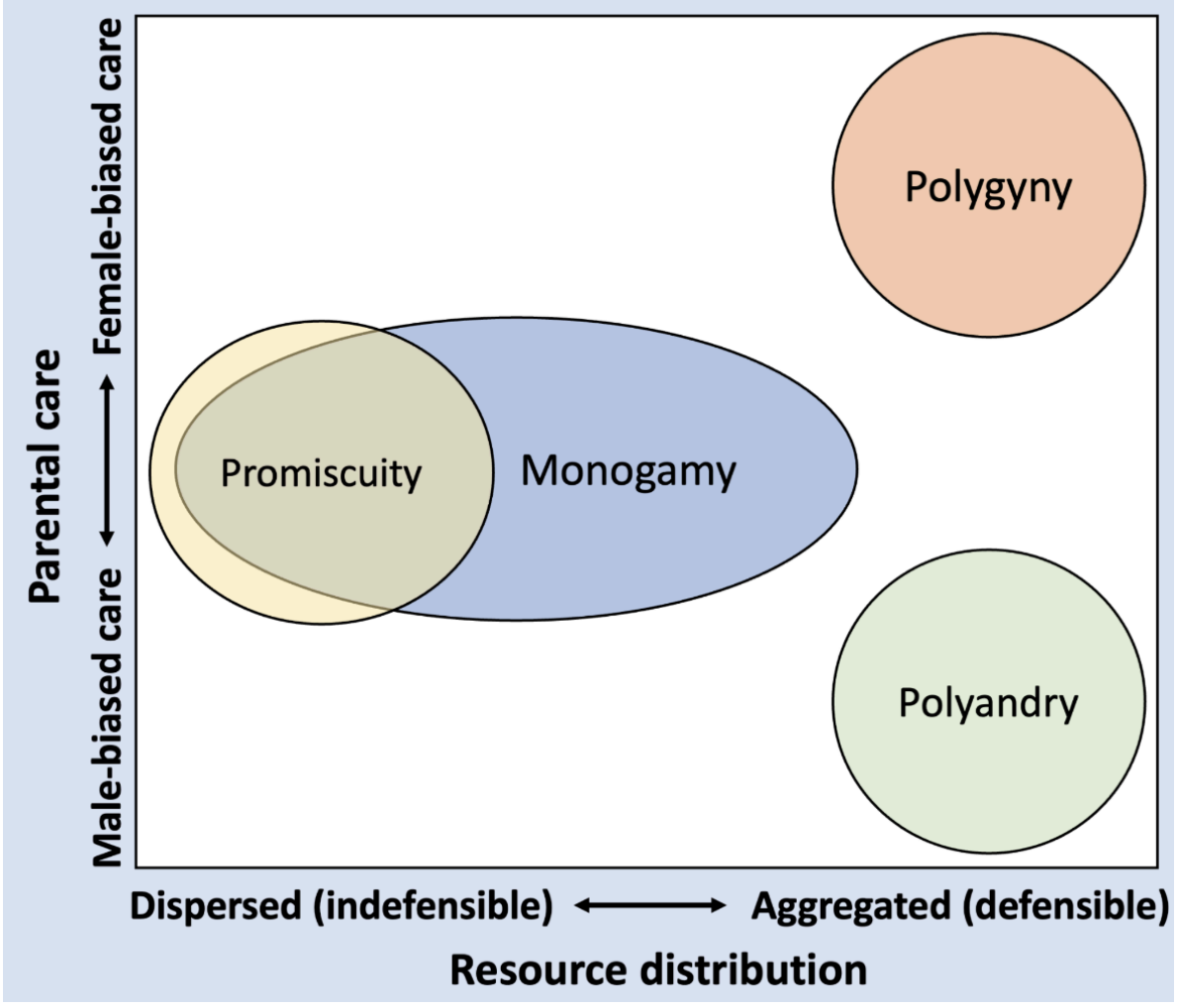


Breeding Systems

Dr. Ethan Linck
Office: 305 Lewis Hall

Breeding systems are correlated with environmental factors

- Factors like the strength and bias in parental care and distribution of resources interact to shape breeding systems



