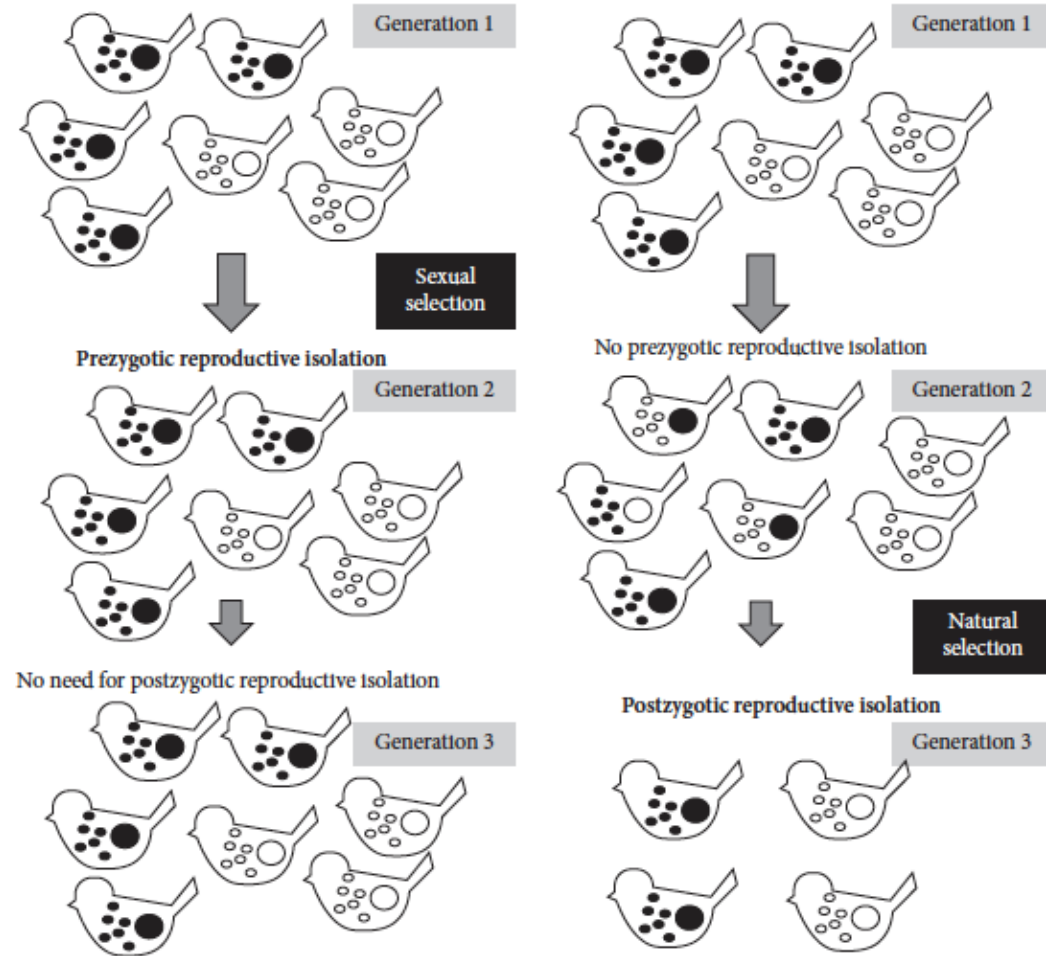


Mitochondrial mate choice

Reproductive barriers

- Postzygotic – genetic incompatibilities, mitonuclear DMIs, etc.
 - costly
- Prezygotic
 - Mate choice
 - Behavior
 - Morphology
 - Less costly

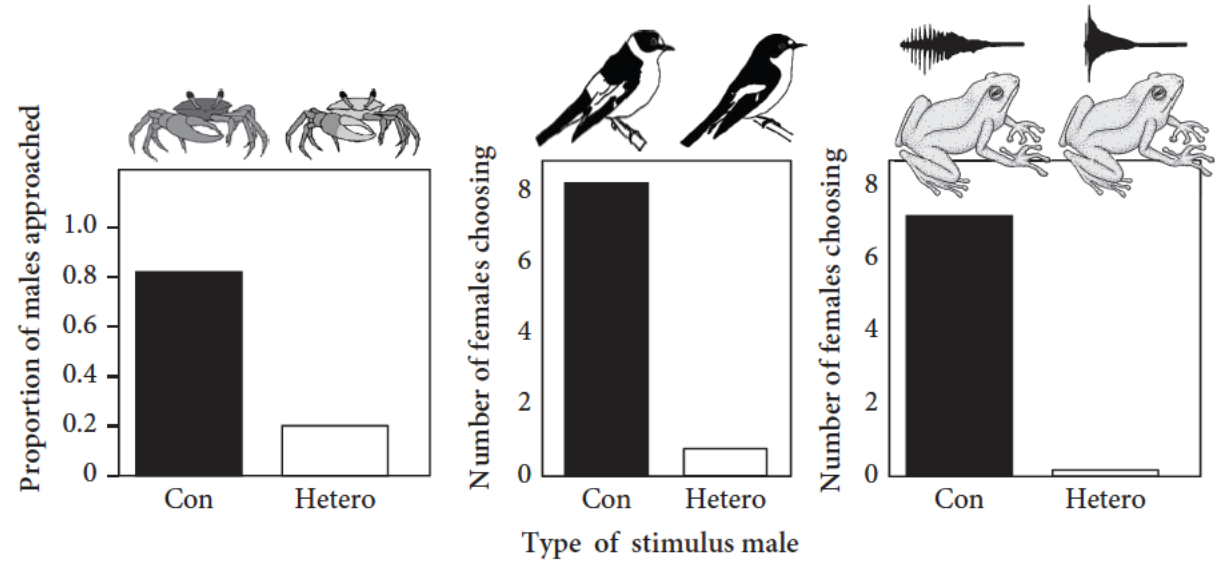


Two types of mitonuclear mate choice

- Choosing for a shared mitonuclear genotype
 - Lots of parallels with mitonuclear speciation
- Choosing a high quality male
 - Condition dependence
 - “Good genes”
 - Direct vs. indirect benefits

Choosing the right species

- Can generally identify “conspecifics”
- Then why is introgression so common?
- “Novel” males and familiar vs. unfamiliar conspecifics

