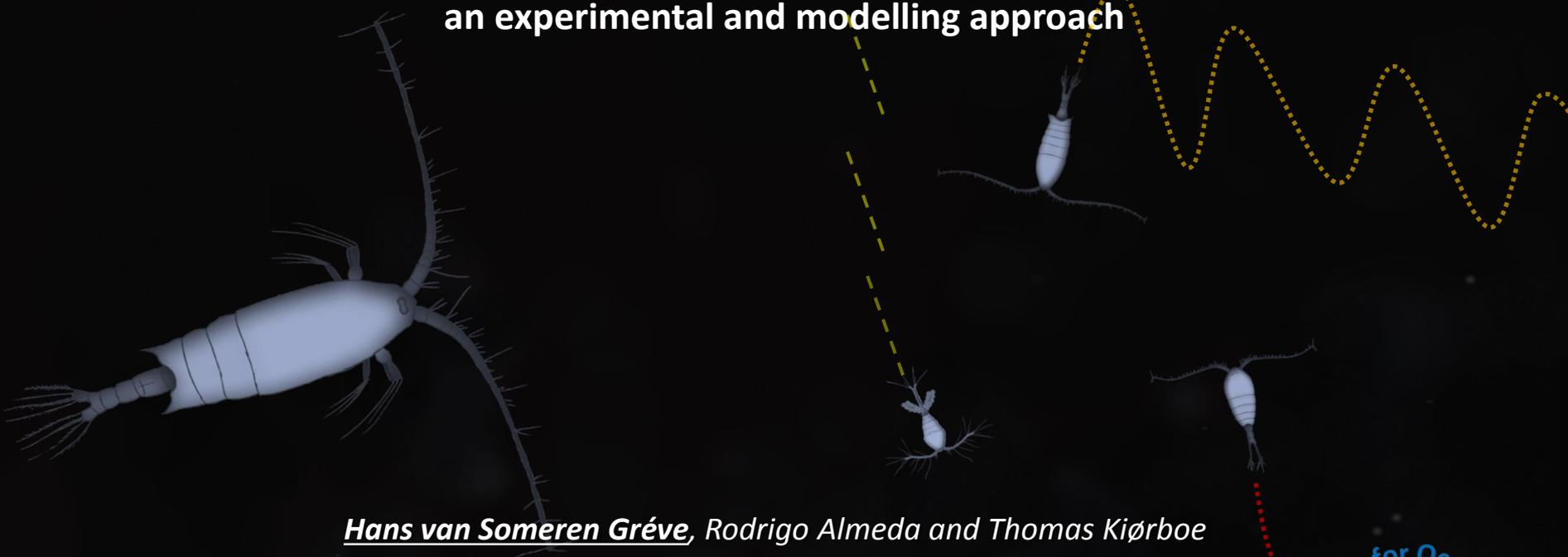


BEHAVIOR-DEPENDENT PREDATION RISK IN MARINE PLANKTONIC COPEPODS

an experimental and modelling approach



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6TH Zooplankton Production Symposium, Bergen