Monogamy

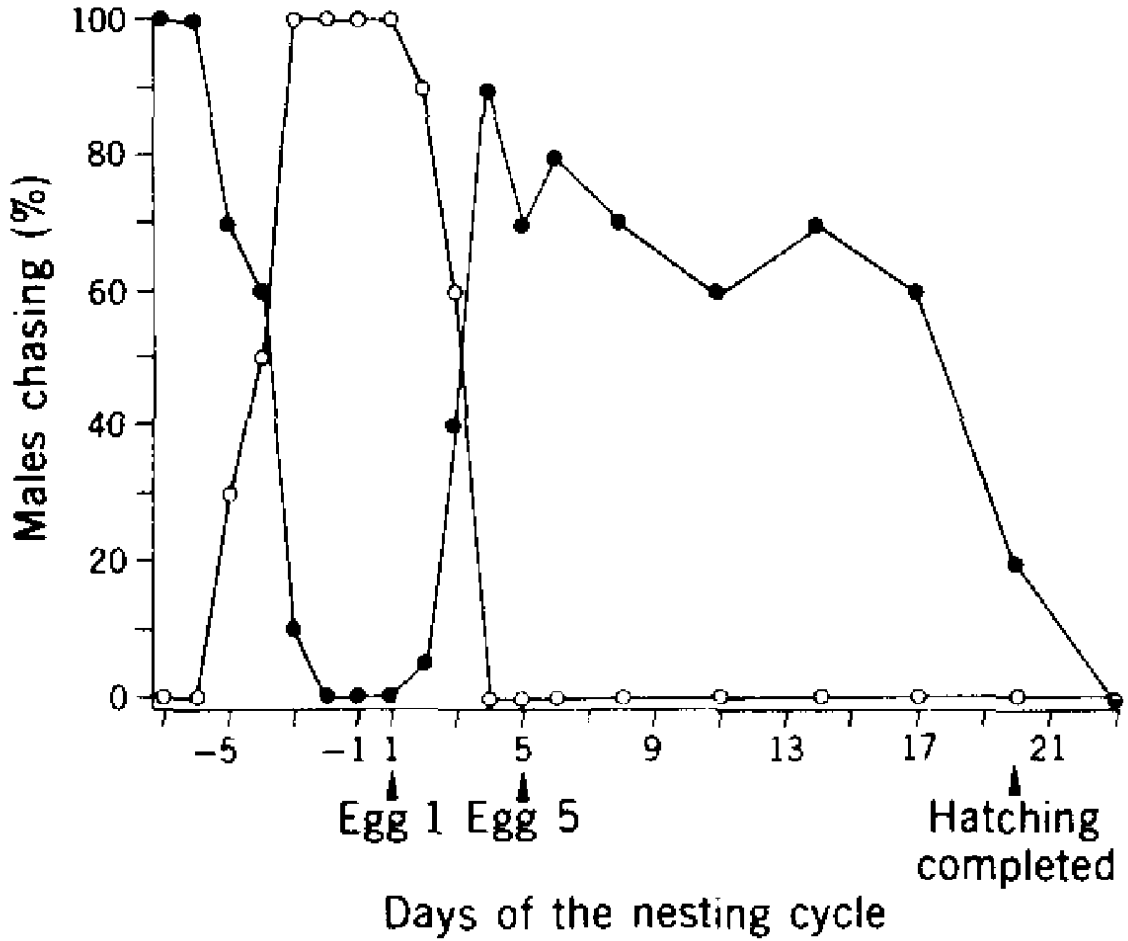
- 2 parents involved in raising & caring for offspring
- ~90% of species
- Duration: 1 nesting attempt to 1 breeding season to a lifetime
- **Extra pair copulations common** (~11% of offspring; consistent with "social monogamy")



Cygnus buccinator

Consequences of extra pair copulation

- Male Barn Swallows protect females from competitors during her most fertile period, but pursue extrapair copulations after it has ended



(Beecher & Beecher 1979)

Polygamy

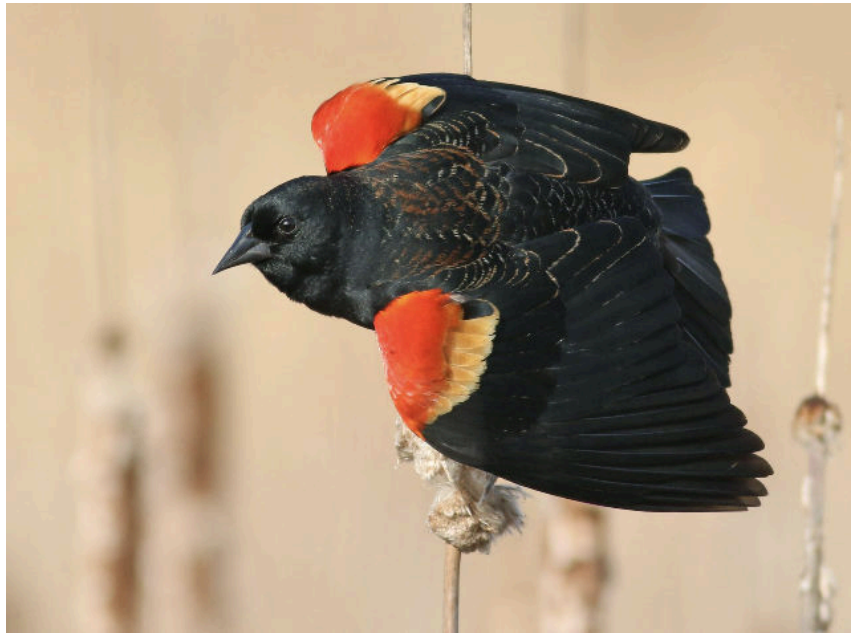
- Any mating system involving multiple mates of the opposite sex
- ~3% of species
- Strong variation in reproductive success for one species -> strong sexual selection
- Can be **polygyny**, **polyandry**, or **polygynandry**



Phalaropus tricolor

Polygyny

- **Territorial polygyny**: multiple females join a single male territory with high quality resources
- Associated with clumped resource distributions
- Found in ~2% of spp. overall
- Found in 14/278 breeding North American songbirds, 11 of which nest in marshes or grasslands



https://www.youtube.com/watch?v=c0Lw23yQFwQ

Agelaius phoeniceus

Polygyny

- **Lek polygyny**: multiple females mate with a limited number of males from communal lek or solitary arena
- Females do all parental care



https://www.youtube.com/watch?v=c0Lw23yQFwQ
https://www.youtube.com/watch?v=cLnbiTkj1TQ

Centrocercus urophasianus

Polyandry

- Multiple males mate with a single female
- $<1\%$ of species; most common in Charadriiformes (due to fixed, 4-egg clutch?)
- Sexual selection on females can lead to sex-role reversal



Actitis macularius

What mating system is likely to evolve under dispersed resources?

