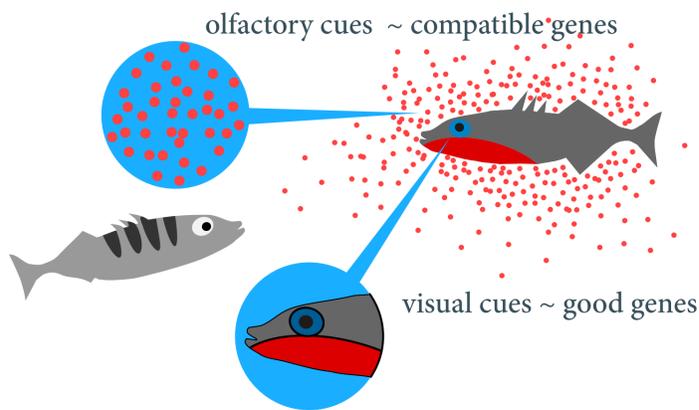
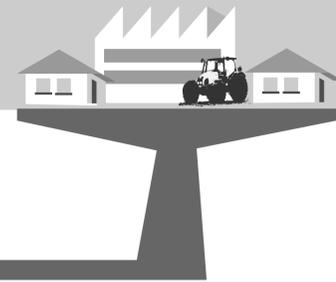
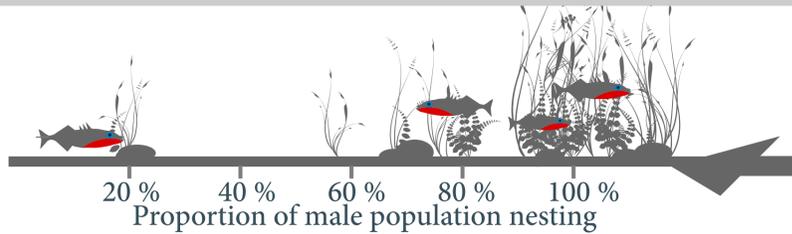


Female choice in eutrophied waters



Female sticklebacks use multiple cues in mate choice, with different cues indicating the same or different benefits. Since the assessment and information content of cues may vary with environmental conditions, changes in the environment could alter mate choice and therefore the target of sexual selection.



- Male competition ↓
- Male nest density ↑
- Male quality (MQ) distribution
- Uncertainty in MQ assessment ↑
- Reaction distance ↓

Augmented nutrient levels due to anthropogenic activities increase phytoplankton turbidity and the growth of filamentous algae in aquatic ecosystems. Reduced visibility influences mate choice and mate competition in fish.

Eutrophication influences Sexual selection

Reduced and altered female choice for male coloration and male size has been observed in field populations of threespine sticklebacks.

Which of the induced changes influence female choice ?