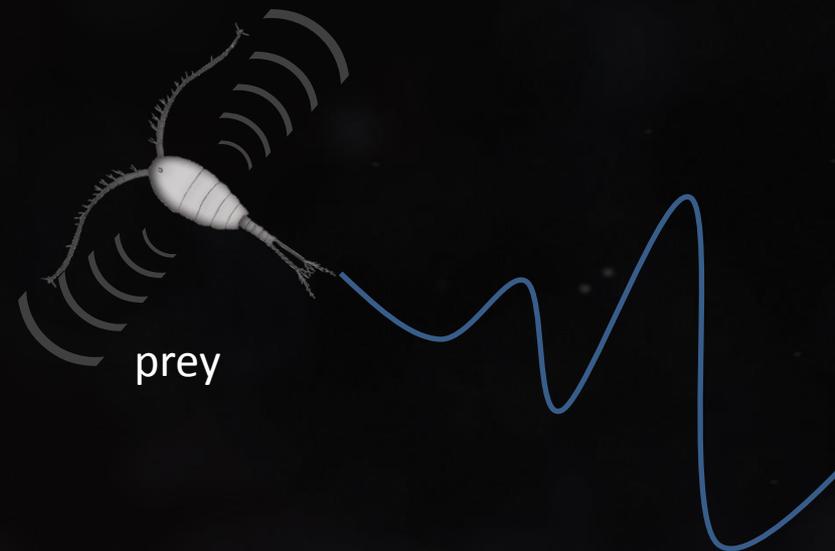
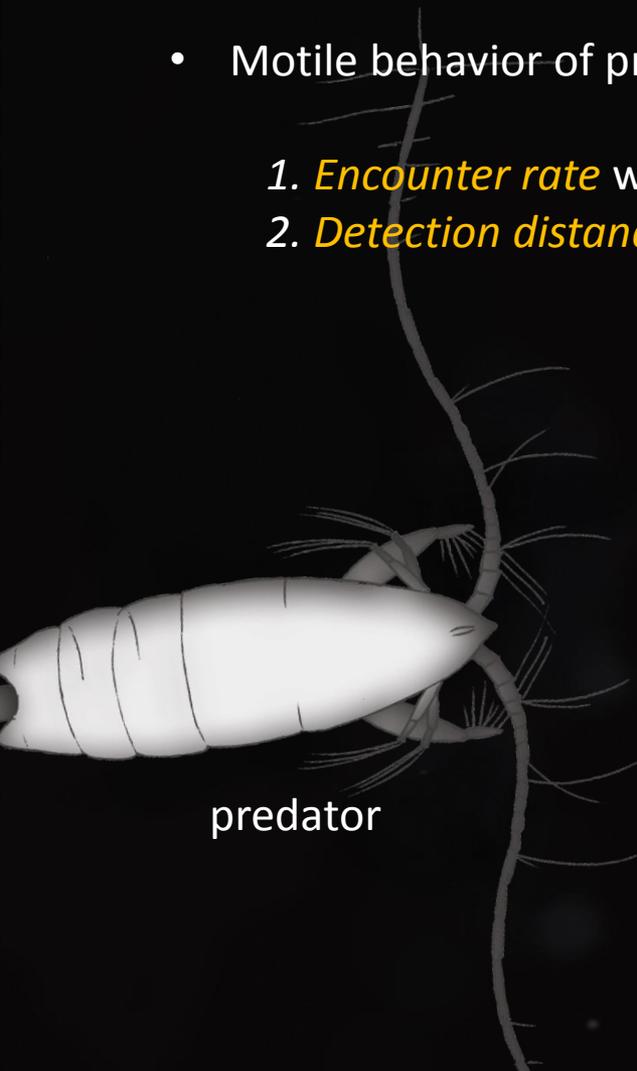
VKR Centre of Excellence

Predation risk in copepods



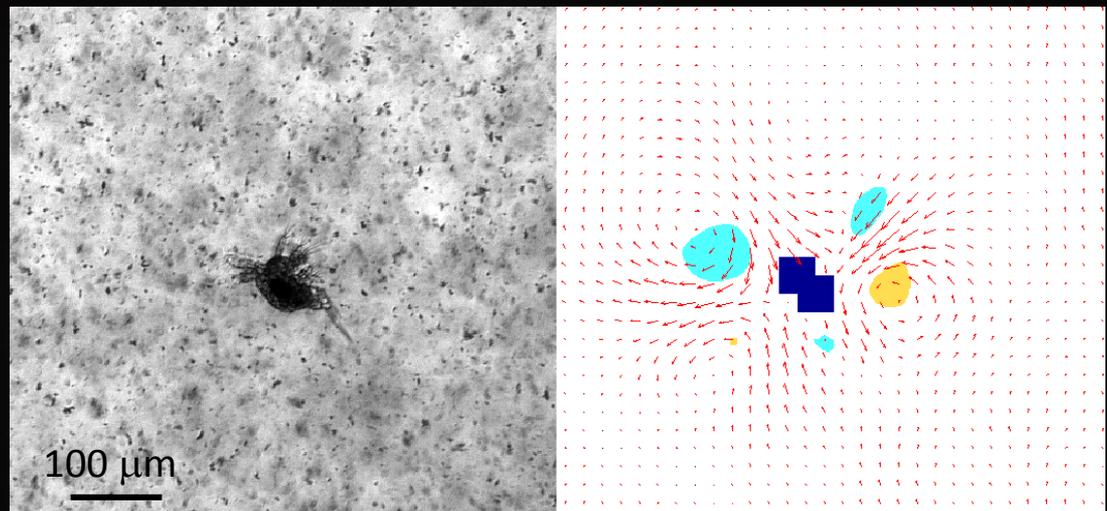
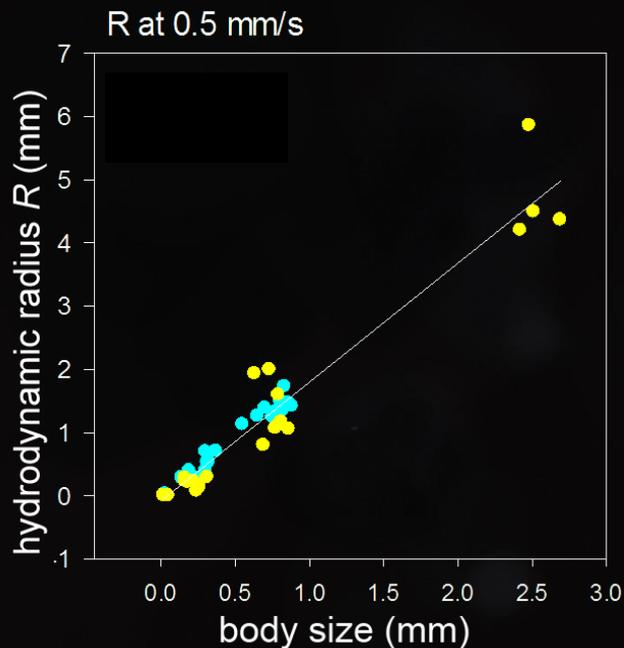
Predation risk in copepods