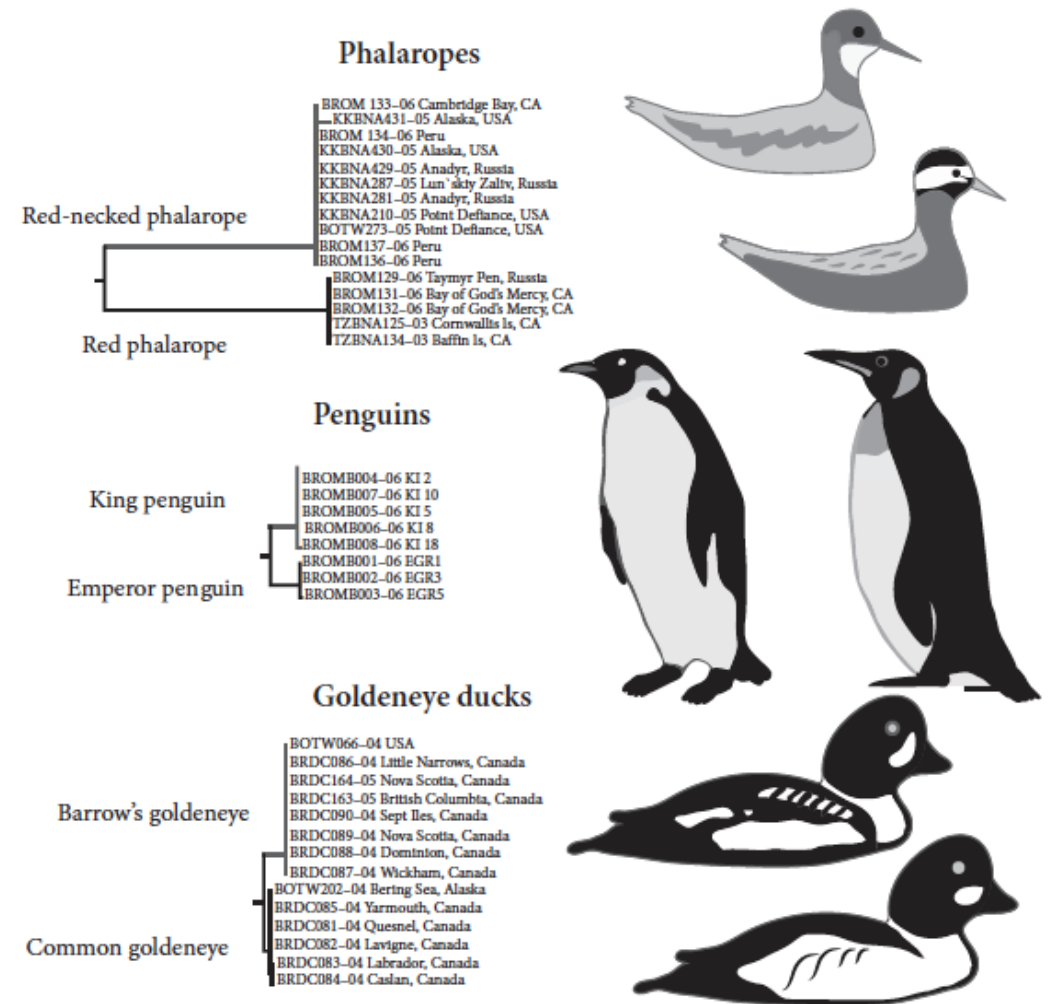


Loss of ornaments on islands

- Birds lose species-identifying ornaments on islands
- Generally fewer predators, so might be less costly, so expectations would be for more elaborate ornaments
- Maybe because they don't need to distinguish among conspecifics
- Should scale with # conspecifics
- Nothing to do with mitonuclear interactions

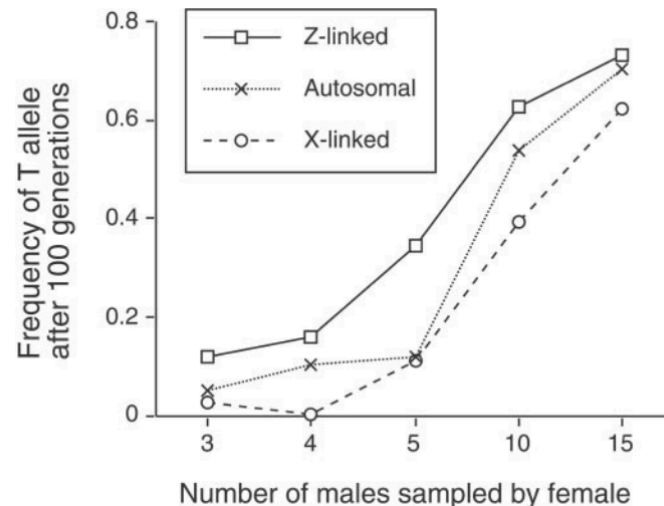
Choice for shared mt/N-mt genotypes

- Posits that because N-mt/mt gene combinations are the defining characteristic of a species, choice is for the correct combination of N-mt/mt genes
- Mt based barcodes and ornaments covary in birds (mt genes do not underly ornaments)
- “Striking” coincidence