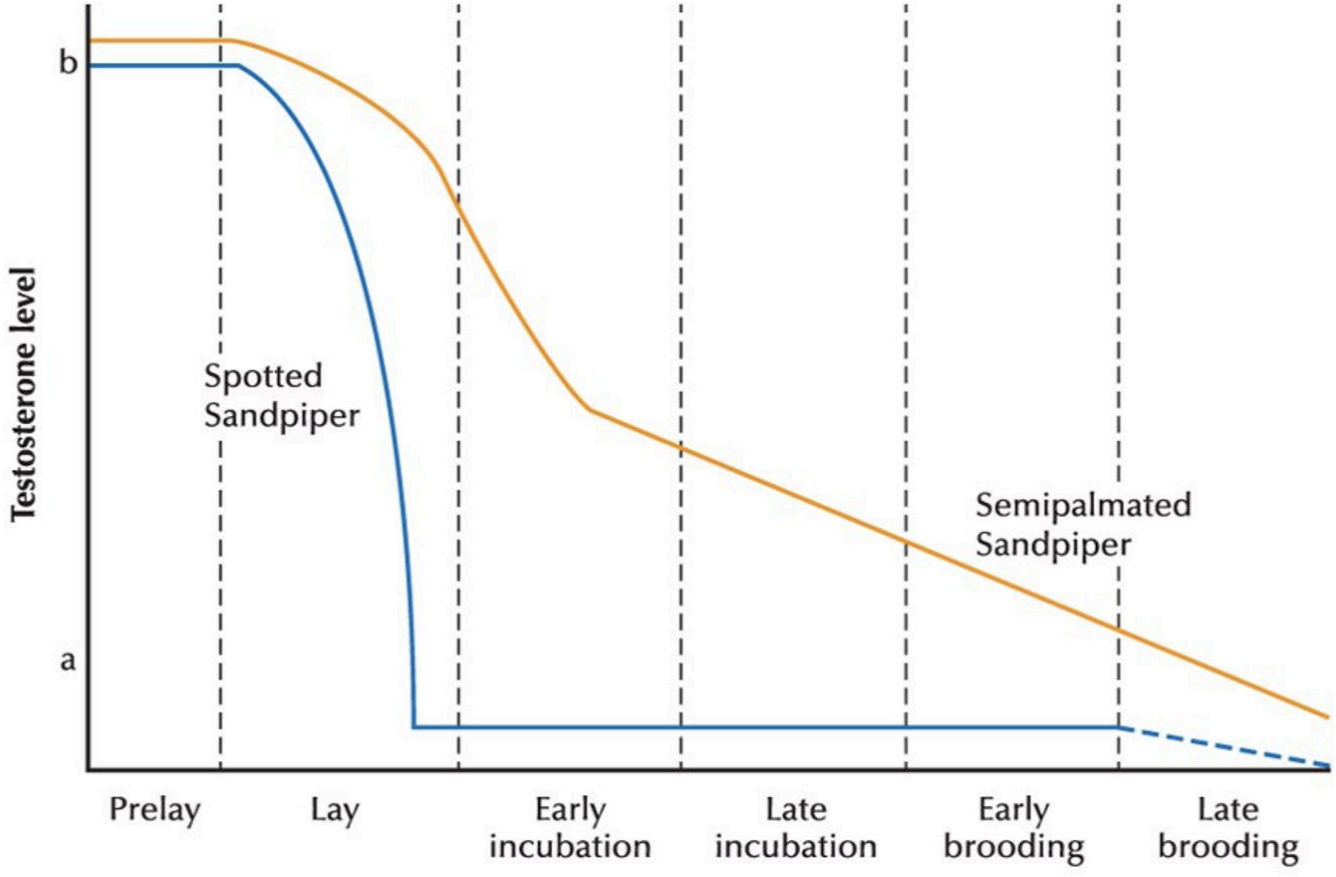


(*Ammospiza caudacuta*)

a) polyandry
b) polygamy
c) promiscuity
d) monogamy

Testosterone and sex role reversal in Spotted Sandpipers

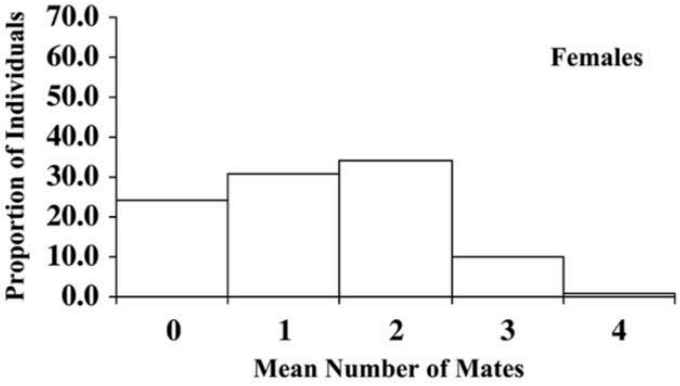
- Females have higher testosterone, fight each other for males
- Males incubate eggs, defend territories, provide most parental care

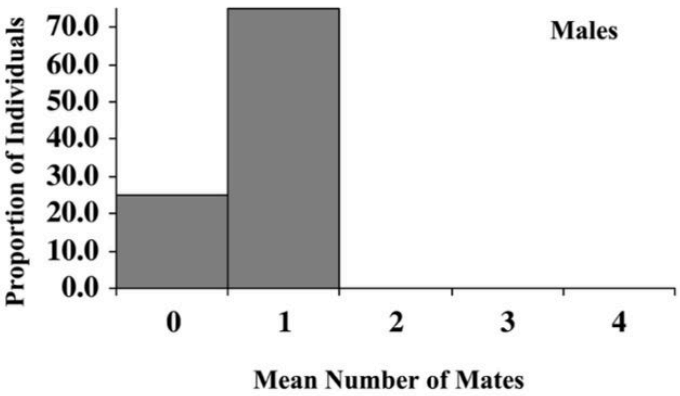


(Gill et al. 2019)