- Motile behavior of prey influences:
 1. *Encounter rate* with predator
 2. *Detection distance* through *hydrodynamic signals*



Predation risk in copepods

- Motile behavior of prey influences:
 1. *Encounter rate* with predator
 2. *Detection distance* through hydrodynamic signals
 - Activity & size of prey



flow visualization (slow motion)

Predation risk in copepods

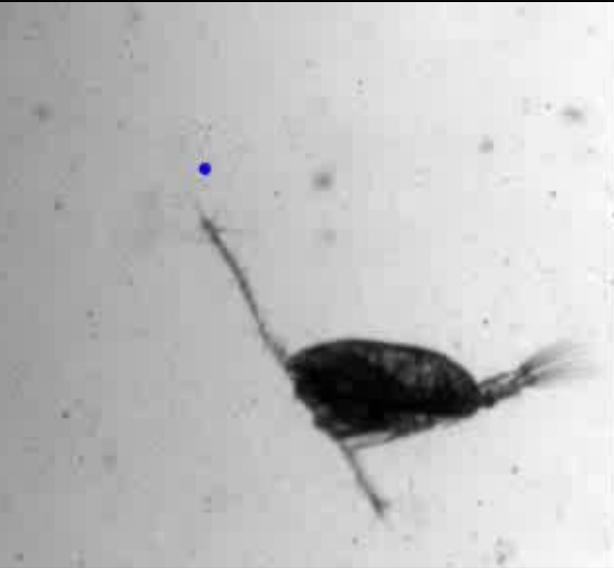


PREDATION RISK IS BEHAVIOR DEPENDENT

Copepod feeding behavior

- Three main copepod feeding strategies
 - > Feeding strategy and motile behavior closely linked

