eDNA popgen conceptual model
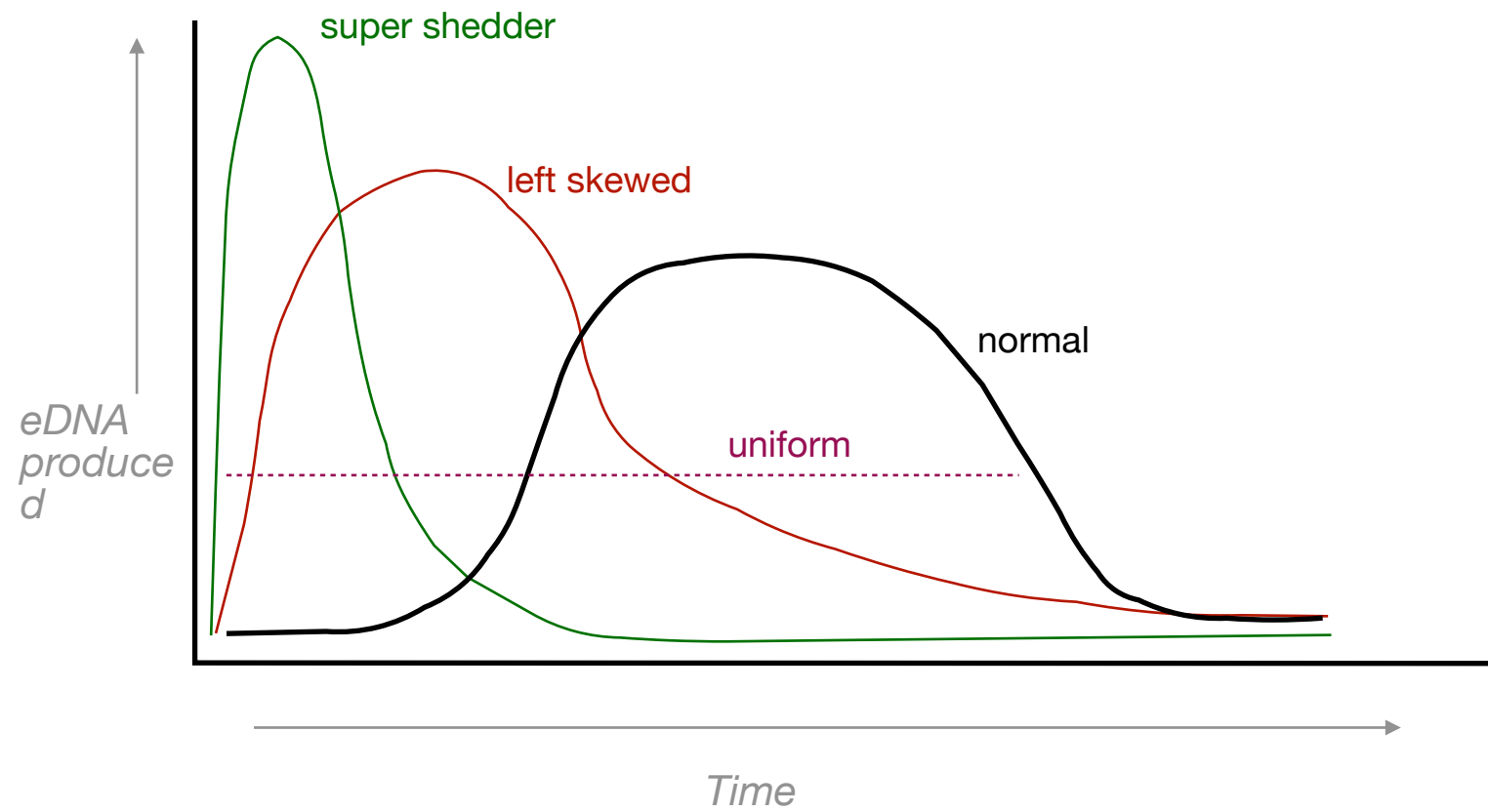
Peek & Miller 2020