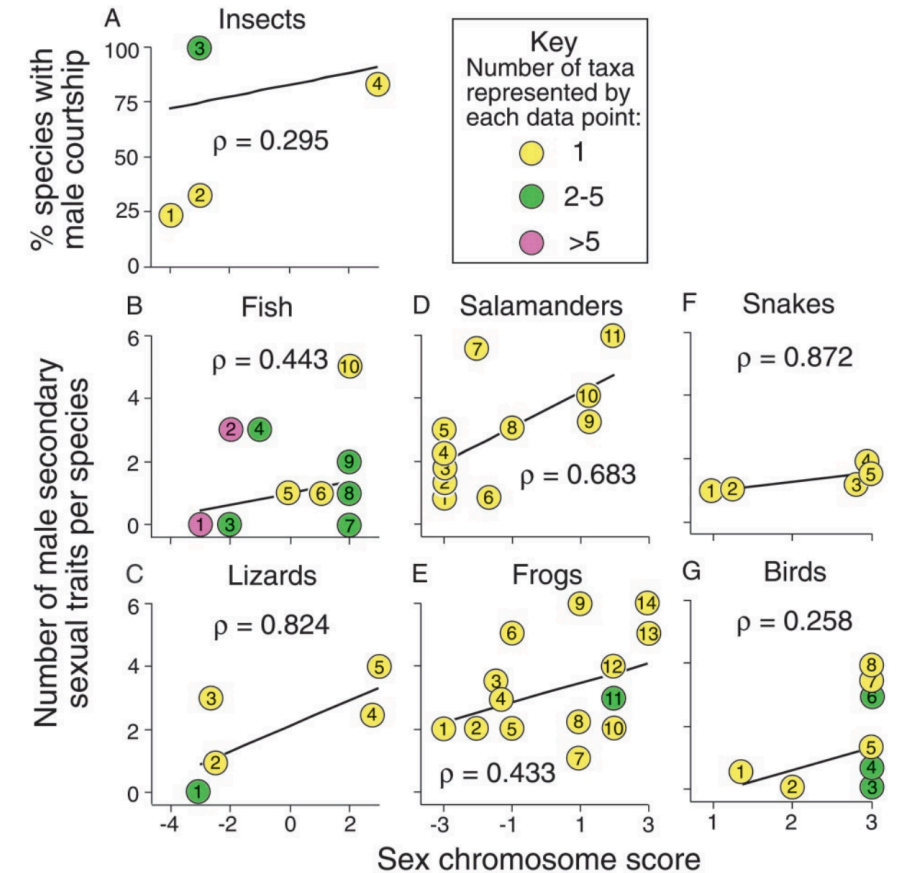
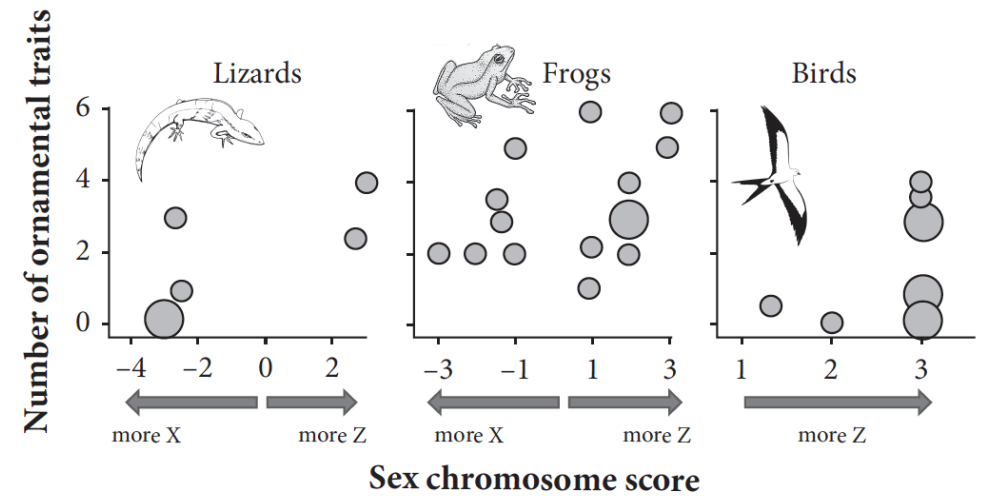


Sex linkage

- Which gene(s) underly ornamentation?
 - Largely unknown and likely varies tremendously
- Ornamentation genes on Z chromosomes are more protected against random loss than on X chromosome



Reeve and Pfennig 2003



N-mt linkage

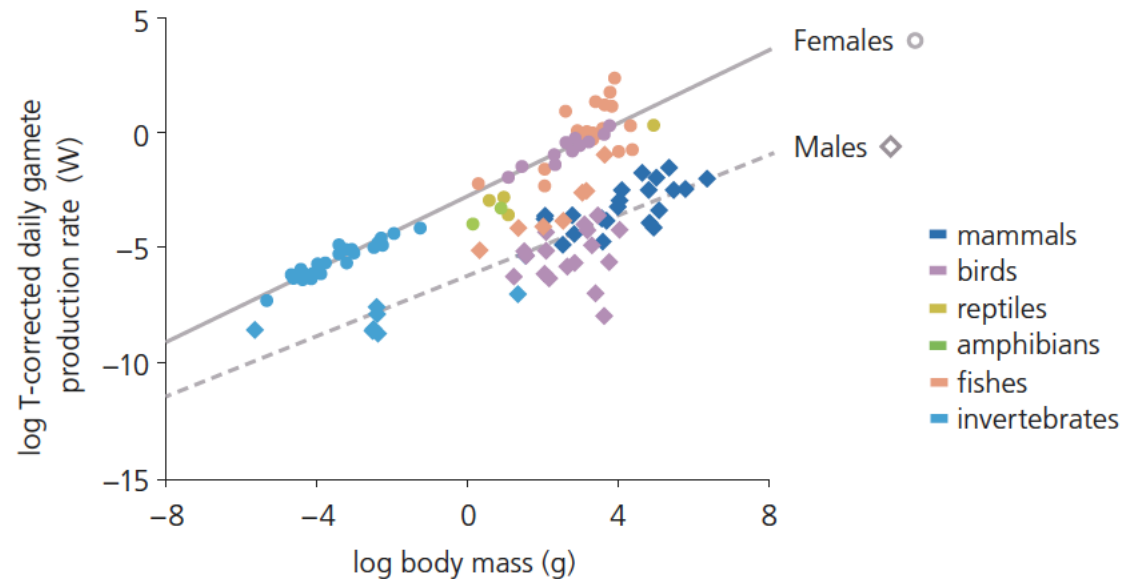
- Hypothesis is that N-mt genes are also overrepresented on Z chromosomes
- N-mt genes are closely linked to (or are) ornamental genes
- Assessing ornaments equates to assessing N-mt “fit”
- Not much data here
- Problems
 - Selection for ornamental alleles may cause hitchhiking of maladaptive N-mt genes
 - Female has to assume male N-mt genes are matched to her mt type

Two types of mitonuclear mate choice

- Choosing for a shared mitonuclear genotype
 - Lots of parallels with mitonuclear speciation
- Choosing a high quality male
 - Condition dependence
 - “Good genes”
 - Direct vs. indirect benefits

