The Ecology of Sex Part 5: Mating Systems

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Biol 417: Evolutionary Ecology

Table of contents

1. Review

2. Breeding Structure & Mating Systems

3. Mate Guarding

Review

Review

Last lecture we covered the idea that sexually reproducing organisms needs to choose suitable mates with which to mix their genes and this choice can have a substantial impact on fitness.

This drives intrasexual competition and sexual selection.

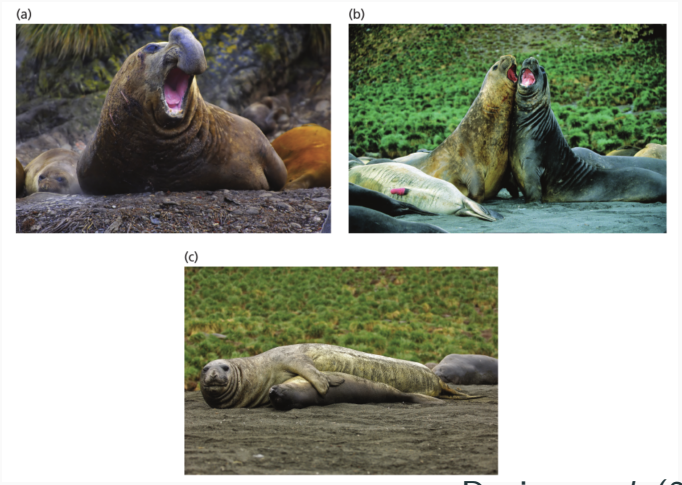
The net outcome of these individual breeding strategies is the establishment of breeding structure and **mating systems**.

Breeding Structure & Mating Systems

Breeding Structure

As individuals compete for access to mates and exhibit mating preferences, their behaviour can impart breeding structure on a population (i.e., breeding is non-random).

In elephant seals (*Mirounga angustirostris*), a few males guard large harems of females and secure most of the mating.



Davies *et al.* (2012)

Inbreeding avoidance in female *Drosophila subobscura* results in outbred males securing more breeding.

Source: University of Exeter

Mating systems

The way in which a group is structured in relation to its sexual behaviour is termed a **mating system**.

Importantly, mating systems are the result of **individual** strategies and not evolutionarily adaptations *per se* (Clutton-Brock, 1989).

In general, this means that:

- Mating systems are flexible and subject to local conditions (resource availability, density dependence, etc.).
- Variation in mating behaviour is to be expected both within and between populations.
- The extent to which mating systems will vary differs between species (some are highly variable, others are constrained).

Mate Guarding

Although mating systems are highly variable, they are driven by mate guarding strategies adapted to the spatiotemporal distribution of receptive females (Clutton-Brock, 1989).

Source: Jeff Mitton, UC Boulder

Mate Guarding

Obligate Monogamy

Males are socially bonded to a single breeding female.

Breeding structure: Monogamy with rare polygyny/polyandry.

Prevalence: Common in birds. Rare in mammals (but for canids and primates).

Paternal care: Paternal care is the norm.

Defence system: Territorial defence.

Mechanism: Paternal care required for rearing young and males can achieve higher breeding success by monopolizing the reproductive output of a single female.

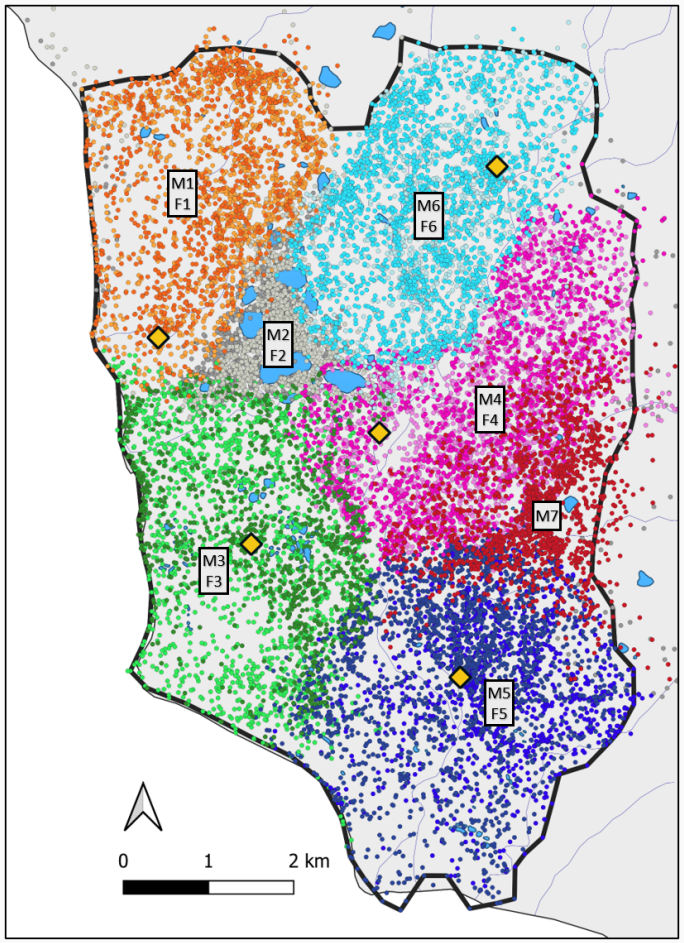
Ex.: lar gibbon (*Hylobates lar*)