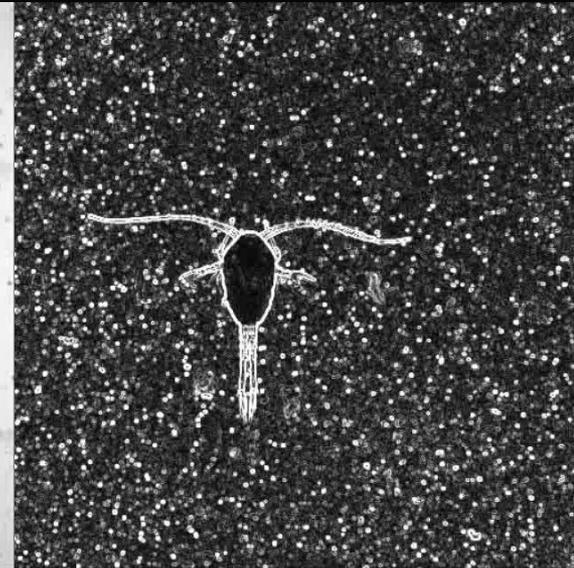
Ambush



Cruise



Feeding current



LOW

Volume of water scanned per time unit

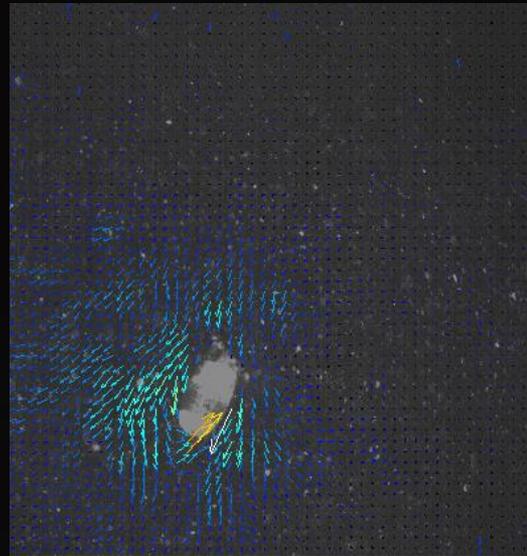
HIGH

Feeding behavior vs Predation risk

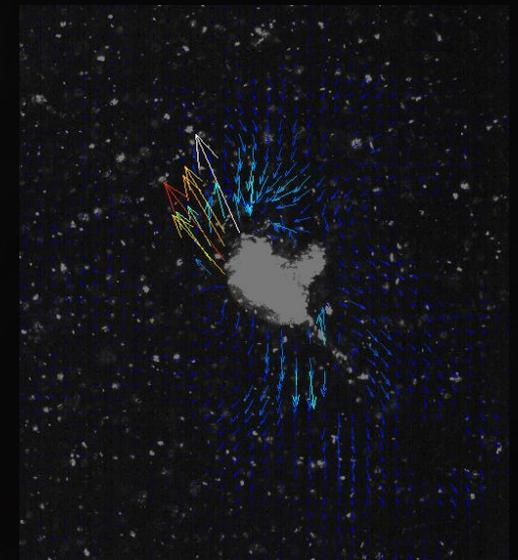
Ambush



Cruise



Feeding current



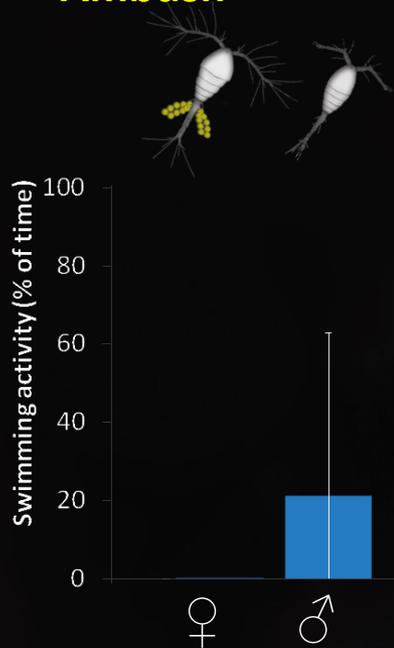
LOW

Fluid signal generation

HIGH