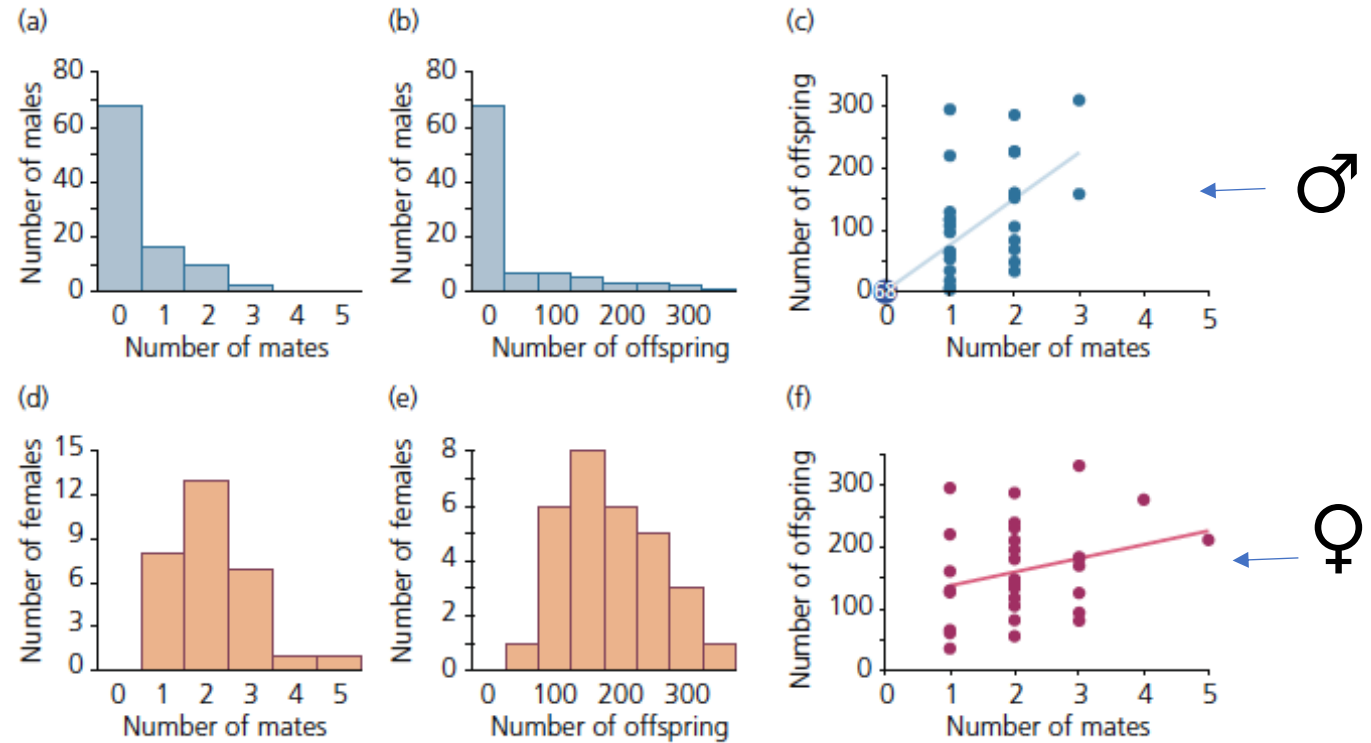
Sexual selection on the sexes

- Males
 - Limited by # of mates
- Females
 - Limited by # of gametes



Herron and Freeman Fig. 11.6

Access to mates matters more in males...

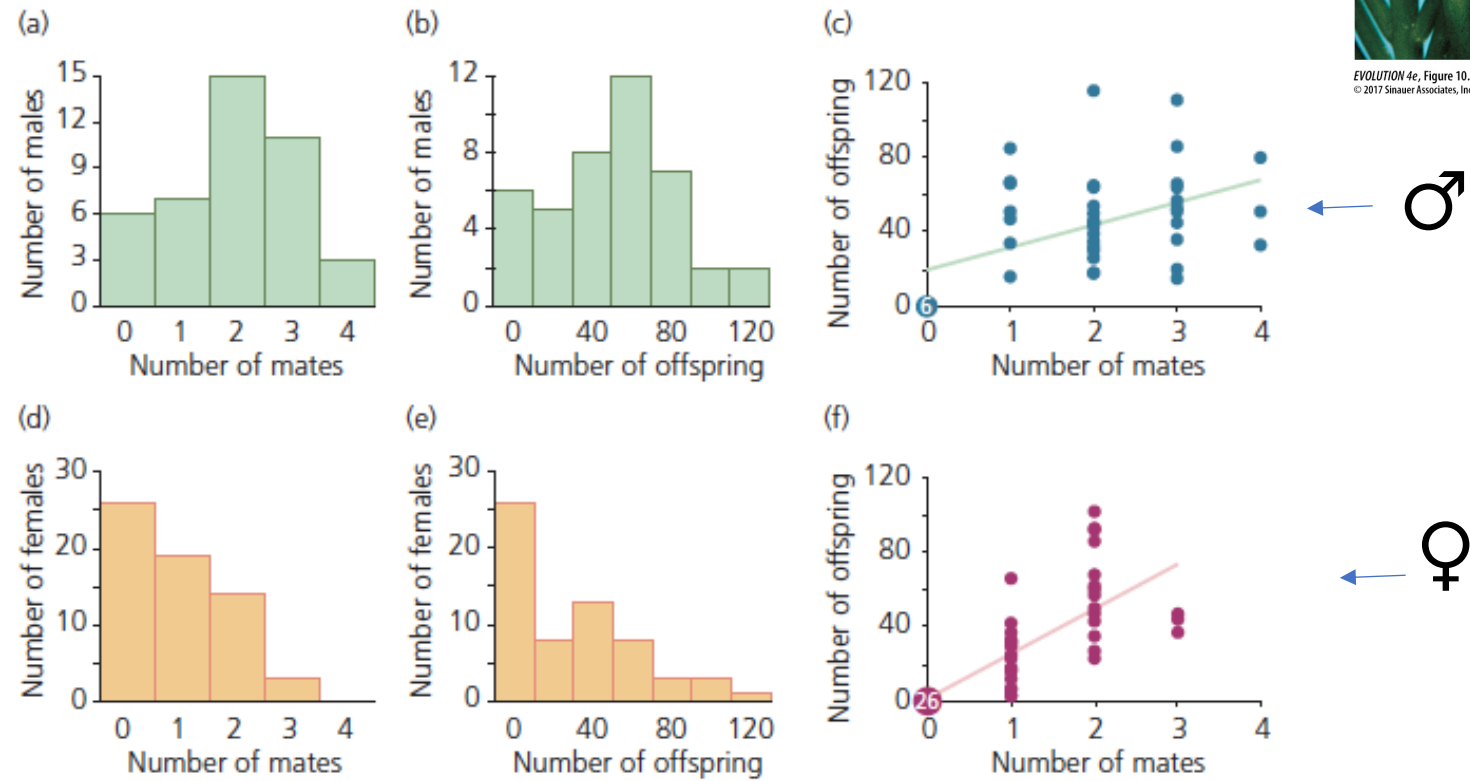


Herron and Freeman Fig. 11.10

... most of the time



EVOLUTION 4e, Figure 10.8 (Part 2)
© 2017 Sinauer Associates, Inc.



