SIZE-SELECTIVE FISHING MORTALITY, LARVAL PRODUCTION, AND sustainable Yield in species with obligate male care

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## Kindsvater lab

- Life history evolution of animals: mechanisms shaping growth, mortality and reproduction
- Fish mating systems: causes and consequences for demography (age, size, and sex composition of a population)
- Resilience of different fish species to fishing mortality (and selectivity)



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## Symphodus melops Corkwing wrasse

Managed with minimum size limit (at least 120 mm OR Slot limit (Take 120 mm - 170 mm only)


A fishery for large corkwing males (Fyke net and traps) developed rapidly in the last decade to meet demands for louse biocontrol in salmon aquaculture

Smaller fish get beat up in the salmon nets, so there is a strong preference for largest males.



Halvorsen et al. 2017, ICES J Mar Sci; Halvorsen et al., unpublished data


- Females
- Nesting males
- Sneakers

Sneakers mature after first year (age 1) All individuals mature by age 3 ; most by age 2


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In species with obligate sharable male care, how do we manage to protect egg supply and ensure adequate recruitment?

- assume no density-dependent compensation in larvae hatching success

Females want to know this too: S. ocellatus females copy each other so nesting males won't abandon nest. BUT they will avoid spawning if density of sneaker males is too high (Alonzo 2004)




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## Fishery reference points

SPR $=\frac{\text { Lifetime production (with fishing) }}{\text { Lifetime production (unfished) }}$
Spawning Potential Ratio*
Near $1=$ High compensation
Near $0=$ No compensation

* usually estimated statistically from stock assessments, not mechanistically linked to life history

Fishery reference points
New metric: care availability per egg



Care capacity ratio= fished care per egg unfished care per egg

Fishery reference points


## Yield

## Questions:

## How do different management strategies affect yield, spawning potential (recovery capacity) and care capacity?

## What if care capacity feeds back into spawning potential?



## Relative corkwing wrasse yield (numbers)



Slot size limit

\% decrease in yield with slot limit


Fishing mortality

## Corkwing wrasse

Minimum size limit


## Corkwing wrasse

Minimum size limit


Slot size limit


## Corkwing wrasse



Improvement is greatest at $F<0.4$

- Slot limits are only effective at low levels of fishing mortality in species with high natural mortality
- They may not be effective if fishing mortality is displaced onto fish within the slot size



## Thanks!


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