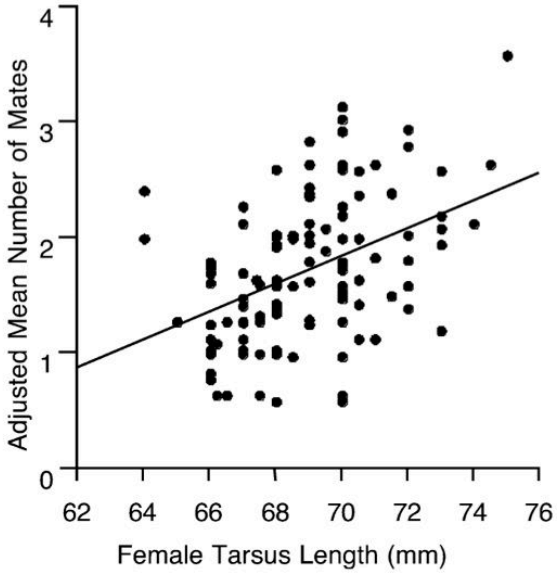
Sexual selection in Wattled Jacanas

- Females have more mates, greater variance in reproductive success
- Females with larger tarsi have greater mating success









(ML27855351; Emlen & Wrege 2004)

Polygynandry

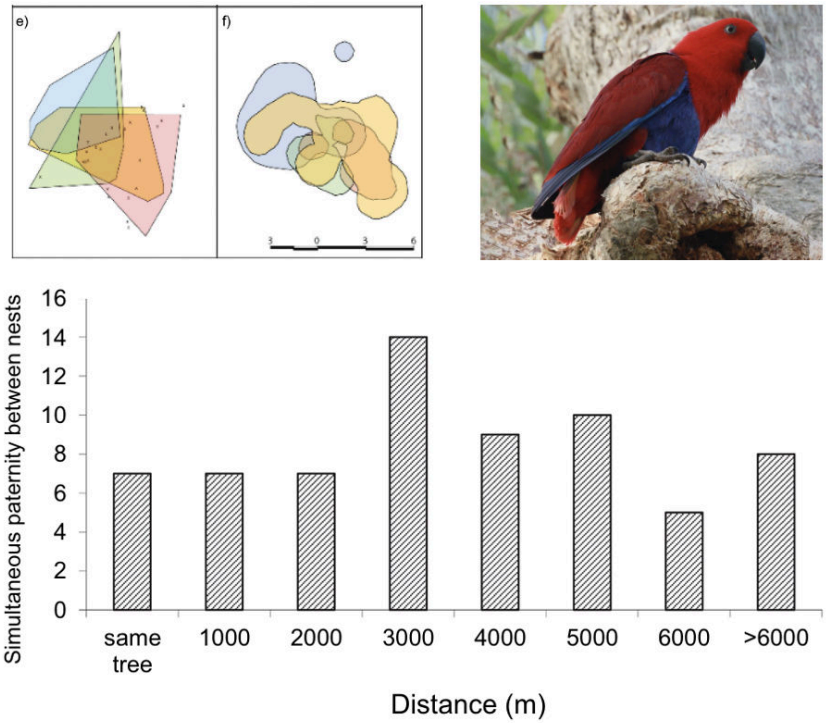
- Both males and females have >1 mate
- $<1\%$ of species: tinamous, ratites, some parrots
- Males incubate mixed clutches of >1 female



Dromaius novaehollandiae

Polygynandry in Electus Parrots

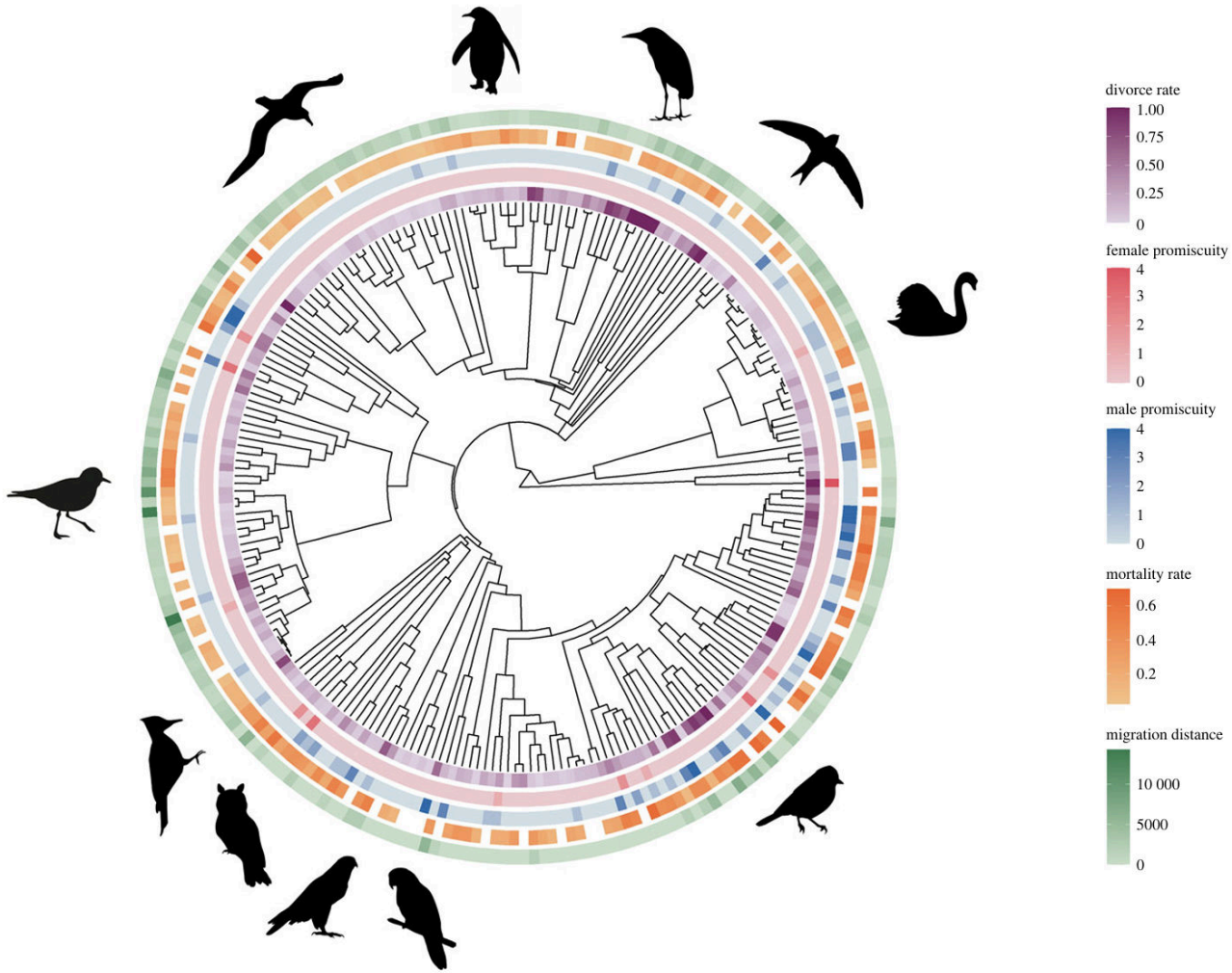
- Females depend on males for almost all food, stay in nest trees
- Telemetry data shows male territories overlap with each other and female trees
- Males equally likely to have offspring with females across territory (and vice versa)