Herron and Freeman Fig. 11.11

Paradox of mitonuclear mate choice

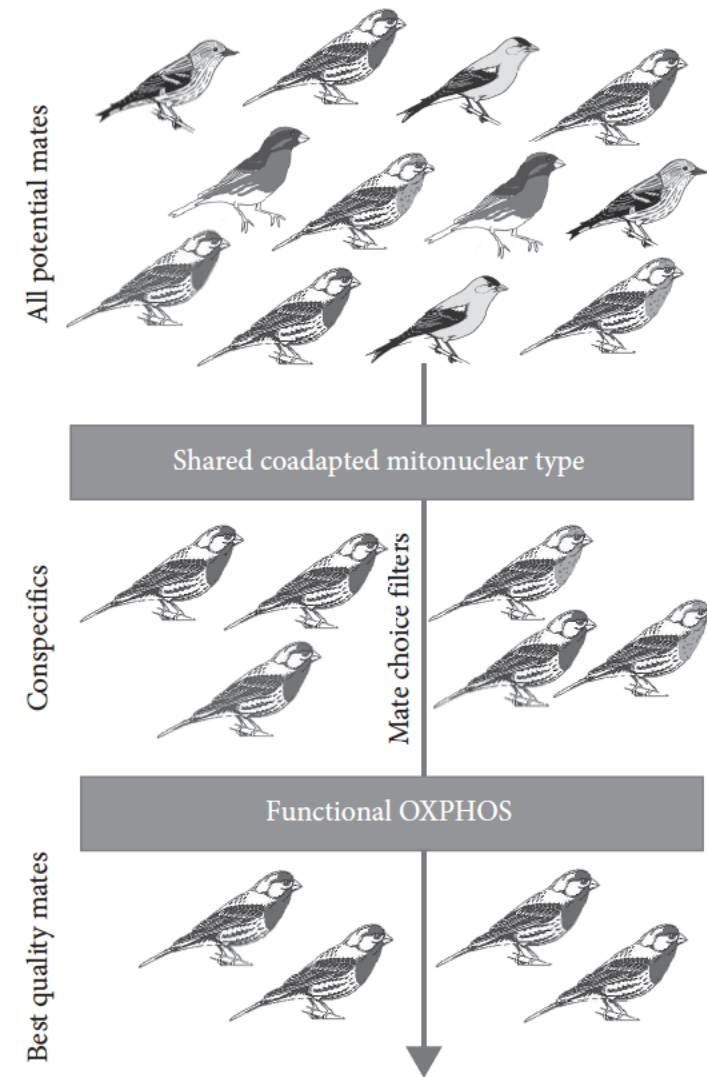
- Females generally choose among males
- Males don't pass on mt genes
- Females can't choose for mitonuclear incompatibility unless they *assume* males have the same mt type that they do
- They can then choose for N-mt genes and assume that if males have good mitonuclear incompatibility then offspring will as well
- Looking at seahorse type examples may be interesting

Assessing condition

- “Good genes” vs. direct benefits
 - May be linked
- Human mt diseases are prevalent
 - Variation among mt (and N-mt) genes segregate within a species
 - Females must sort out this variation and pick the best male
- Coadaptation vs. highest fitness
- GxGxE – LHON mutations

Ornaments as signals of mt function

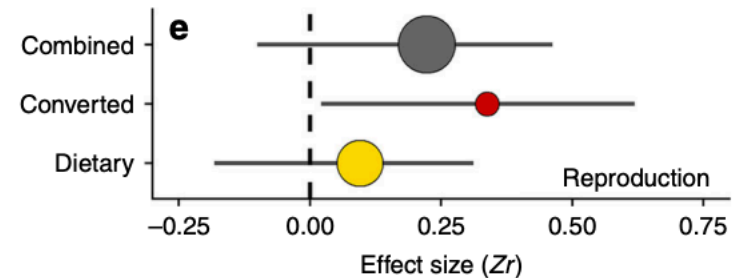
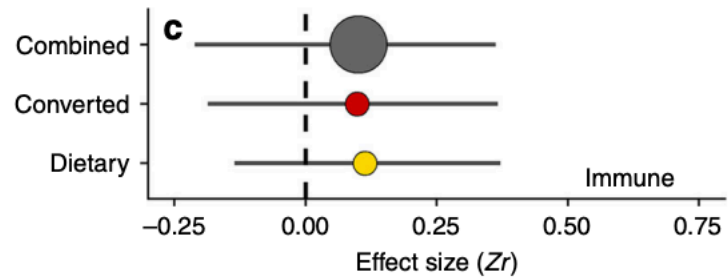
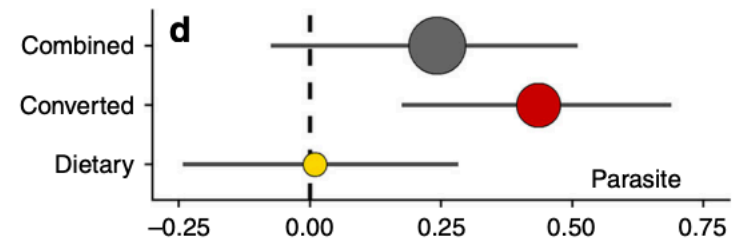
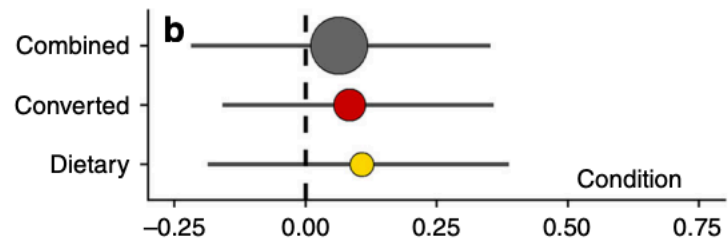
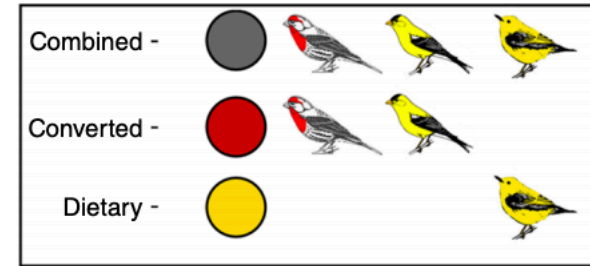
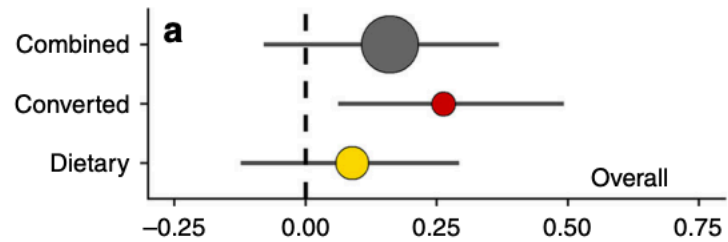
- Mt function is dependent on coordinated mt and N-mt genes
- Only individuals with high mt function can have ability to produce (costly?) ornaments
- May not apply to extreme ornaments(?)
- Mt function -> condition
- Condition -> mt function
- Selecting for ornaments selects for N-mt and mt genes



