, the female minimizes the time and energy cost associated with locating and comparing potential mates, thereby favoring males who display communally. The collective display may also amplify the overall signal, making the lek more detectable from a distance.

**The Predator Avoidance Hypothesis:** While the elaborate displays increase individual visibility, large groups of displaying individuals may reduce individual risk through dilution or increased vigilance (the many-eyes effect), making aggregation safer than solitary display, especially in open environments where lek species often reside.

## 5. Ecological and Taxonomic Examples

Lekking behavior is most famously associated with birds, but it is also observed across diverse taxonomic groups, indicating convergent evolution in response to specific ecological conditions where resources are widely scattered and defense is impractical.

Among birds, classic examples include the North American **Sage Grouse** and **Sharp-tailed Grouse**, where dozens of males gather before dawn, utilizing specialized air sacs and elaborate plumage displays accompanied by distinctive sounds. The Black Grouse of Eurasia demonstrates a traditional lek system where males perform complex dances in spring. Furthermore, the specialized display behaviors of the Manakins in Central and South America are highly studied examples of lekking, often involving synchronized group dances or elaborate solitary maneuvers like the "moonwalk."

Lekking is not confined to avian species. Mammalian leks are exhibited by several antelope species, notably the **Ugandan Kob** and the **Topi**, where males defend small, resource-free mating arenas during breeding season. Lekking behavior is also documented in insects, such as certain species of fruit flies (*Drosophila*) and bats, demonstrating the universality of this mating strategy under conditions where resources are not monopolizable by males, and female mobility is high, forcing males to rely solely on the advertisement of genetic quality.

## 6. Significance and Impact

The lek display system represents an extreme form of polygyny and has profound implications for understanding sexual selection. Because mating success is decoupled from resource ownership,

the selection pressure is intensely focused on traits that signal genetic quality (good genes models) or compatibility (runaway selection models). This intense selection often results in extreme sexual dimorphism, where males develop spectacular, high-cost ornamentation (e.g., heavy antlers, vibrant colors, elaborate songs) that serve no function other than attracting females and securing matings.

Lek systems are critical for studying the dynamics of mate choice. They provide natural laboratories for observing female assessment strategies, including sequential choice (visiting multiple males before deciding) and simultaneous comparison. The study of leks helps researchers quantify the costs associated with maintaining elaborate traits and the benefits they confer in terms of reproductive success, offering crucial insights into the mechanisms driving evolutionary change in mating systems. Furthermore, the highly skewed nature of reproductive success in leks means that genetic variance is transmitted unevenly, potentially accelerating evolutionary divergence or creating strong bottleneck effects within populations.

## 7. Debates and Criticisms

While the categorization of a lek system is generally straightforward, the relative importance of the competing evolutionary hypotheses (Hotspot, Hotshot, and Female Preference) remains a subject of ongoing debate. Few systems adhere perfectly to a single model, and field studies often find evidence supporting multiple factors simultaneously driving aggregation. For instance, a lek might initiate in a hotspot location, but the subsequent spatial arrangement of territories within the lek is heavily influenced by the presence of a hotshot male, suggesting synergistic mechanisms are common.

A second major debate centers on the genetic benefits derived from female choice in lek systems. Given that males offer no direct benefits (resources or parental care), females are assumed to be selecting for genetic quality. However, demonstrating consistent, measurable 'good genes' benefits that translate into improved offspring survival remains challenging, especially because intense selection quickly removes unfavorable alleles, reducing observable variance in quality. This has led to alternative views focusing on arbitrary preferences driven by Fisherian runaway selection, where the female preference and the male trait become genetically linked, rather than purely functional quality indices.

## Further Reading

[Lek \(Ethology\)](#)

[Lek Mating System Overview \(ScienceDirect\)](#)

[Why do males aggregate on leks? A case study in guppies \(Wiley Online Library\)](#)