(*ML81458761s*; Heinsohn et al. 2024)

Evolution of social mating systems

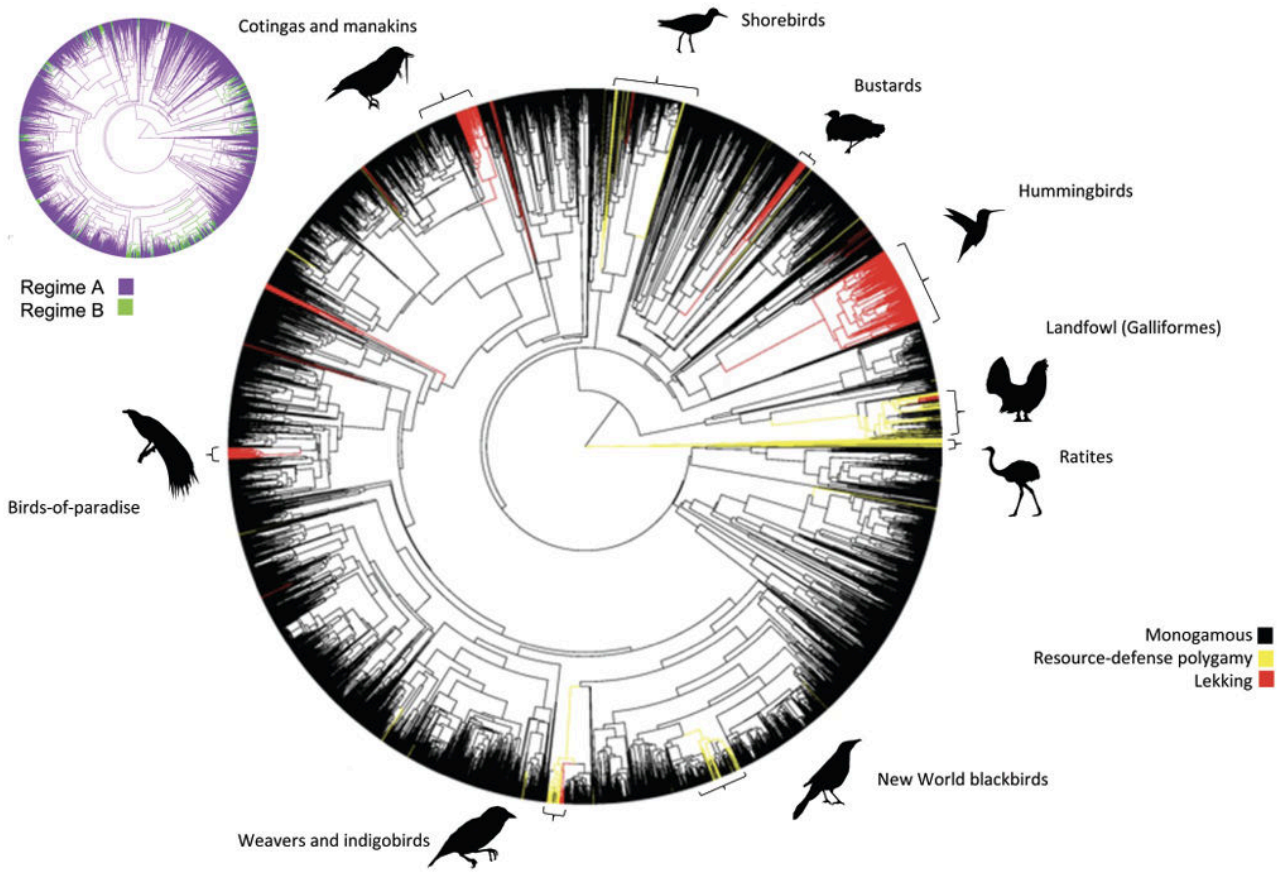
- "Divorce" in monogamous birds associated with male promiscuity and migration distance



(Chen et al. Douvas 2023)

Evolution of mating systems

- Monogamy is ubiquitous, ancestral for most species
- Reversion from lekking to monogamy is hard
- Reversion from resource-defense polygamy is a little easier



(Marcondes & Douvas 2024)