Red carotenoid coloration as an example

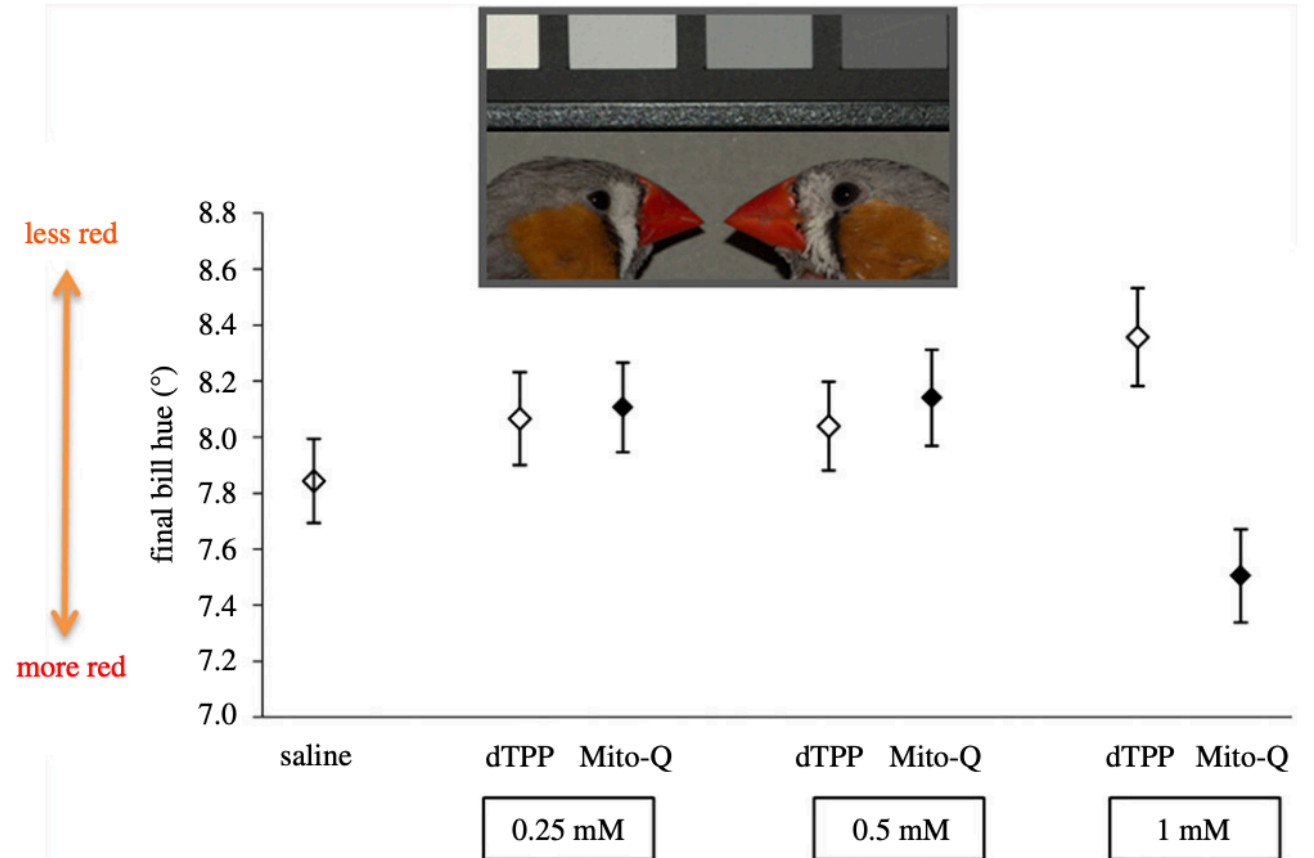
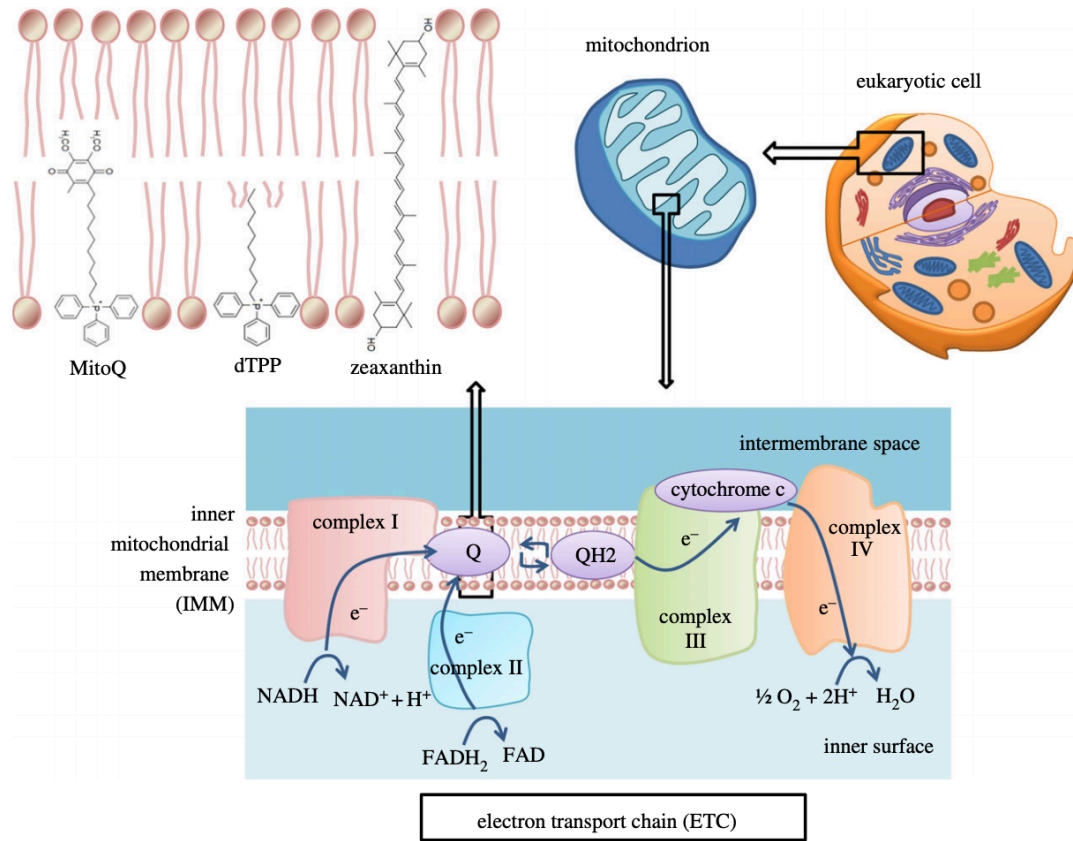
- Can't be synthesized de novo
- Must be converted from dietary precursors
- Redder males are more desirable
- Questions:
 - Does red coloration signal "condition"?
 - Does red coloration signal mt function?
 - Does red coloration signal mt/N-mt genetic variation?