Source: Wikipedia

Obligate Monogamy

The *arctic fox (Vulpes lagopus)* forms monogamous pairs during the breeding season that persist in order to raise young (up to 18 pups!).

Poulin *et al.* (2021)



Source: Jeanne Clermont, Univ. du Québec à Rimouski

Facultative monogamy/polygyny

Males are socially bonded to one or more breeding females, females are bonded to a single male.

Breeding structure: Long-term or serial monogamy with polygyny.

Prevalence: Common in small to medium sized mammals.

Paternal care: Male assistance not required for rearing young.

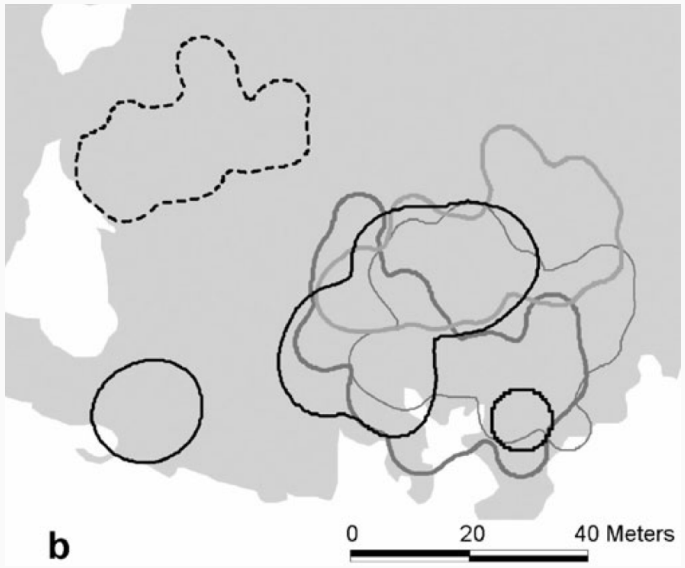
Defence system: Territorial defence.

Mechanism: Females are solitary and occupy home ranges small enough to be defensible. Males defend territories overlapping those of one or more females.

Ex.: Water vole (*Microtus richardsoni*)

Facultative monogamy/polygyny

Water vole (*Microtus richardsoni*) females are solitary and mate with a single male, males overlap multiple females (litter size of 5; lifespan is ca. 5 months).



Pita *et al.* (2011)

Unimale groups with spatial defence

Males are socially bonded to a group of breeding females, females are bonded to multiple females and a single male.

Breeding structure: Unimale polygyny with some female promiscuity.

Prevalence: Common in small to medium sized mammals.

Paternal care: Male assistance not required for rearing young.

Defence system: Territorial defence.

Mechanism: Females live in groups with home ranges small enough to be defensible by a single male.

Ex.: Yellow-bellied marmots (*Marmota flaviventris*)

Source: Wikipedia

Multimale groups with spatial def.

Males are socially bonded to a group of breeding females and multiple males, females are bonded to multiple females and males.

Breeding structure: Multimale polygyny with polyandry and female promiscuity.

Prevalence: Less common. Occurs mostly in carnivores ad primates.

Paternal care: Male assistance not required for rearing young.

Defence system: Territorial defence.

Mechanism: Females live in groups with home ranges that are too large to be defensible by a single male.

Ex.: lions (*Panthera leo*)

Multimale groups with spatial def.

Male lions are solitary or form coalitions females live in groups and mate with a single or multiple males (litter size of 2-4; lifespan is ca. 8-10 years).