Gender vs Predation risk

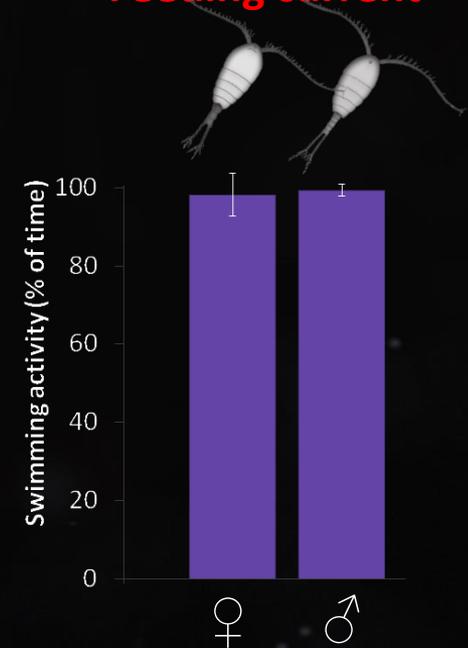
Ambush



Cruise



Feeding current



HIGH

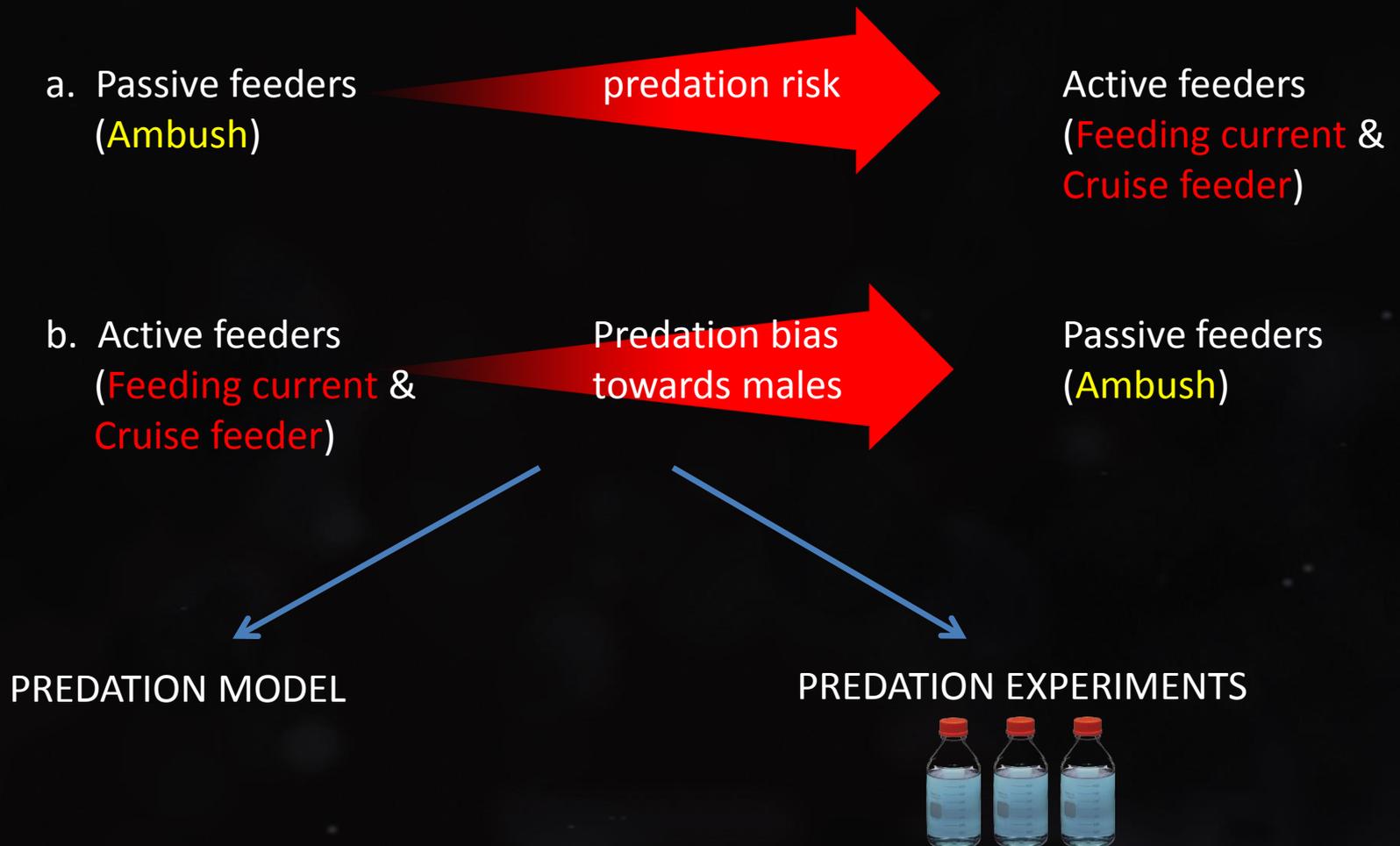
Male predation risk

~EQUAL



Hypothesis

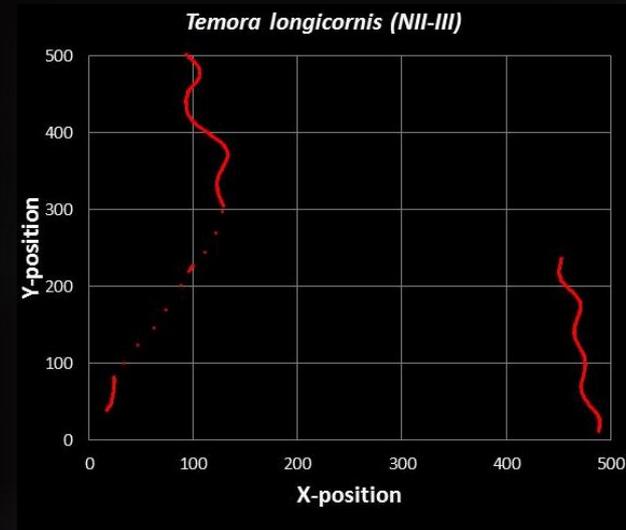
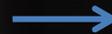
Differences in motility behavior result in differences in predation mortality:



