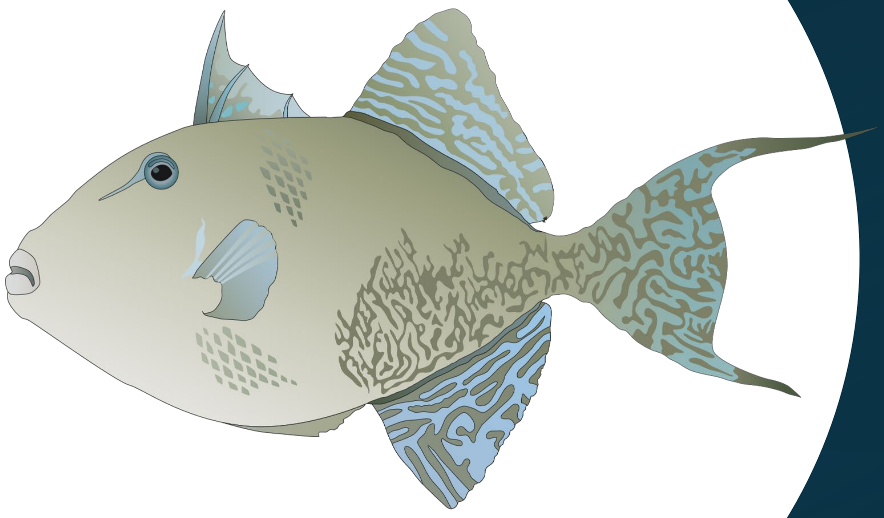
Depth and water temperature drive elevated post-release mortality of gray triggerfish



A. Challen Hyman, Chloe Ramsay, Sean Wilms, and Thomas K. Frazer

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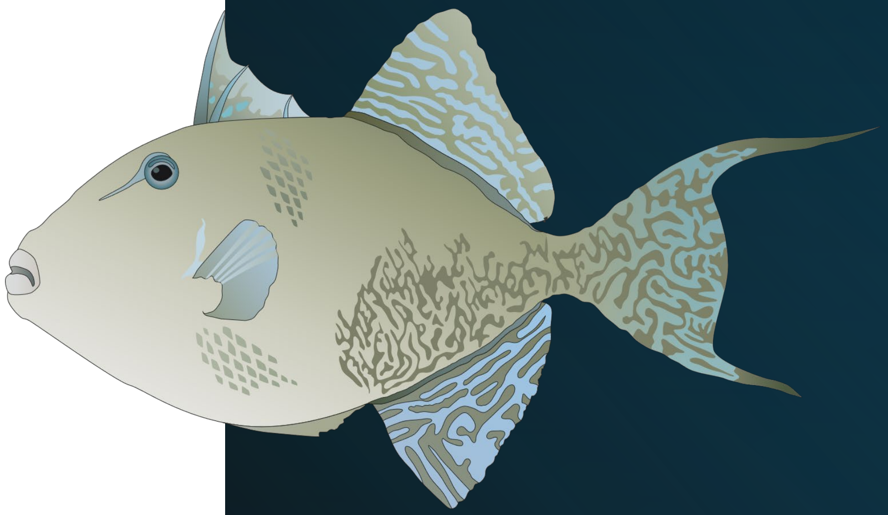
- Long-term conventional tagging datasets can be used to assess effects of environmental variables on recapture rates



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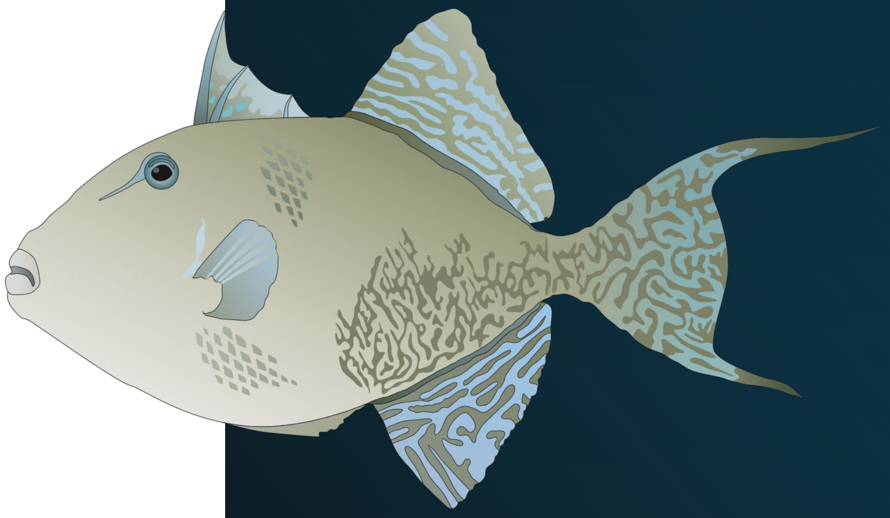
- Models leveraging these datasets can estimate post-release mortality while accounting for variable effort