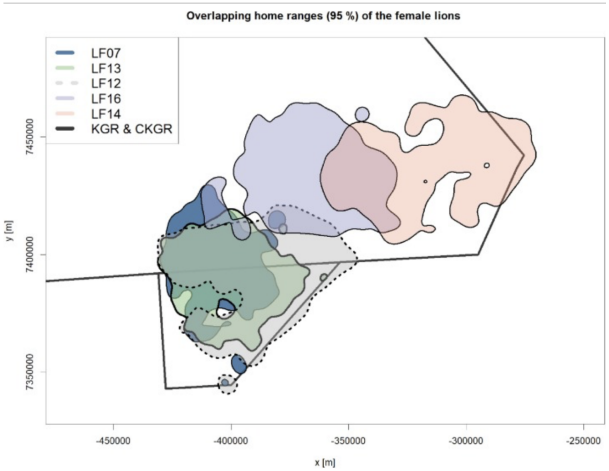


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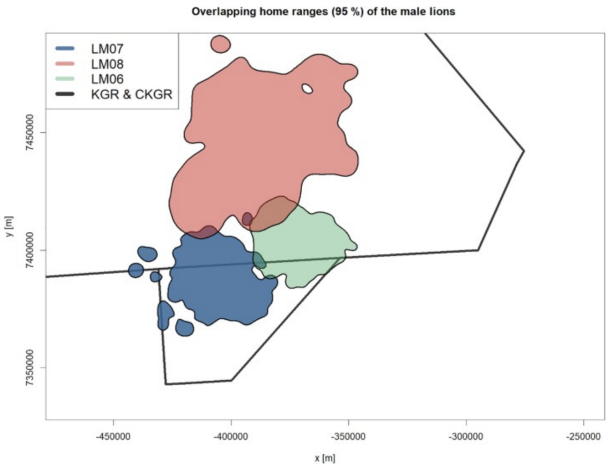
Fig. 2. Visualized home ranges (95% isopleth) of the female lions. The combination of KDE and the reference bandwidth is presented.



Zehnder *et al.* (2018)

Unimale groups without spatial def.

Males may or may not be bonded to a group of females, females may or may not be bonded to multiple females and a single male.

Breeding structure: Unimale polygyny with serial monogamy in females.

Prevalence: Common in ungulates and primates.

Paternal care: Male assistance not required for rearing young.

Defence system: Defence of female group.

Mechanism: Females aggregate in small groups at particular sites during the breeding season or live in stable social groups in ranges too large to be defended.

Ex.: elephant seals

Davies *et al.* (2012)

Multimale grps. without spatial def.

Males may or may not be bonded to a group of breeding females and multiple males, and vice versa for females.

Breeding structure: Multimale polygyny with polyandry and female promiscuity.

Prevalence: Seen mostly in primates and large mammals.

Paternal care: Male assistance not required for rearing young.

Defence system: Defence of female group.

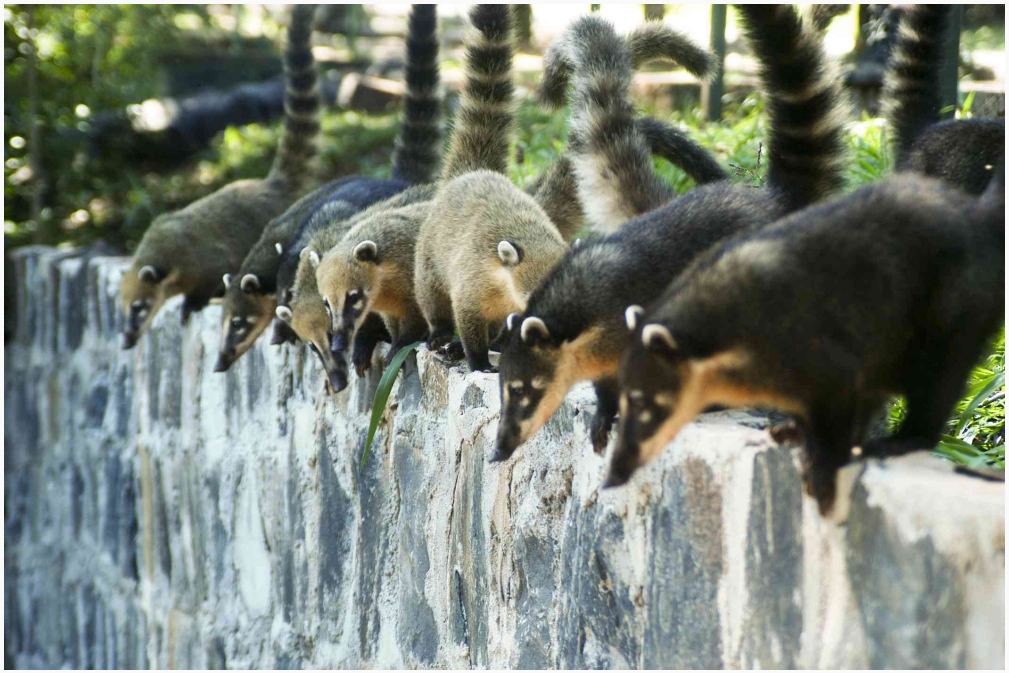
Mechanism: Females aggregate in large groups at particular sites during the breeding season or live in stable social groups in ranges too large to be defended.

