

**LARVAL DISPERSAL HAS LITTLE  
EFFECT ON BENEFITS FROM  
SPATIALLY EXPLICIT PROPERTY  
RIGHTS**

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# Introduction

- Connectivity and recruitment determine the sustainability of fish populations.
- Large body of literature:
  - It is critical to include larval dispersal in the design management schemes
- In MPAs
  - Their design should match the dispersal of adults and larvae.

# In TURFs

TURFs need to be hundreds of Km long to provide full ownership

- The strongest source of spillover is larval dispersal (White and Costello 2011)

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## Main Question

**Do spatial property rights really have to match the dispersal capacity of the species they target?**

# Why would they have to match?

- Strong levels of larval spillover



- Incomplete ownership over the resource



- Race to fish



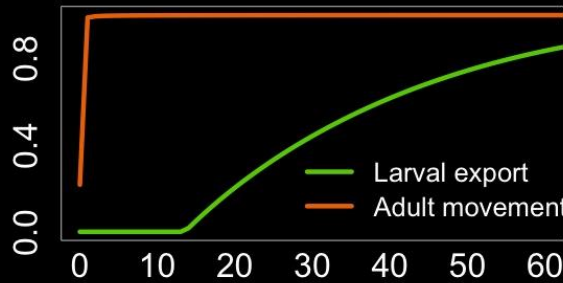
- Over-exploitation

# SUMMARY

PROPORTION OF MSY

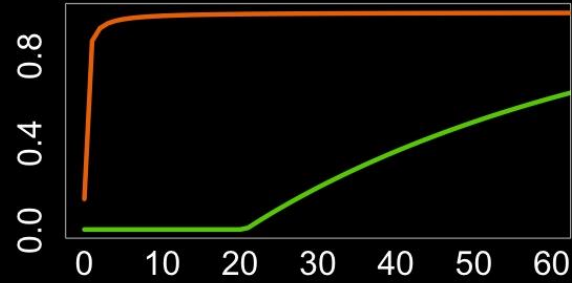
CHIL

Loco



MEXIC

Spiny Lobster



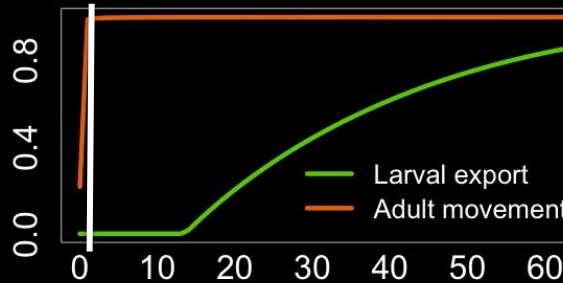
TURF SIZE  
(KM)

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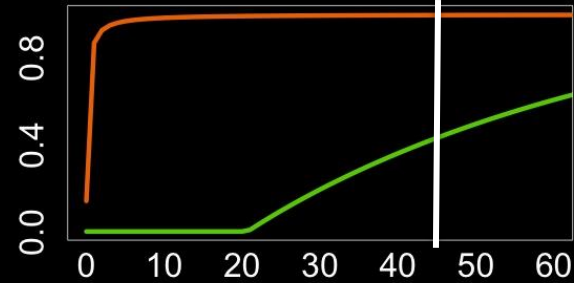
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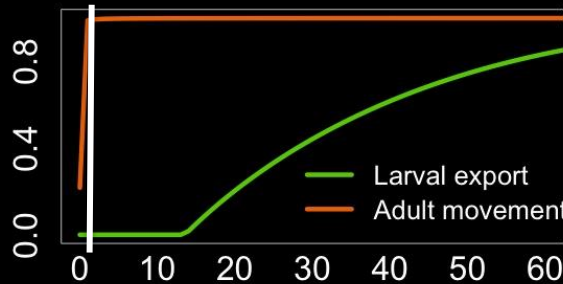
TURF SIZE  
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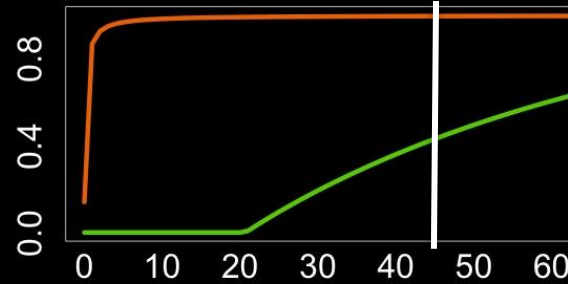
CHIL