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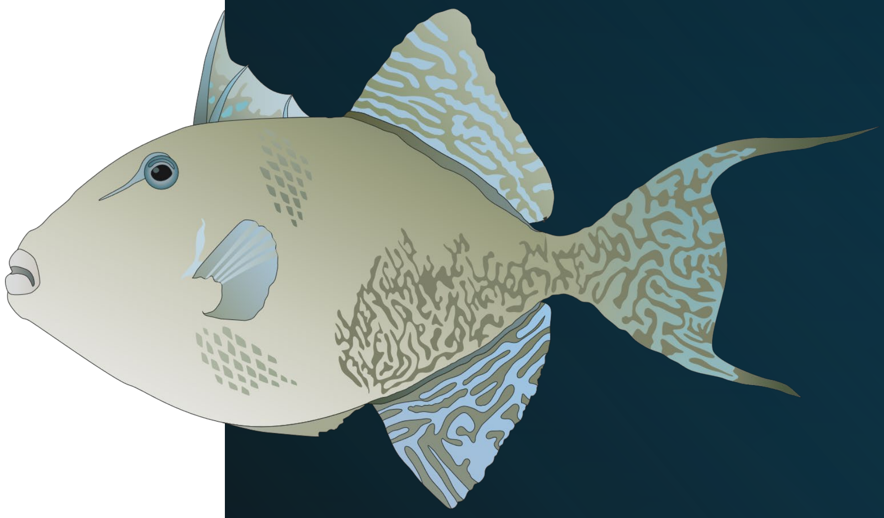
- Long-term conventional tagging datasets can be used to assess effects of environmental variables on recapture rates

- Models leveraging these datasets can estimate post-release mortality while accounting for variable effort

- Built a discrete-time model to infer post-release mortality in gray triggerfish



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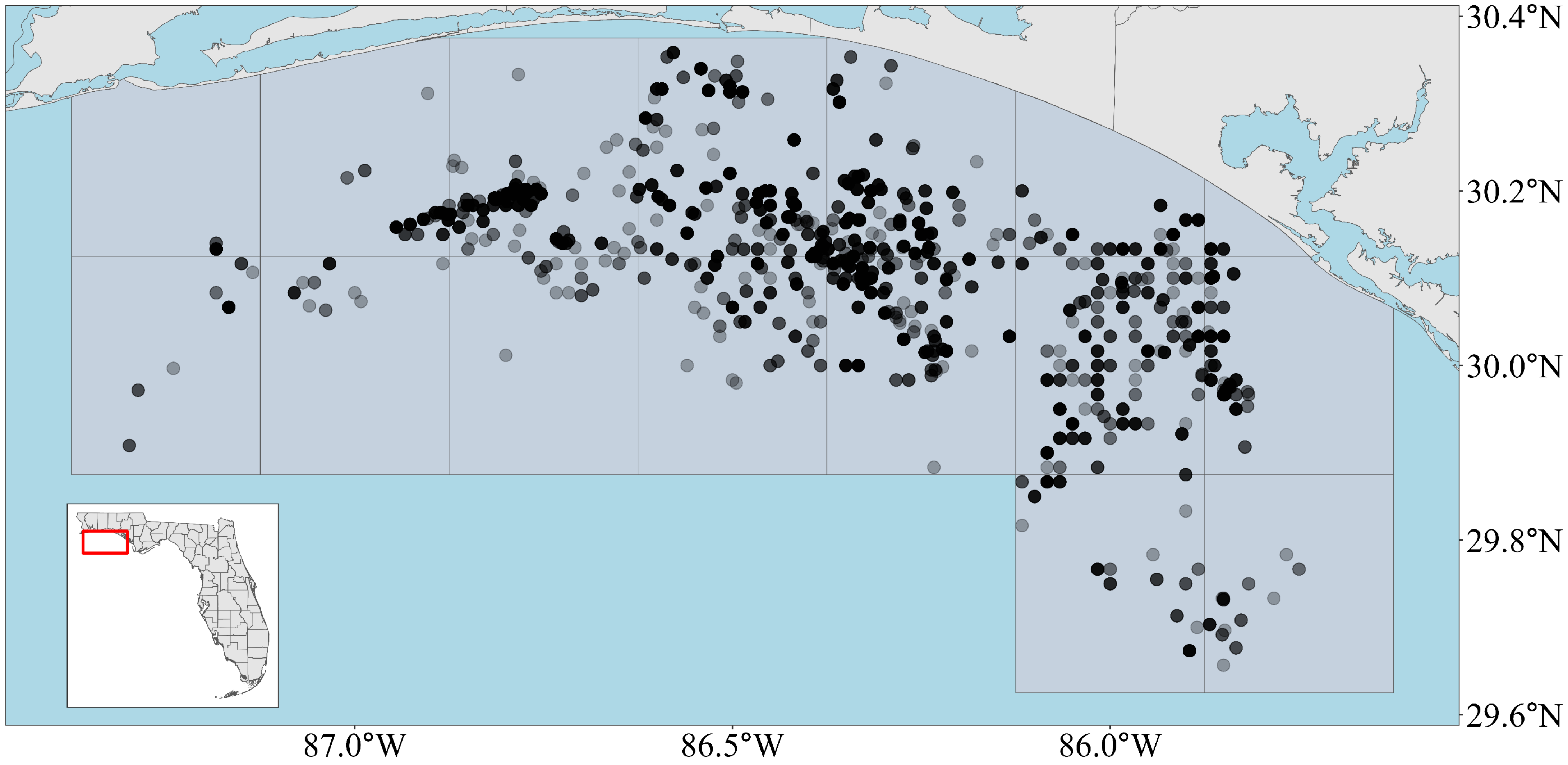
Tagged 3,744 fish between 2022 and 2024