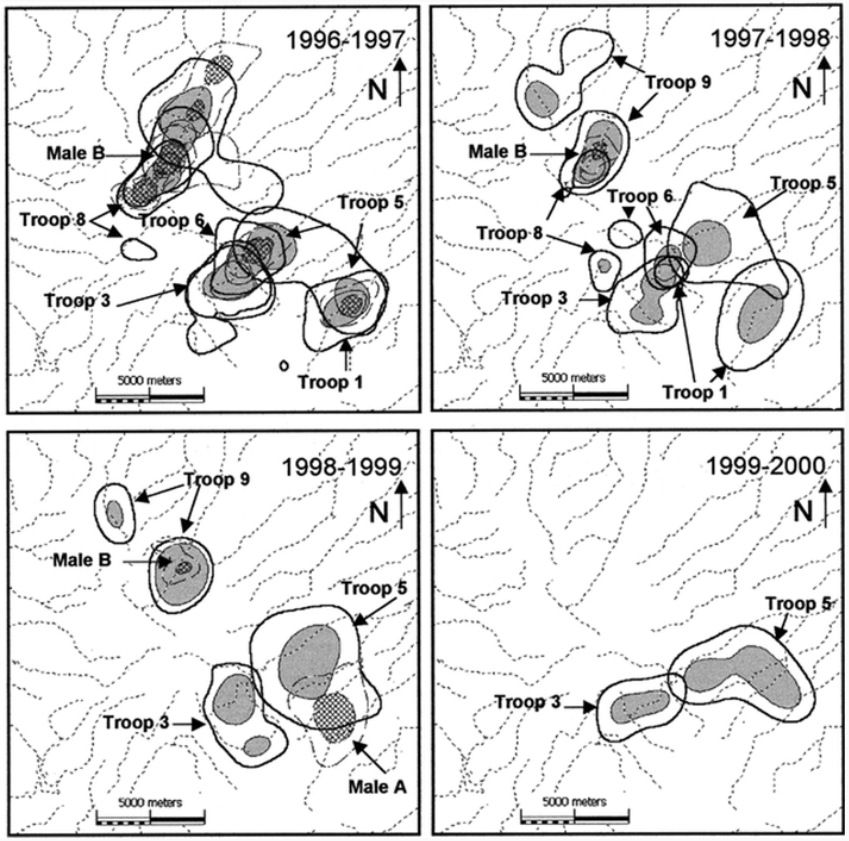
Ex.: Cape buffalo (*S. caffer*)

Source: Wikipedia

Multimale grps. without spatial def.

Male white-nosed coatis (*Nasua narica*) are solitary females live in large roaming groups (litter size of 3-4; lifespan is ca. 7 years).





Hass (2002)

Mating territories

Males defend a small exclusive territory within the range of an unstable female group.

Breeding structure: Promiscuity.

Prevalence: Common in antelopes, cervids, and equids.

Paternal care: Male assistance not required for rearing young.

Defence system: Males defend a small exclusive territory within female range.