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TURF SIZE  
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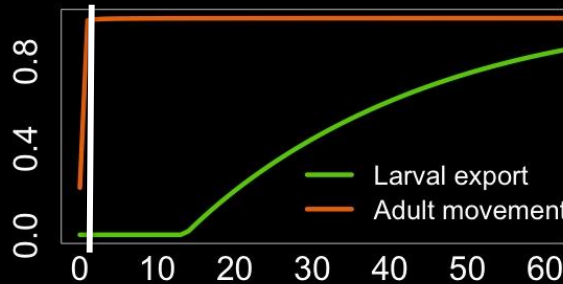
However these cases show a strong performance



# SUMMARY

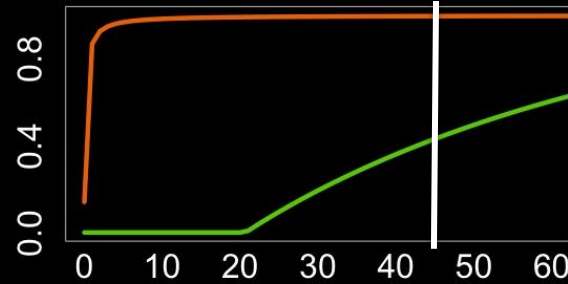
PROPORTION OF MSY

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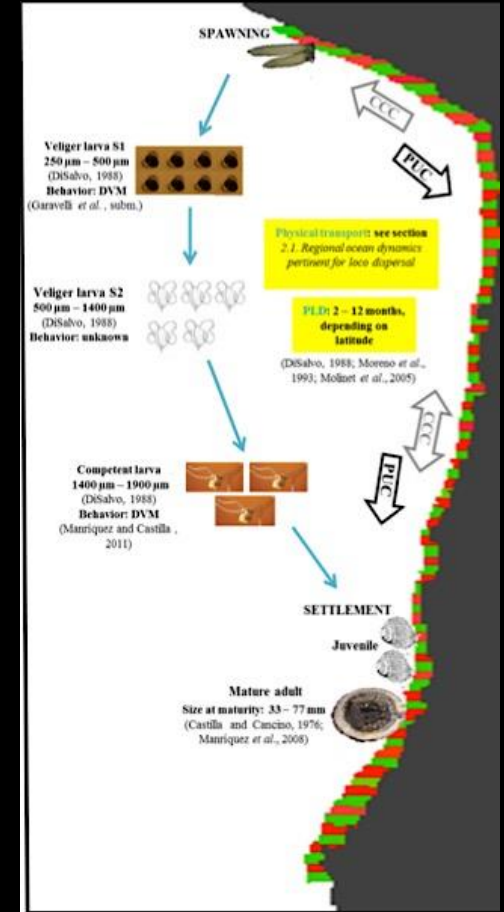


MEXIC

Spiny Lobster



TURF SIZE  
(KM)