Predation model

1. PREDICT PREDATION MORTALITY

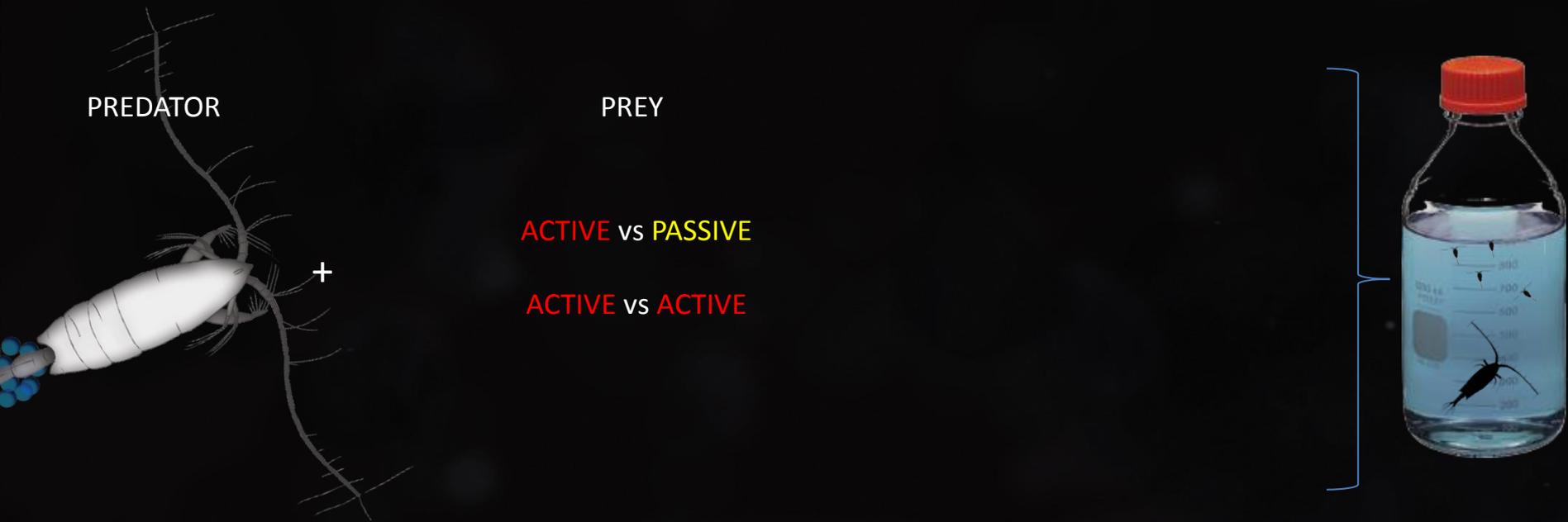
- Prey-behavior-dependent encounter model
 - Prey behavior: *velocity* (v), *activity* (p), *hydrodynamic radius* (R_2)
 - Predator behavior: *velocity* (u)
 - Prey and predator *size* (R_1 , R_3)
 - Input:
 - Behavioral observations of prey and predators