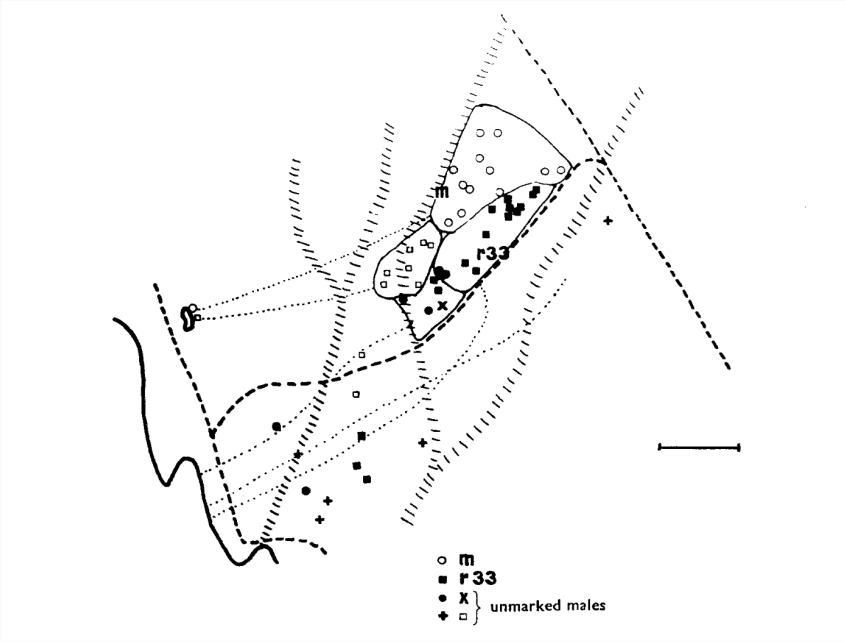
Mechanism: Females ranges are too large to be defensible and groups change in membership over very short timescales (hrs). Resources are clumped.

Ex.: waterbuck (*Kobus defassa*)

Source: Wikipedia

Mating territories

Male waterbuck (*Kobus defassa*) are solitary and defend mating ranges along routes to water females live in large roaming groups (litter size of 1-2; lifespan is ca. 18 years).



Spinage (1969)

Clustered mating territories and leks

Males defend a small mating territories in clusters within the range of an unstable female group.

Breeding structure:
Promiscuity.

Prevalence: Uncommon. Observed in birds, bats, and some ungulates.

Paternal care: Male assistance not required for rearing young.

Defence system: Males defend a small exclusive territory clustered within female range.

Mechanism: Females ranges are too large to be defensible and groups change in membership over very short timescales (hrs). Resources are clumped.

Ex.: *Hypsignathus monstros*

Source: Wikipedia

Nomadic males

Males temporarily associate with receptive females.

Breeding structure: Promiscuity.

Prevalence: Seen mostly in large mammals.

Paternal care: Male assistance not required for rearing young.

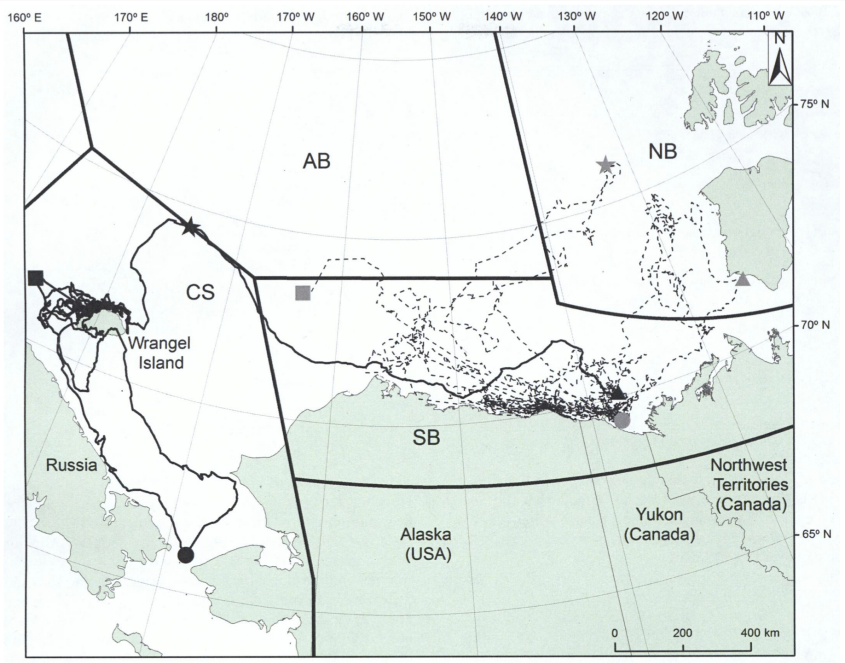
Defence system: Individual males defend receptive females.

Mechanism: Females are solitary and occupy ranges that are too large to be defensible.