Brood Parasitism

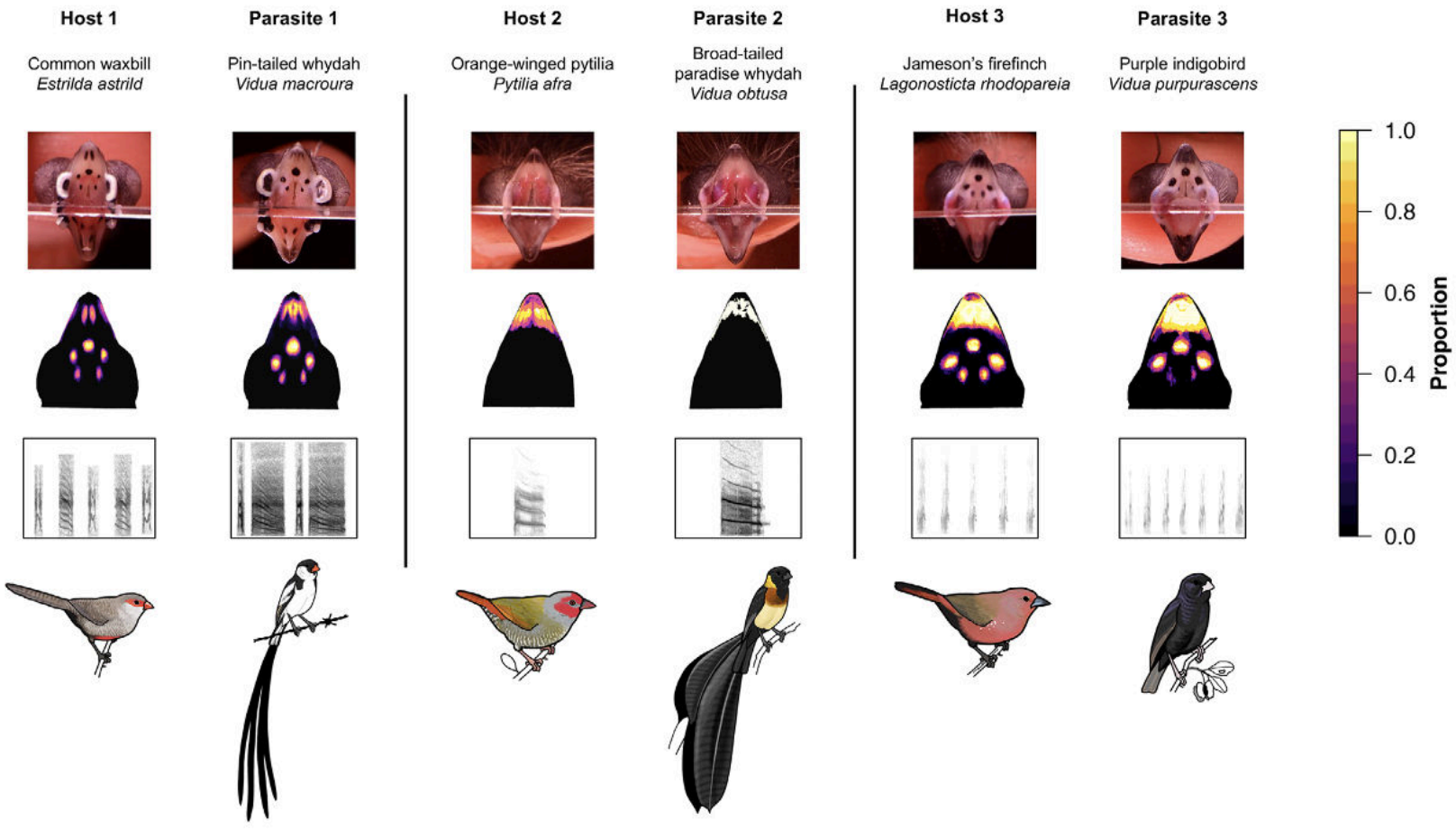
- Female of one species lays an egg in the nest of another species
- Boosts reproductive success without additional parental care
- Can be **intraspecific** or **interspecific**, **obligate** or **non-obligate**, **specialized** on a host species or **generalist**