Larval dispersal is hard to describe

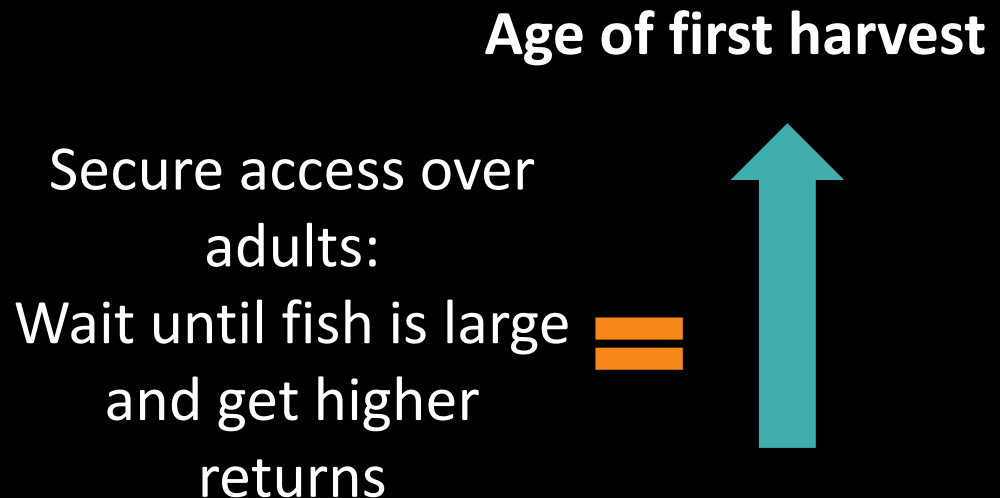
# Why are they not racing?

- Other forces also drive harvest decisions.
- In particular, those that incentivize delays in harvests can be out-ruling those that lead to a race to fish.



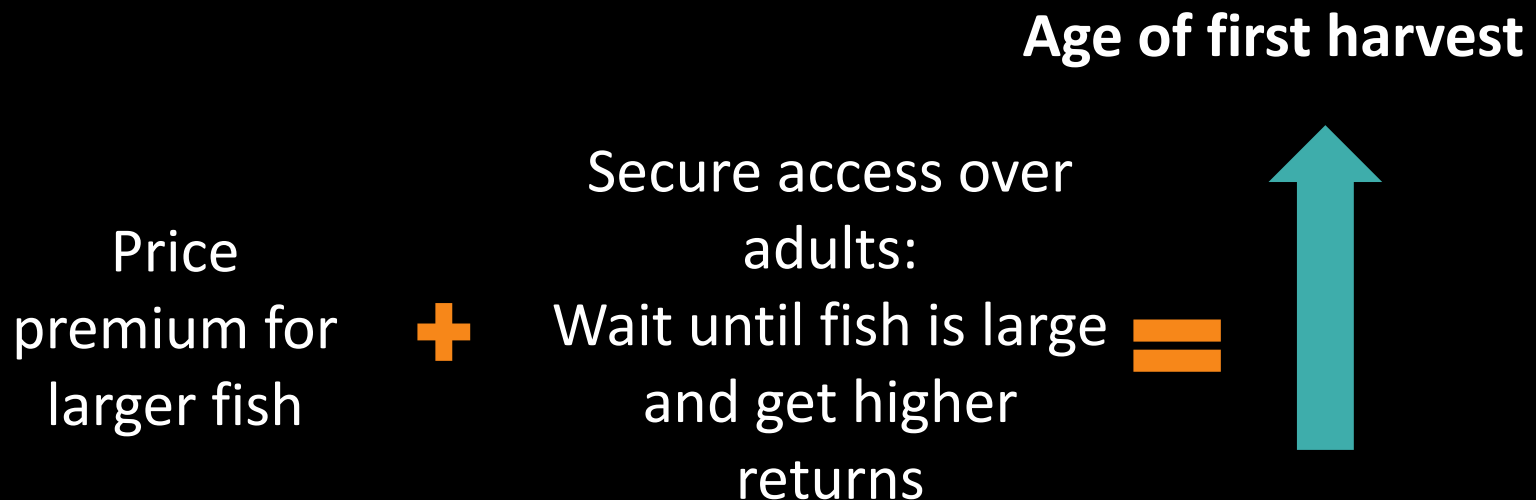
# IF FISHERS IGNORE RECRUITMENT

- Fishers might be completely ignoring larval dispersal and still achieving sustainable harvest
- The incentives to harvest after the age of first maturity need to be present