Red coloration signals condition



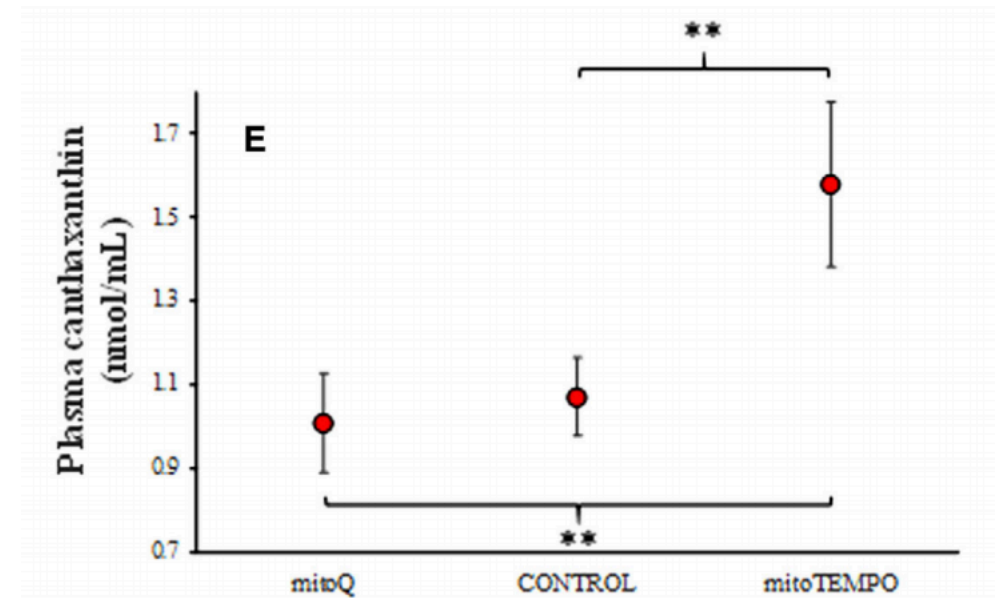
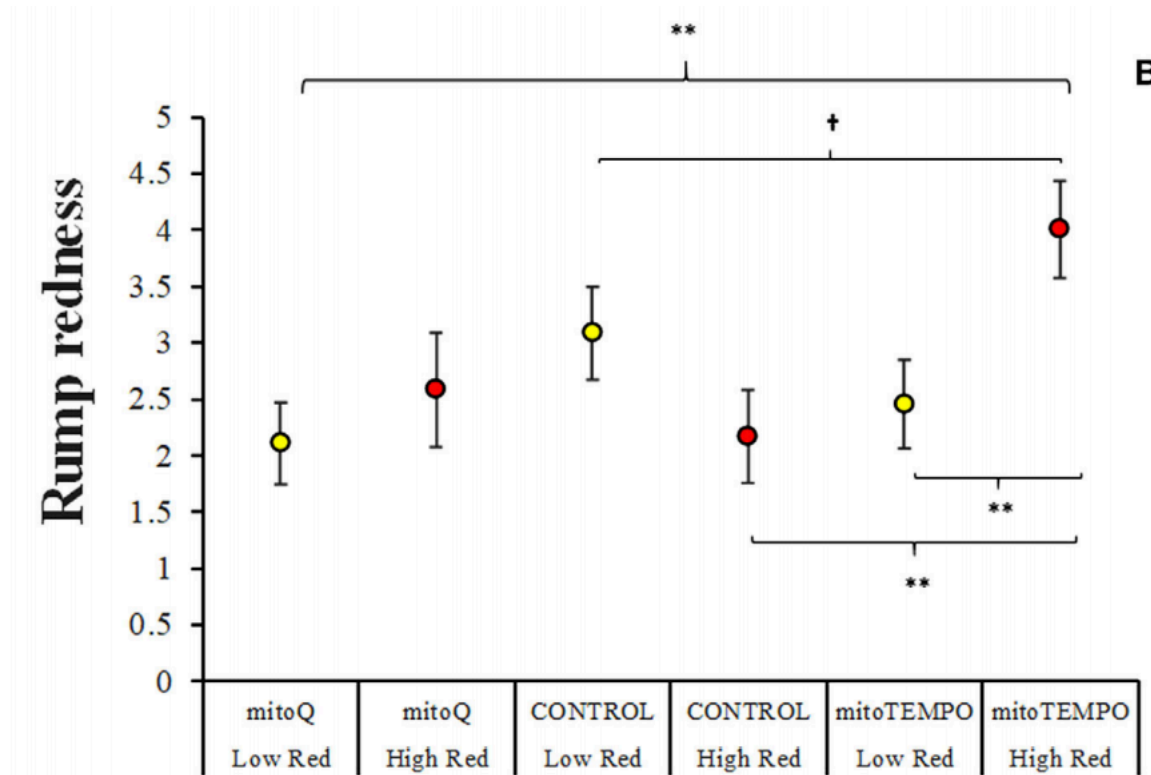
Weaver et al. 2018