Molothrus ater

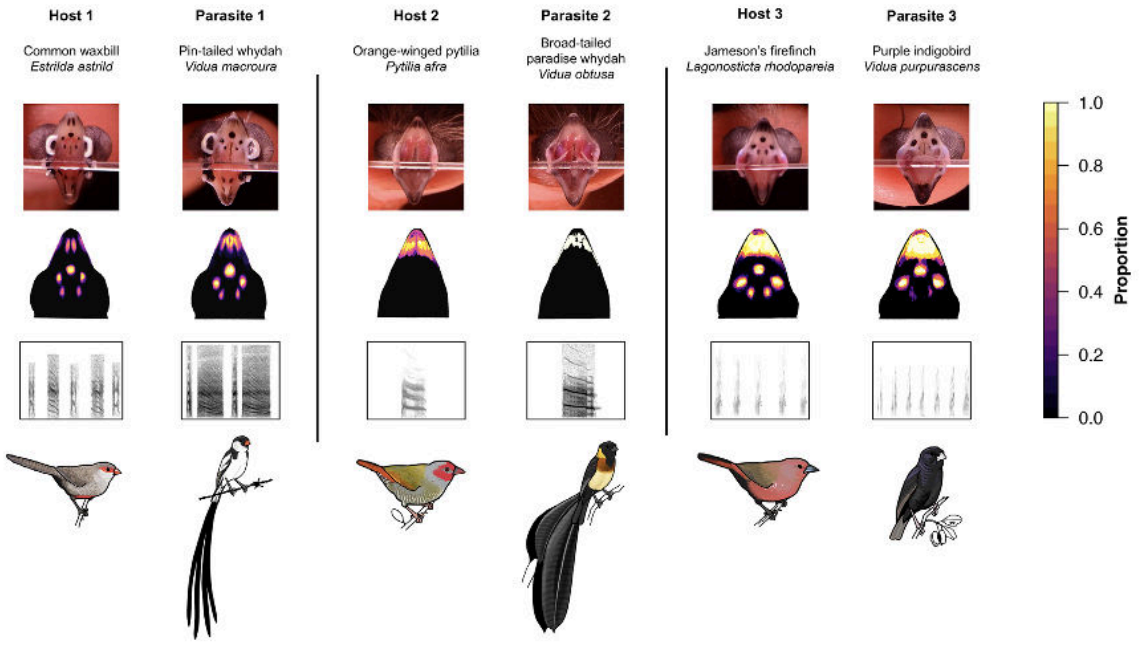
Vidua Brood Parasites

- *Vidua* species mimic grassfinch hosts through gape patterns and sounds of host nestlings



(Jamie et al. 2020)

What kind of brood parasites are *Vidua*?

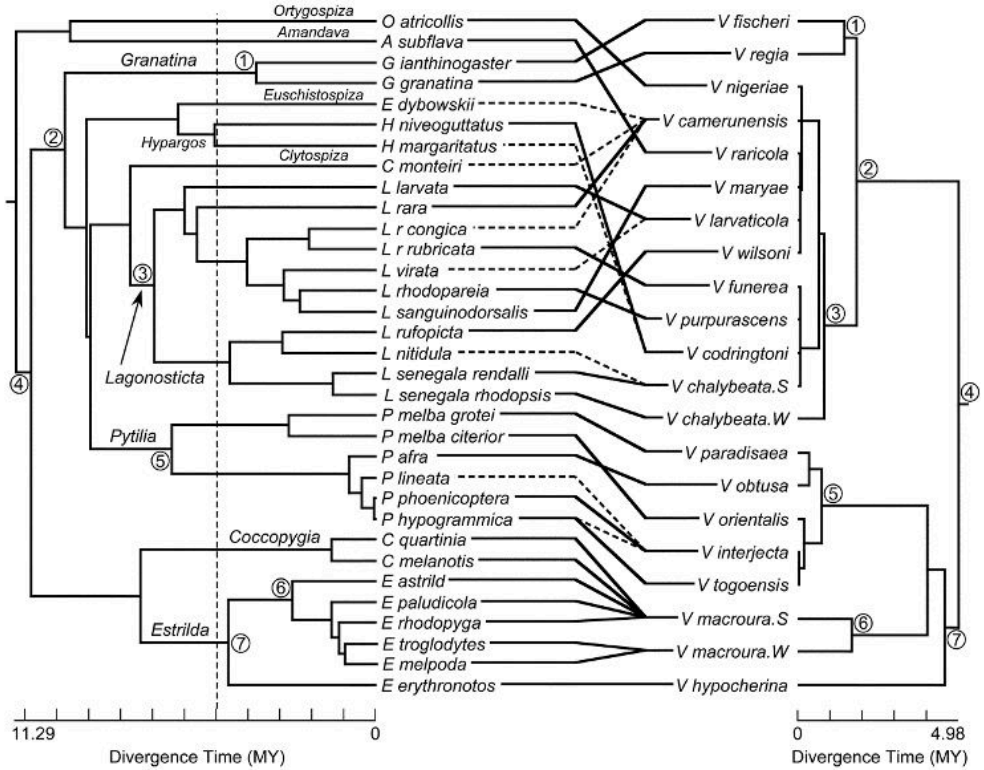


(Jamie et al. 2020)

a) generalist, non-obligate, intraspecific
b) specialized, obligate, interspecific
c) generalist, obligate, intraspecific
d) specialized, non-obligate, intraspecific

Cospeciation in *Vidua* and hosts?

- **Cospeciation** is simultaneous divergence in interacting lineages (host / parasites)
- H: Shared divergence times in hosts and parasites
- Limited evidence, but strong correlation from "clade-limited colonization"



(Sorenson et al. 2004)

Cooperative Breeding

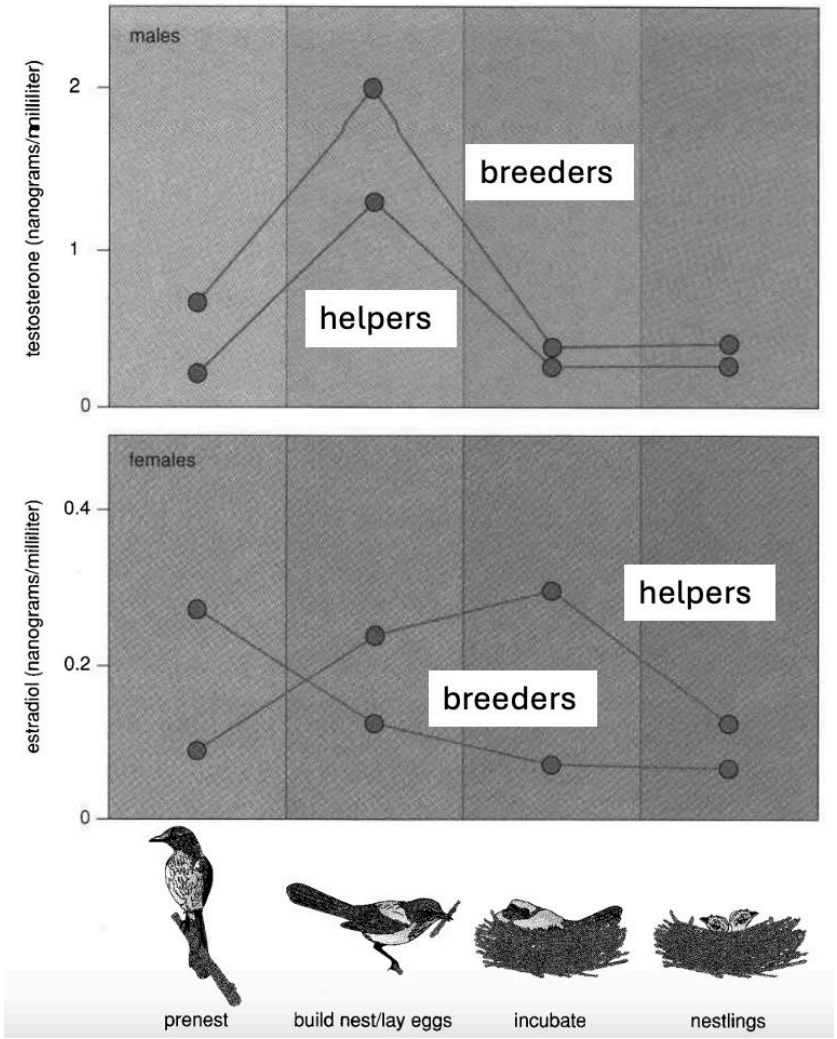
- "Helpers" care for young that are not theirs
- $<$9% of birds
- Driven by **kin selection** (ensure success of genes shared in distant relatives), **reciprocal altruism** (you scratch my back I'll scratch yours), ecological constraints, practice...