Experiments

2. QUANTIFICATION OF PREDATION MORTALITY

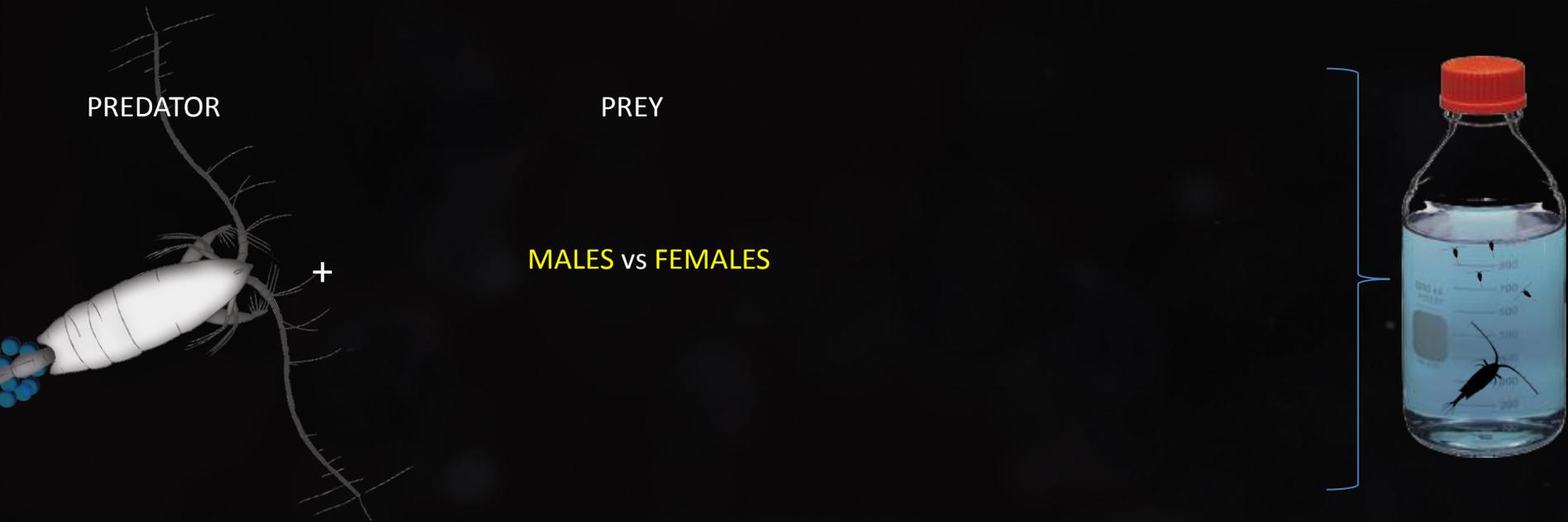
- Bottle incubation experiments (n=27)
 - 2 prey species simultaneously, ratio 1:1
 - Species with contrasting feeding behavior
 - Similar sizes



Experiments

2. QUANTIFICATION OF PREDATION MORTALITY

- Bottle incubation experiments (n=27)
 - 2 prey species simultaneously, ratio 1:1
 - Species with contrasting feeding behavior
 - Similar sizes
 - **Males and females of the same species**



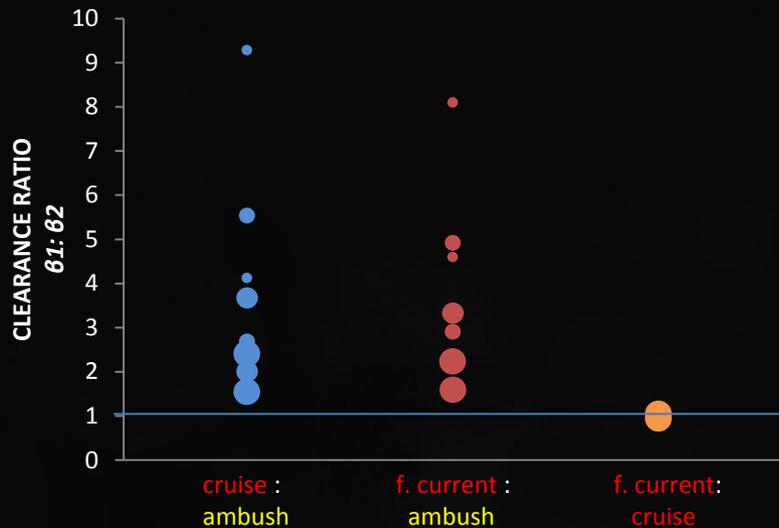
Experiments

2. QUANTIFICATION OF PREDATION MORTALITY

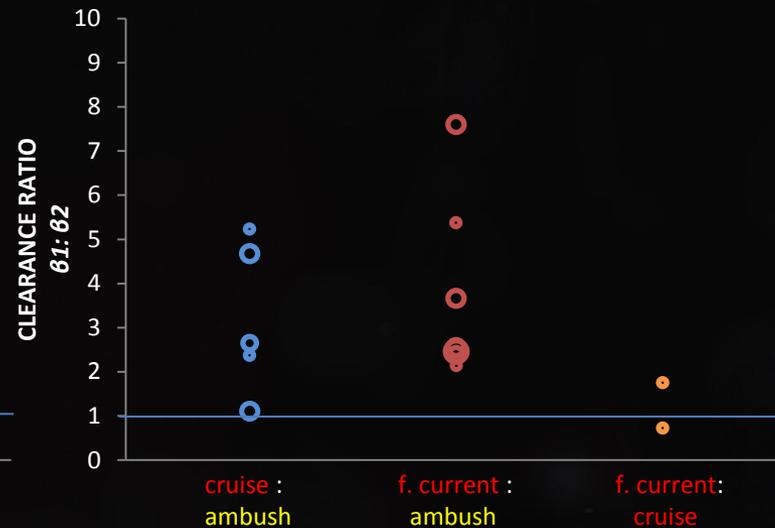
- Bottle incubation experiments (n=27)
 - 2 prey species simultaneously, ratio 1:1
 - Species with contrasting feeding behavior
 - Similar sizes
 - Males and females of the same species
 - 3-5 prey concentrations (10-180 copepods L⁻¹)
 - Calculation of predation mortality & clearance rates
 - Prey reduction compared to controls after 24-48 hrs
 - Maximum clearance rates: Holling type II model fit