Main processes that affect detection of eDNA

Biological/Environmental

- *Production*

- *Transport*

- *Degradation*

Production: different individuals have a different distribution of DNA shedding

Transport: assuming things can travel substantial distances, so sampling after an hour should be more than sufficient
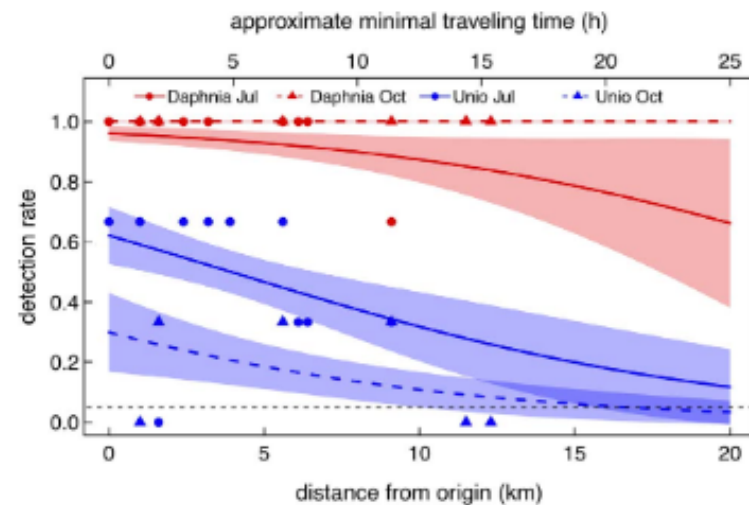

Figure 3. Observed and predicted detection of eDNA along river transect. Distance along the river Glatt from the source population (Lake Greifensee) at which eDNA for each species (red) *Daphnia longispina* and (blue) *Unio tumidus* was detected. Detection rate was determined as the number of positive amplifications of target DNA in three PCR replicates. The colored lines and the shaded area are glm model predictions (mean and standard error respectively) for the two species and time points (Jul: July and Oct: October) respectively. The black dashed line gives the 5% detection threshold. We also give calculated minimal traveling time of river water (and suspended eDNA and other particles therein) over the studied distances.
doi:10.1371/journal.pone.0088786.g003

from Deiner and Altermatt 2014: PLoS

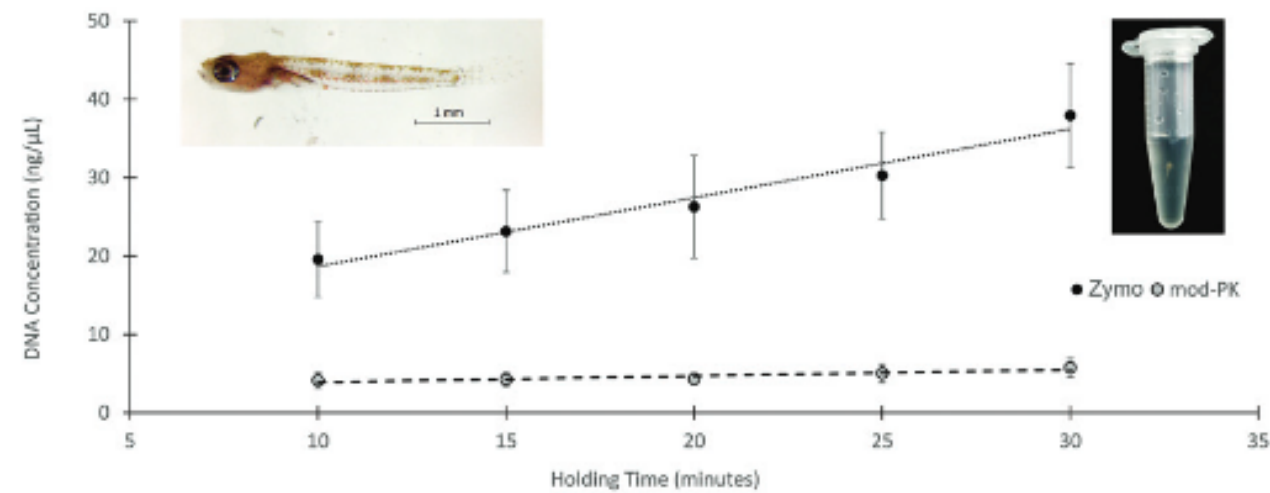# **Degradation**: how long does eDNA persist in the environment?

Figure 1. Isolated DNA concentration as a function of live fish larva holding time. Mean DNA amounts (ng/µl) and SEM (vertical bars) are shown for isolations using the Zymo Quick-DNA Universal Kit (Zymo Kit) (filled circles) and the modified proteinase K-EtOH (mod-PK) protocol (empty circles).

from Espinoza et al 2017: BioTechniques

Main processes that affect detection of eDNA

Technical/Sequencing

- *Sequencing error*

- *Coverage*

- *Diversity (θ)*

- *Number of loci analyzed*

- *loci length (read length)*

with higher *coverage, diversity, loci length*
& less *sequencing error*

expected

with higher
sequencing error
& less *diversity,*
loci length

Number of haplotypes

Number of Individuals