Ex.: Polar bear (*Ursus maritimus*)

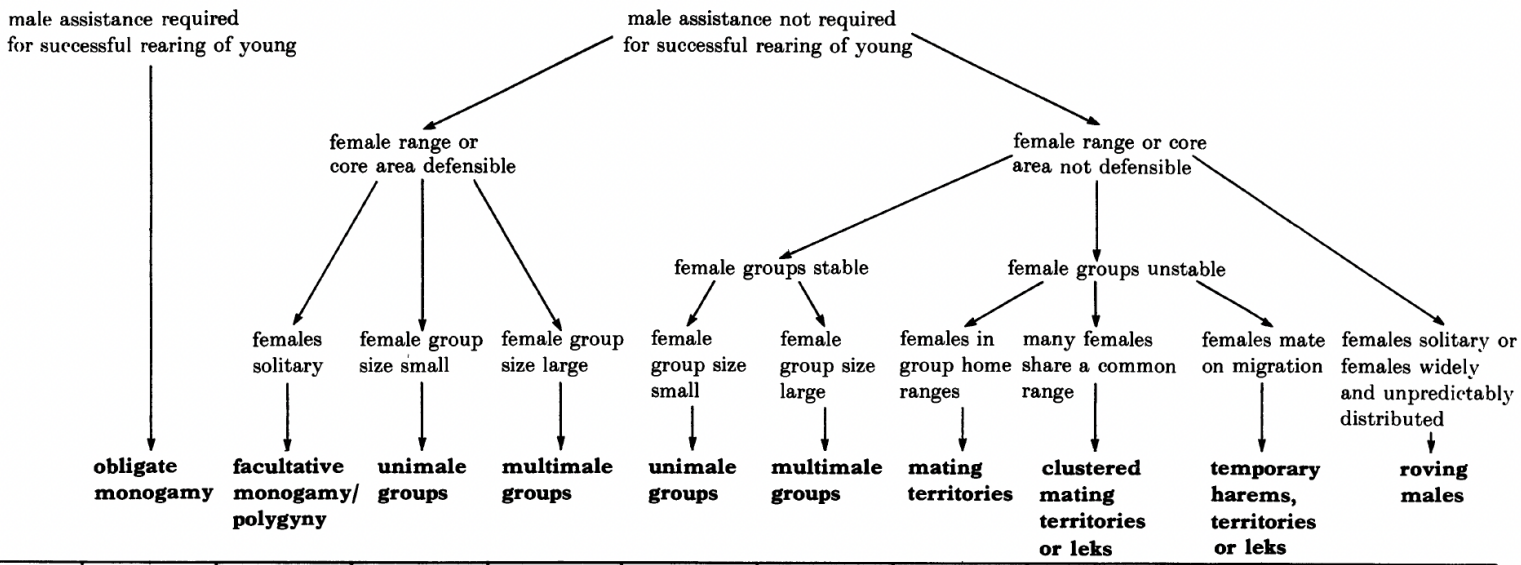
Nomadic males

Male and female polar bears are solitary and occupy ranges that are too large to defence (litter size of 2-3; lifespan is ca. 30 years).



Johnson *et al.* (2017)

Mating systems



male mating system	**mating bond**	monogamy	monogamy or polygyny	unimale polygyny	multimale polygyny	unimale polygyny	multimale polygyny	promiscuity	promiscuity	promiscuity	promiscuity
	defence system	defence of territory usual	defence of territory usual	defence of range of female group	defence of range of female group	defence of female group	individual defence of receptive females	individual defence of spaced mating territories	individual defence of clustered mating territories	variable, including defence of individual females, groups, individual or clustered mating territories	individual defence of receptive females
female mating system	**mating bond**	long-term monogamy or polyandry	long-term monogamy, serial monogamy or promiscuity	serial monogamy or promiscuity	polyandry or promiscuity	serial monogamy or promiscuity	serial monogamy, polyandry or promiscuity	promiscuity	promiscuity	promiscuity	promiscuity
	defence system	defence of territory	defence of individual territories in some species	defence of territory in some spp., no defence in others	defence of territory in some spp., no defence in others	no long-term defence of resources by females though female groups may compete for temporary access					

Clutton-Brock (1989)

Mating System Take Homes

Mating systems are driven by male mate guarding strategies adapted to the sociality and spatiotemporal distribution of females.

The ecological factors that govern the sociality and spatiotemporal distribution of females are clearly more fundamental drivers of mating systems.

Mate guarding and the spatiotemporal distribution of females sow the seeds of sociality, but group living generates competition between mating partners, as well as parents and their offspring.

Next lecture we will cover the ecological conditions that favour the evolution of sociality.

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