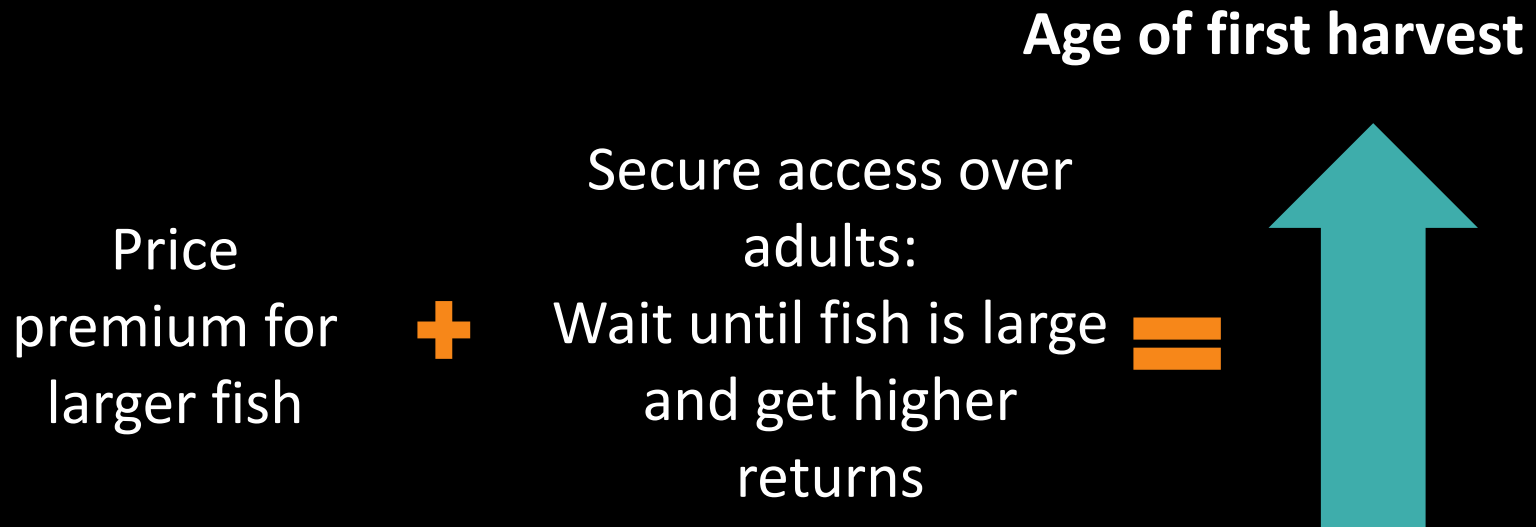
# ONE POSSIBLE EXPLANATION

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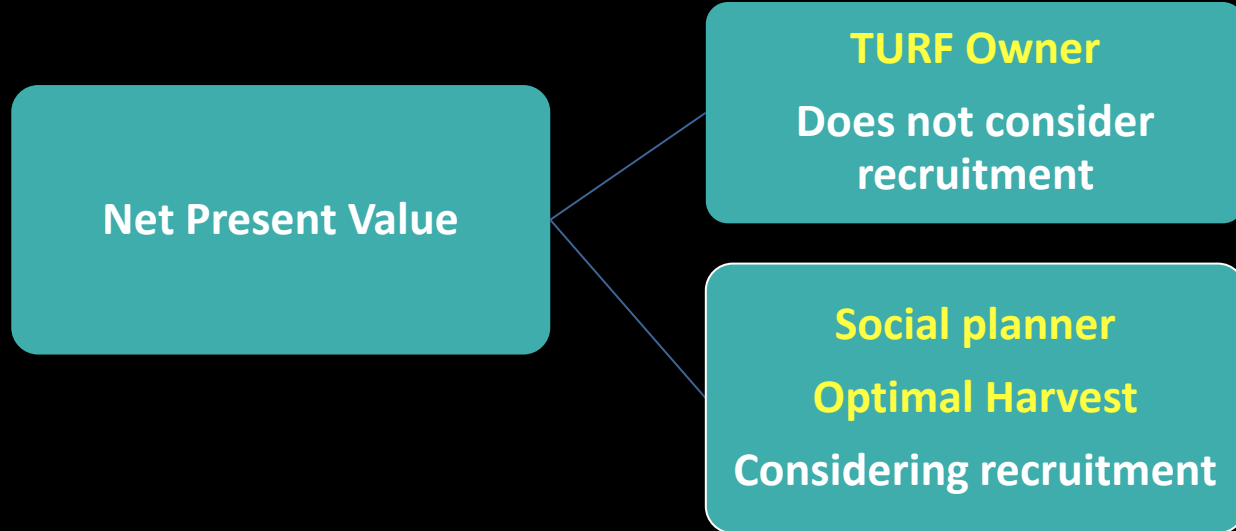