Feeding behavior vs Predation risk

PREDICTED

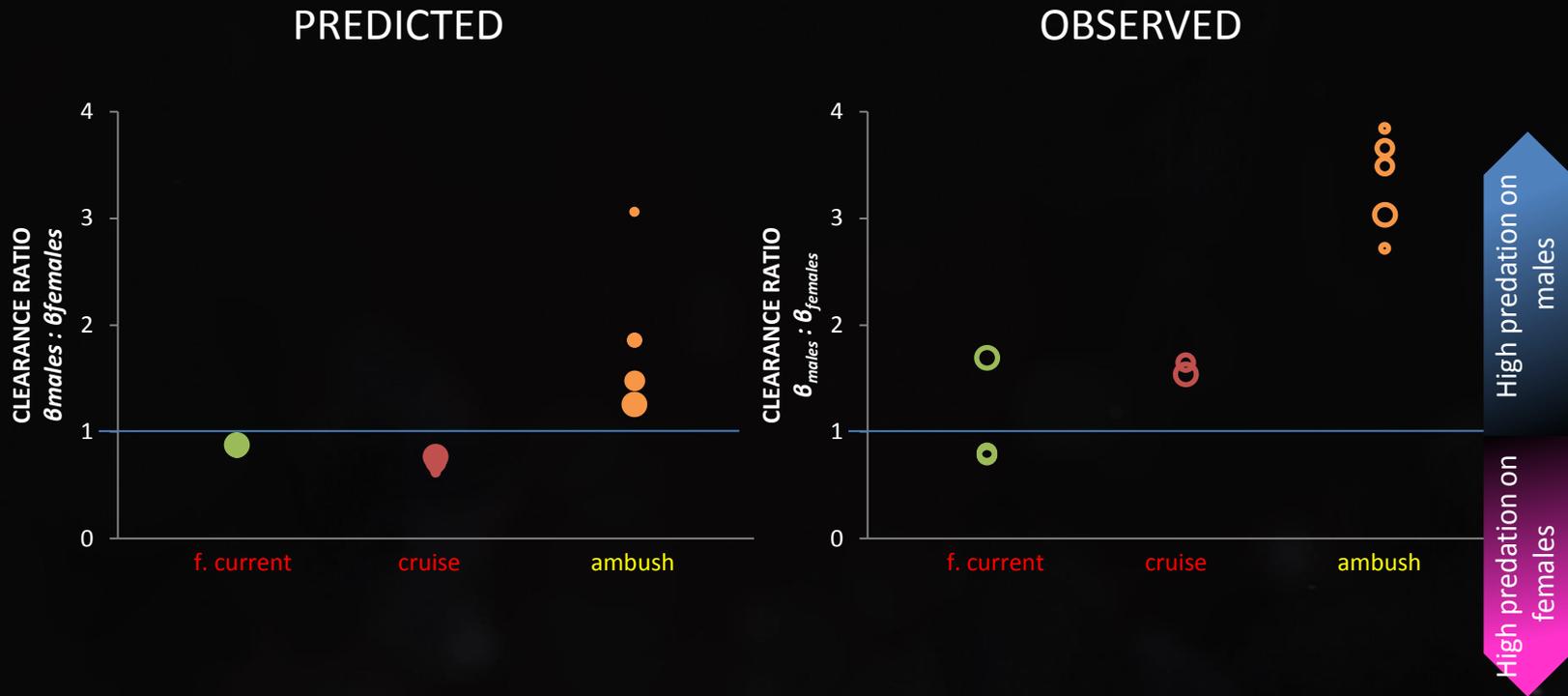


OBSERVED



> **Active feeding** strategies are more risky!

Gender vs Predation risk



> **Passive feeders:** high predation bias towards males

Conclusions

- Differences in motility behavior imply differences in predation risk:



- Predation risk can be predicted from motility parameters in planktonic copepods

THANK YOU!

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