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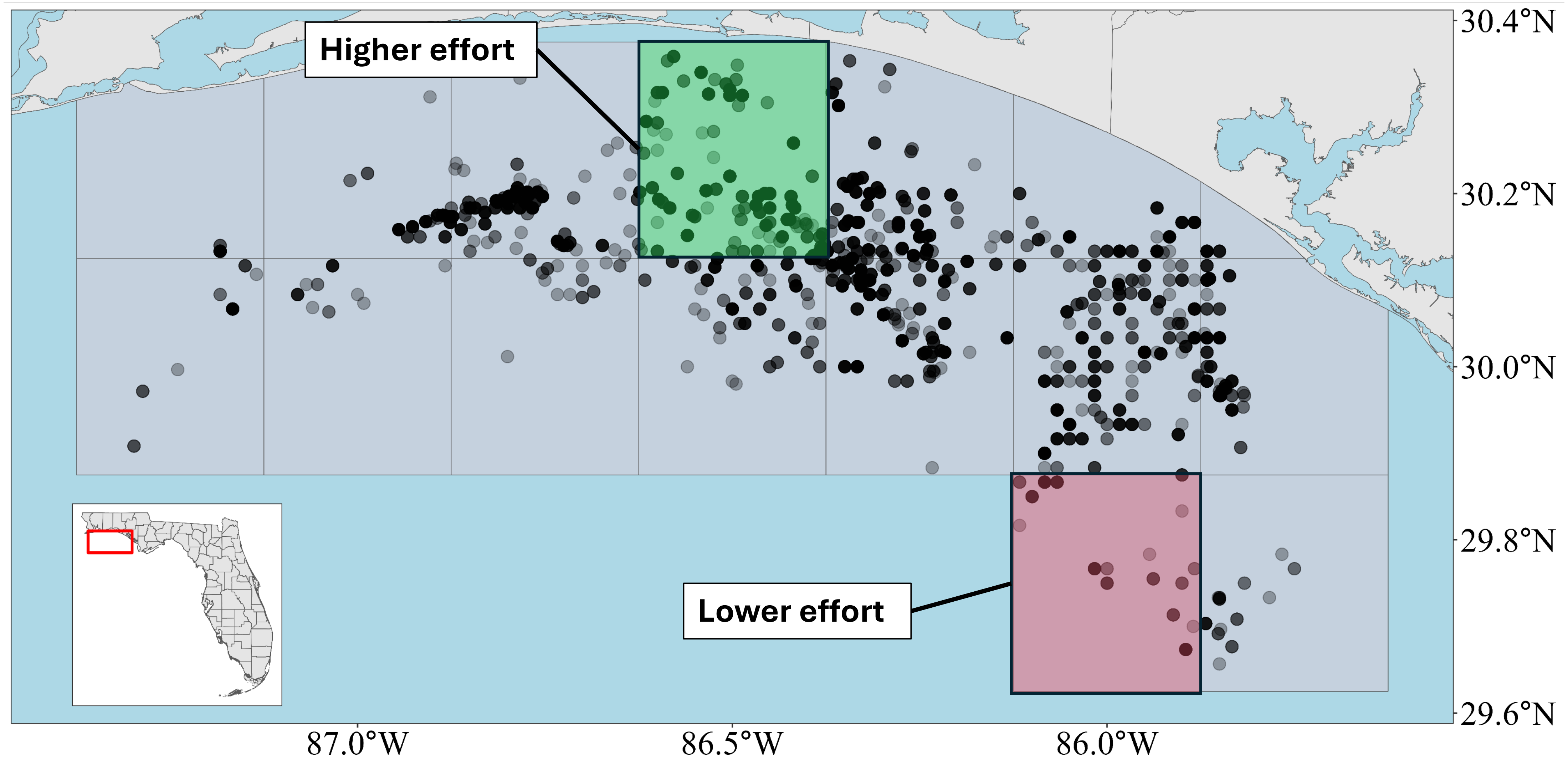