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# Our approach



# The Social Planner

- Full population dynamics
- Age structure population growth model
- Fecundity depends on weight at age
- Age of first maturity  $a_{mat}$ 
  - The inflection point of the individual growth curve.
- Age of first harvest  $a_{\mu}$ 
  - NPV over 100 years
- All individuals older than  $a_{\mu}$  are harvested

# TURF owner

- Does not consider recruitment
- $A_\mu$  results from maximizing:

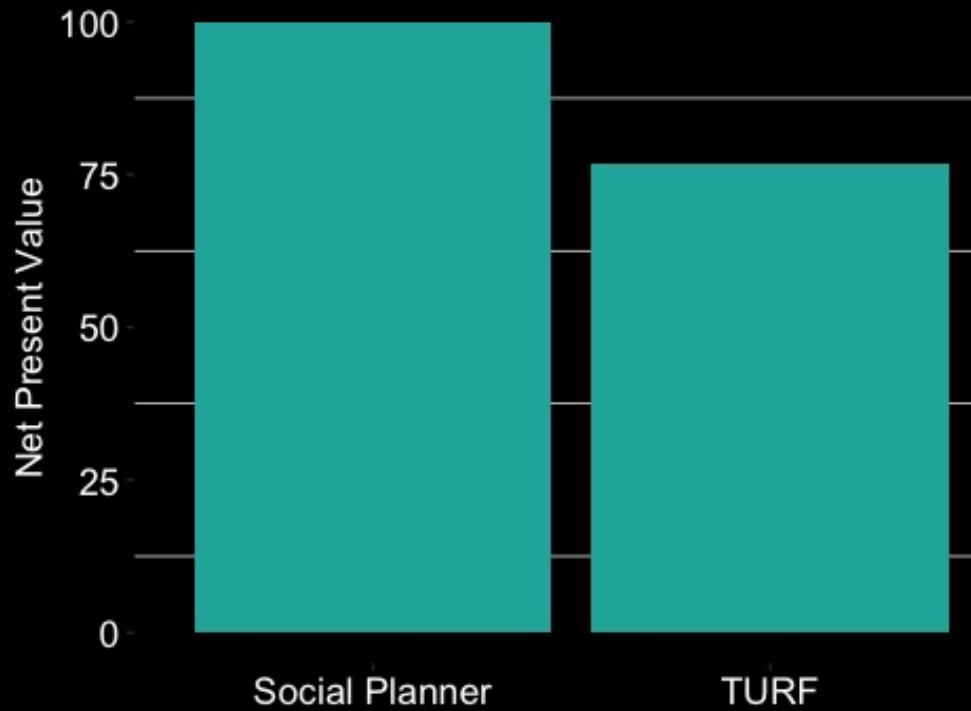
$$\pi_a = p_a w_a e^{-(\delta+m)a}$$

- $m$ =natural mortality
- $\delta$ =discount rate
- $w$ =weight at age
- $p$ =price at age