Red coloration can be linked with mt function

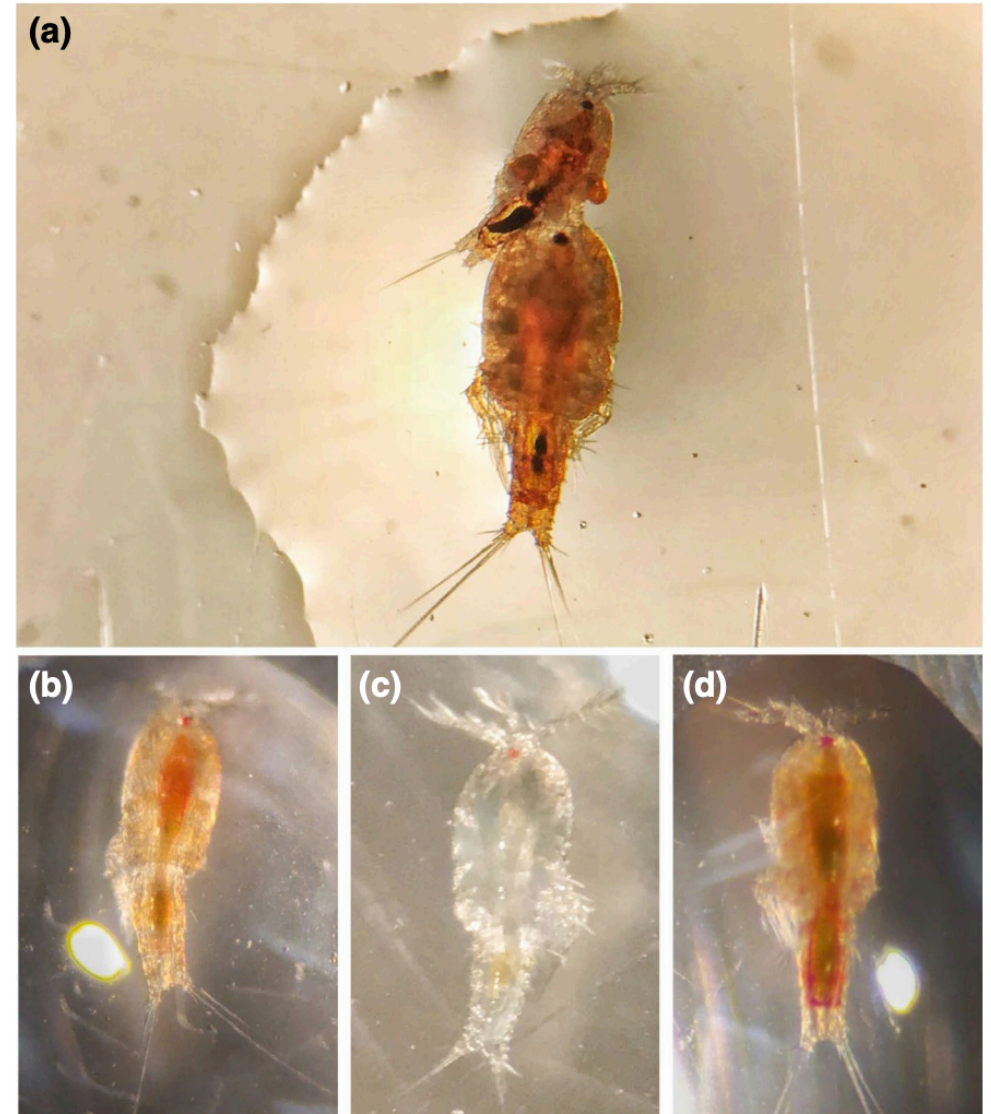
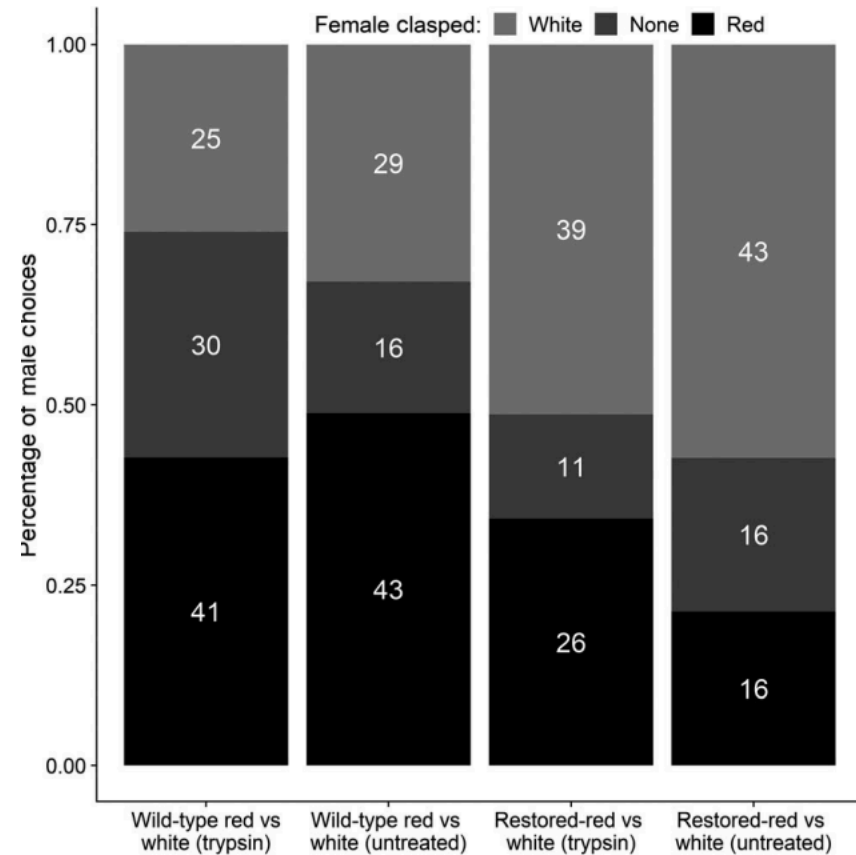


Cantarero and Alonso-Alvarez 2017

Mt function linked with red coloration



Red coloration may be linked with mito match



Powers, Hill, and Weaver 2020

Mitonuclear mate choice?

- May occur in some situations
- Is it super important?
- Ongoing work...

THE BIOLOGICAL BULLETIN



Marine
Biological
Laboratory

Published by the University of Chicago Press