Aphelocoma coerulescens

Hormonal differences between breeders and helpers

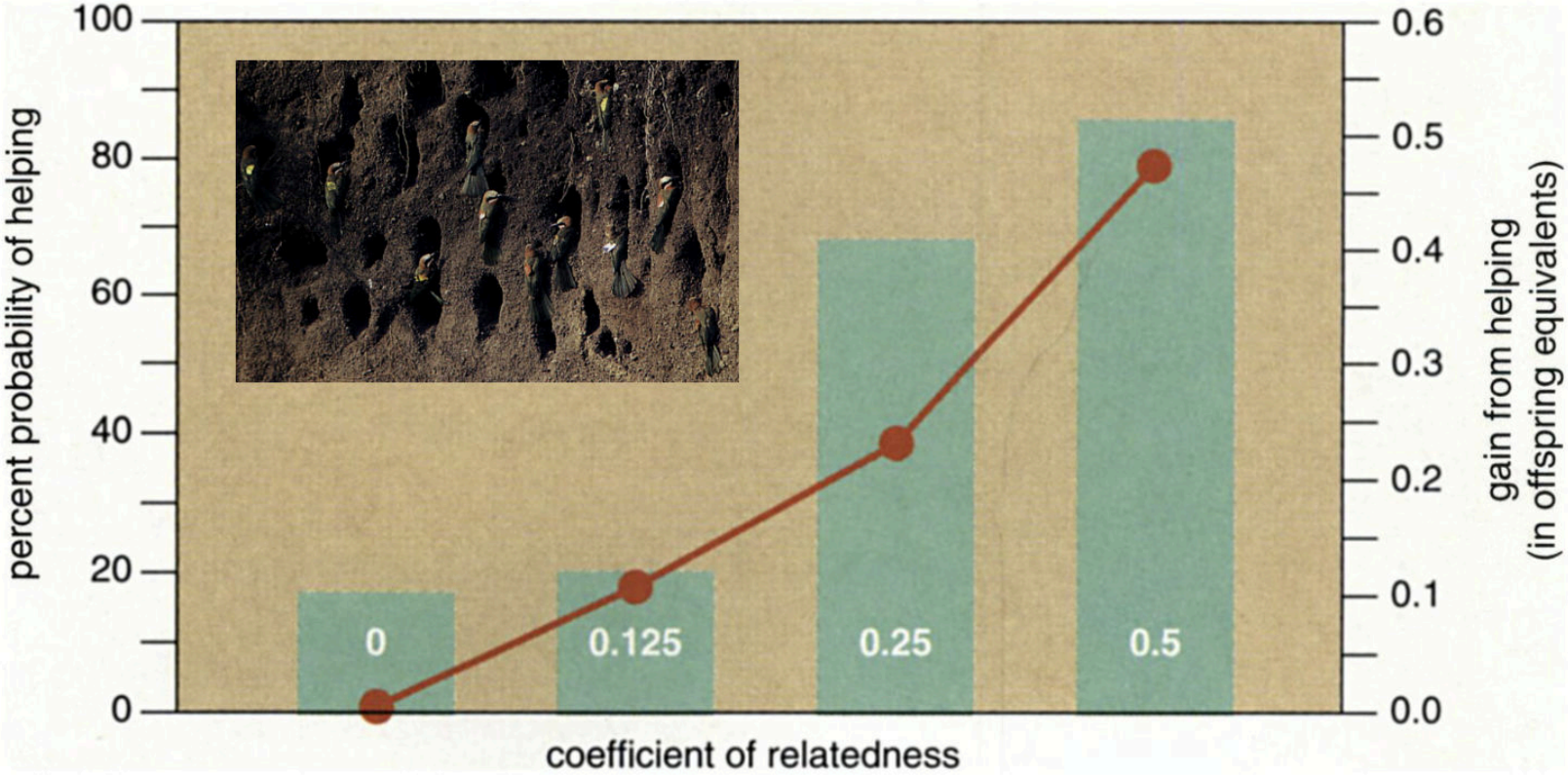
- Male helpers have lower testosterone than breeders
- Female helpers have estradiol peak when breeder is incubating and they disperse to find their own territory



(Schwabl 1993)

Evidence for kin selection in White-fronted Bee-eaters

- "Helpers" preferentially assist most closely related mating pairs, maximizing their "inclusive" reproductive fitness



(Emlen et al. 1995)

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