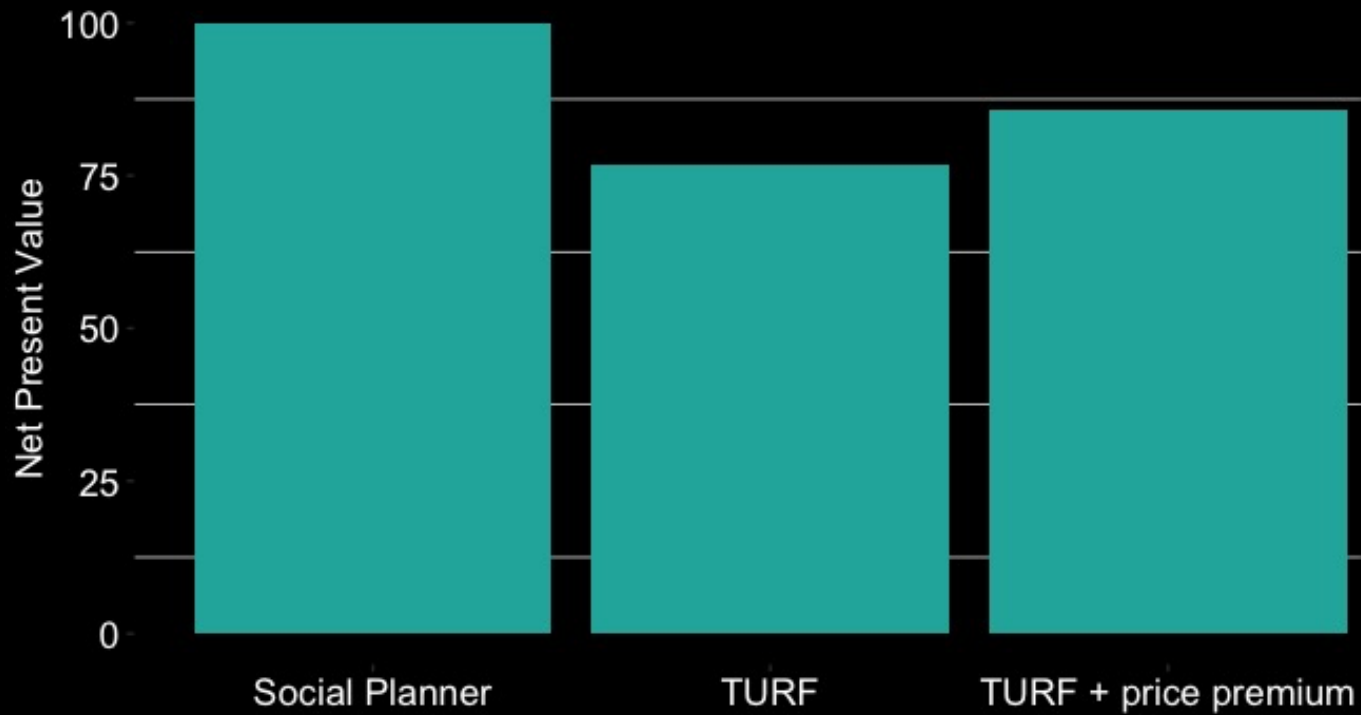


# Results

# RESULTS



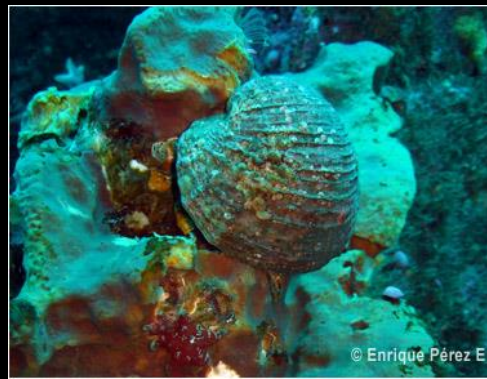
# RESULTS



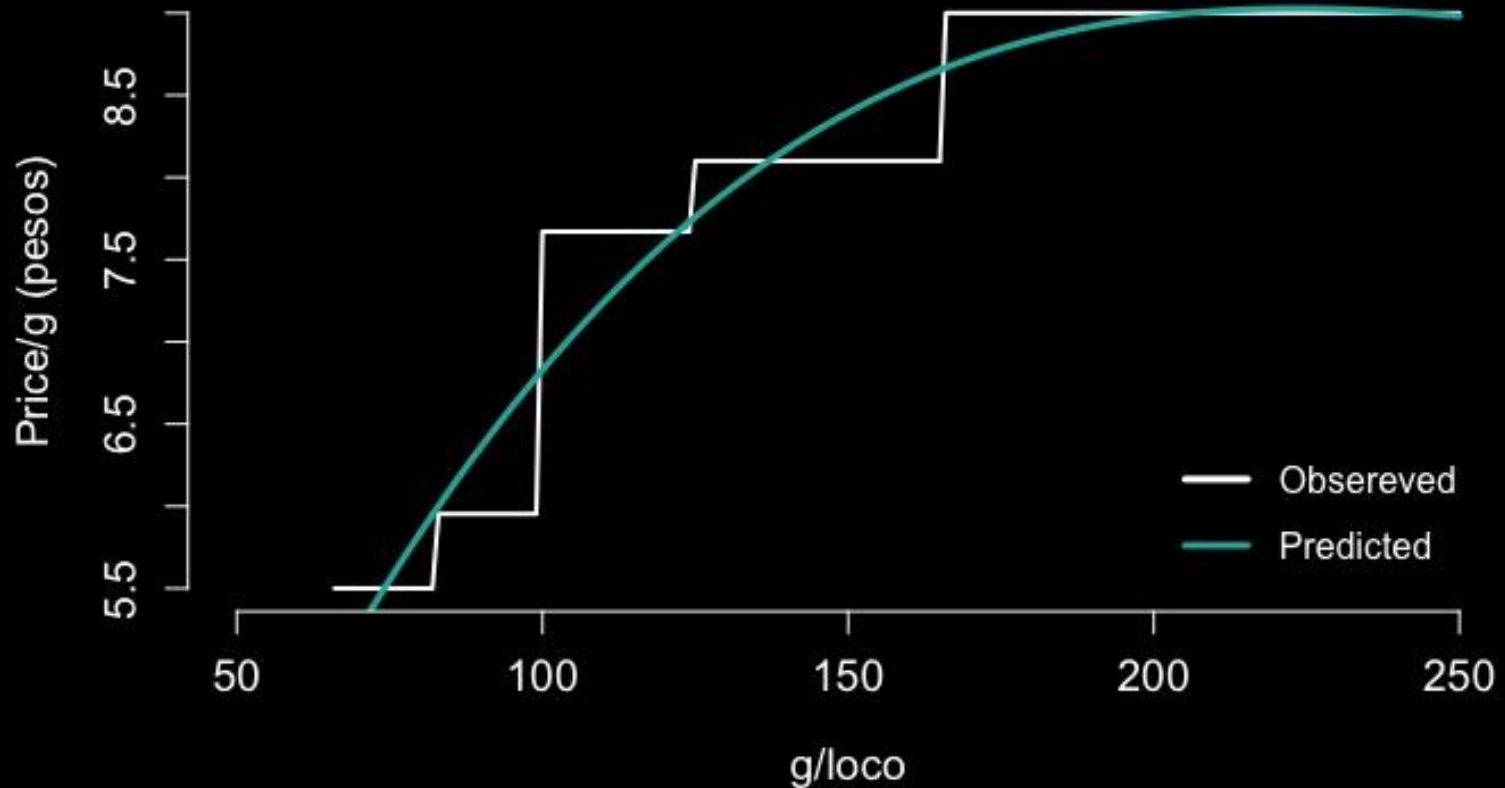
# A Case Study: Chilean Loco

# Chilean loco

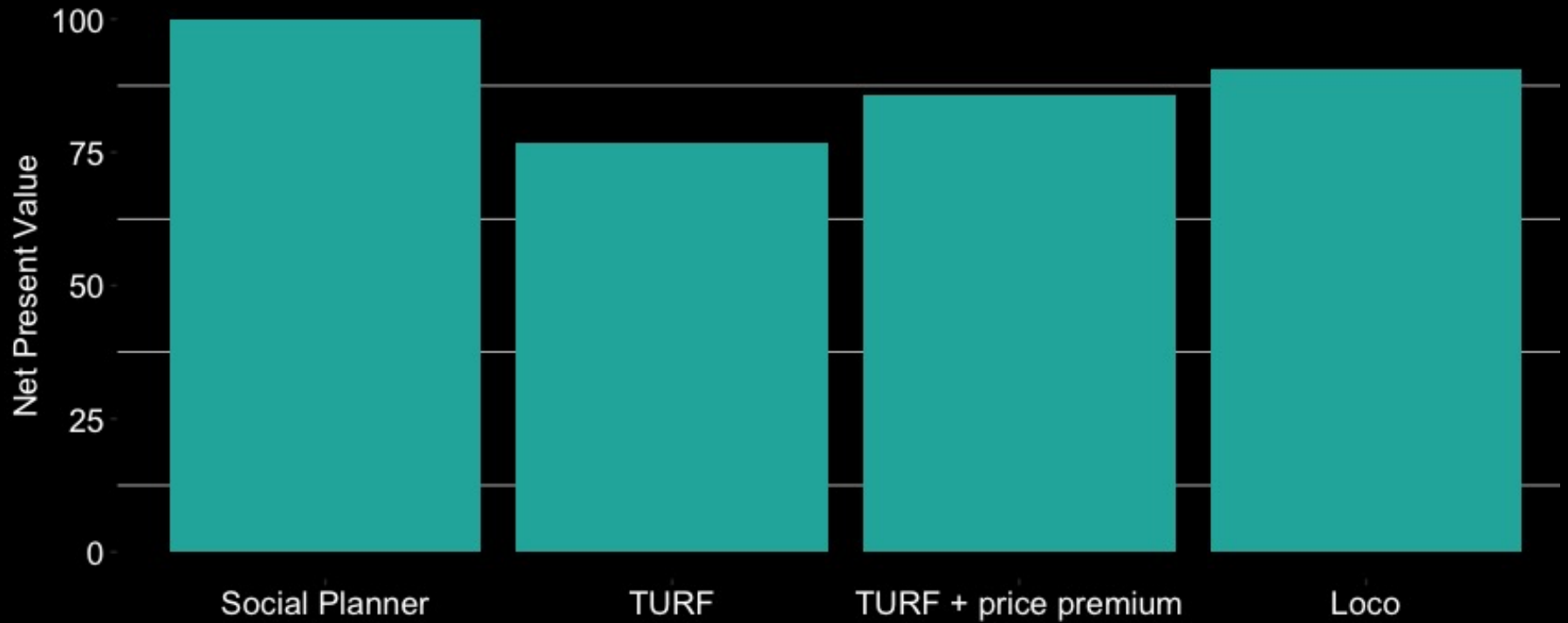
- Chilean loco TURFs have in average 1.63km of along shore length
- They show high levels of larval spillover, but property rights are clear over adult stock.



# A CASE STUDY: CHILEAN LOCO



# RESULTS



# CONCLUSIONS

- Economic gains close to the maximum can be achieved even when fishermen completely ignore recruitment
  - If the benefits from waiting until the resource achieves higher values are strong enough
  - This is possible with slow growing species
- This can help us understand some dynamics behind some existent TURFs, such as the Chilean TURFs



# THANK YOU

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