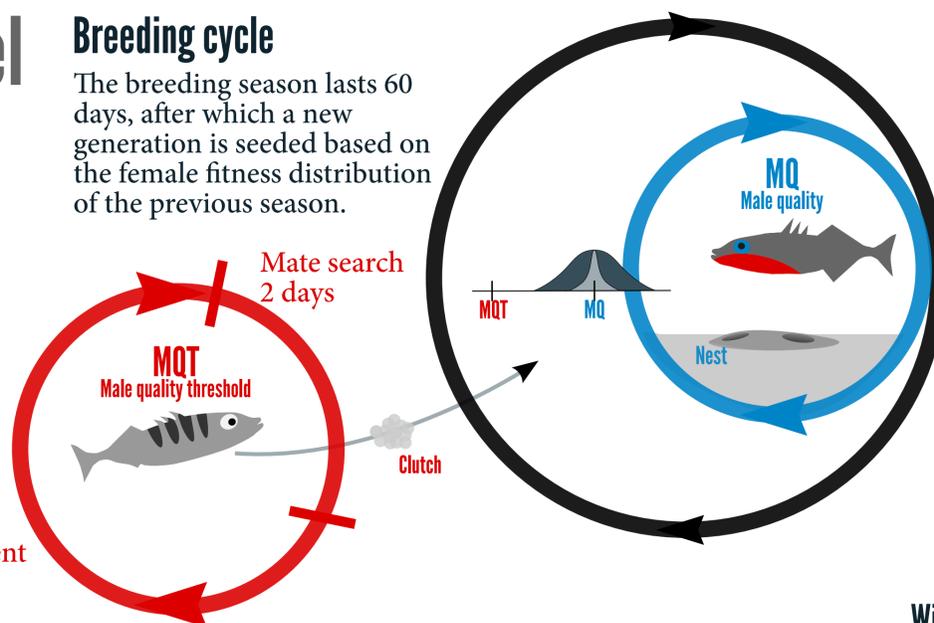
Individual based model

Emergent female trait

Each female has a mate quality threshold that represents a heritable mating strategy. A female will only mate with an encountered male if his mate quality (MQ) equals or exceeds her MQT.

Breeding cycle

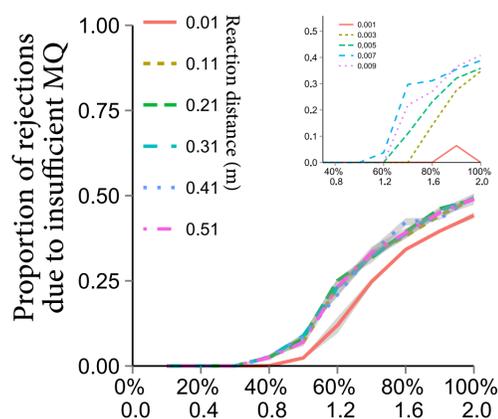
The breeding season lasts 60 days, after which a new generation is seeded based on the female fitness distribution of the previous season.



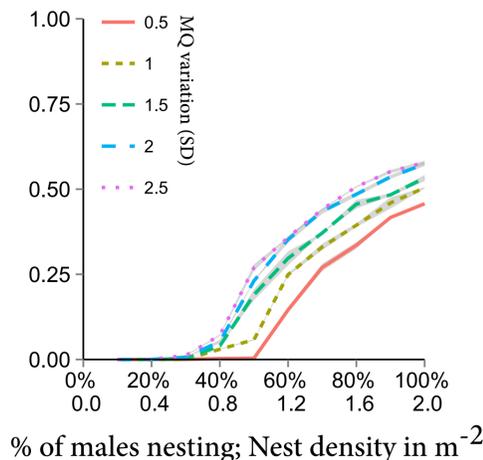
Male nest cycle

Males are represented by their mate quality (MQ). Males receive eggs from several females, and once their nest is full, they care for the eggs until hatching and then reopen the nests for new females.

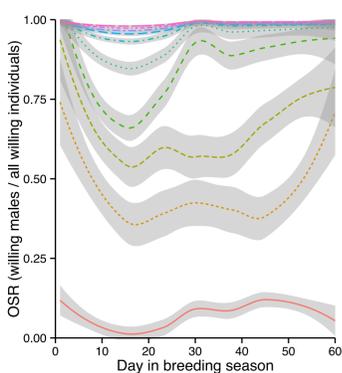
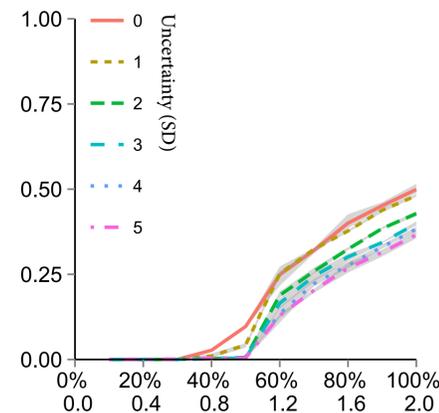
Reaction distance only changes the optimal MQT if it falls below 1 cm.



Increased variation in male quality leads to a MQT increase in females.



With increased uncertainty females evolve higher MQT as they mistakenly can also choose low quality males = model artefact?



At female biased sex ratios (low male densities), females compete for the few available males.

At low densities female competition for males dominates, while in eutrophied environments female choice can evolve. However females have been shown to reduce and reverse choosiness for common traits in eutrophied waters, which suggests that females change the targeted male traits or are maladapted to the eutrophied environment.