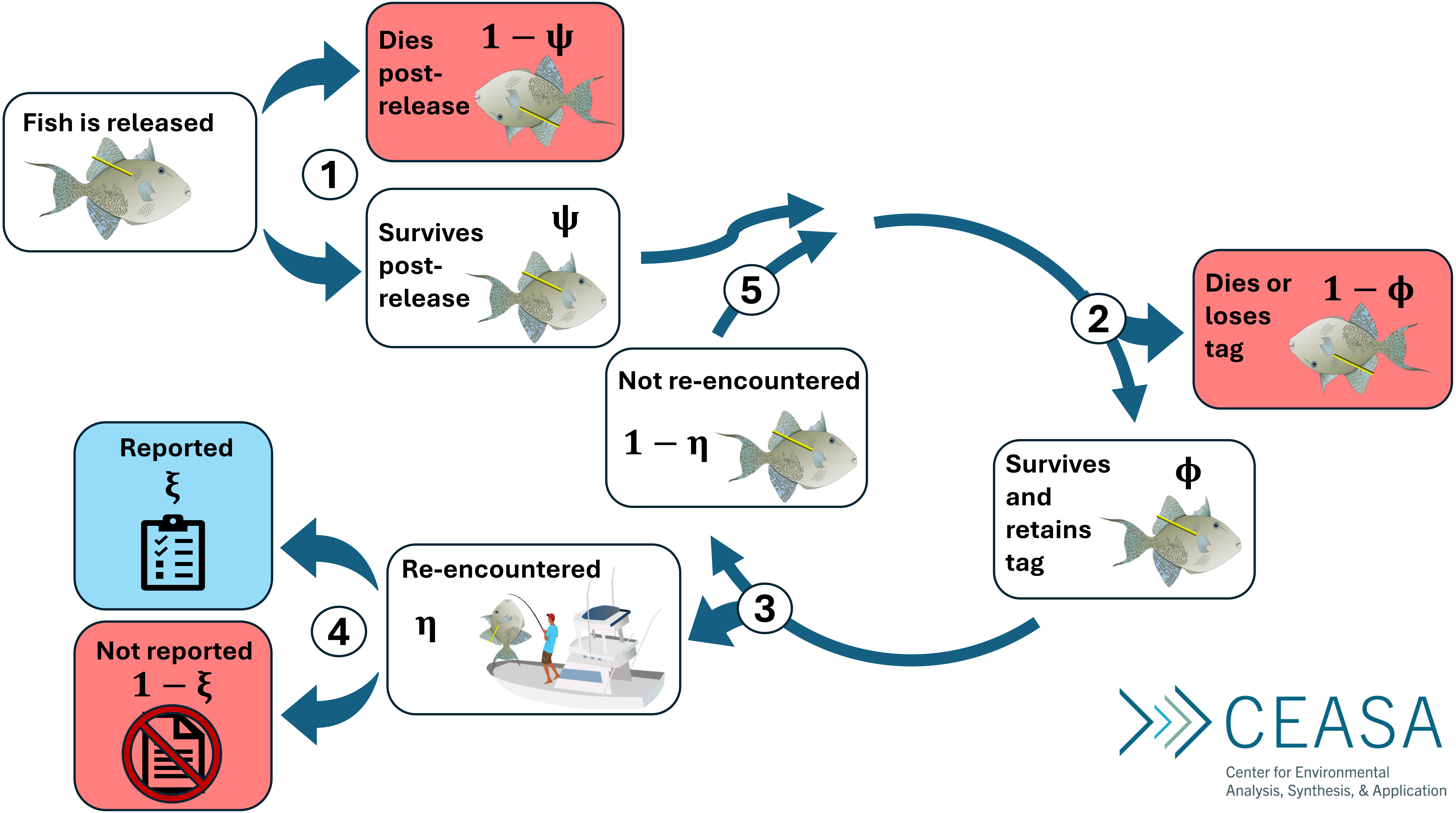
Fish is released
1
Dies post-release $1-\psi$
Survives post-release ψ
5
Not re-encountered $1-\eta$
2
Dies or loses tag $1-\phi$
Survives and retains tag ϕ
3
Re-encountered η
4
Reported ξ
Not reported $1-\xi$
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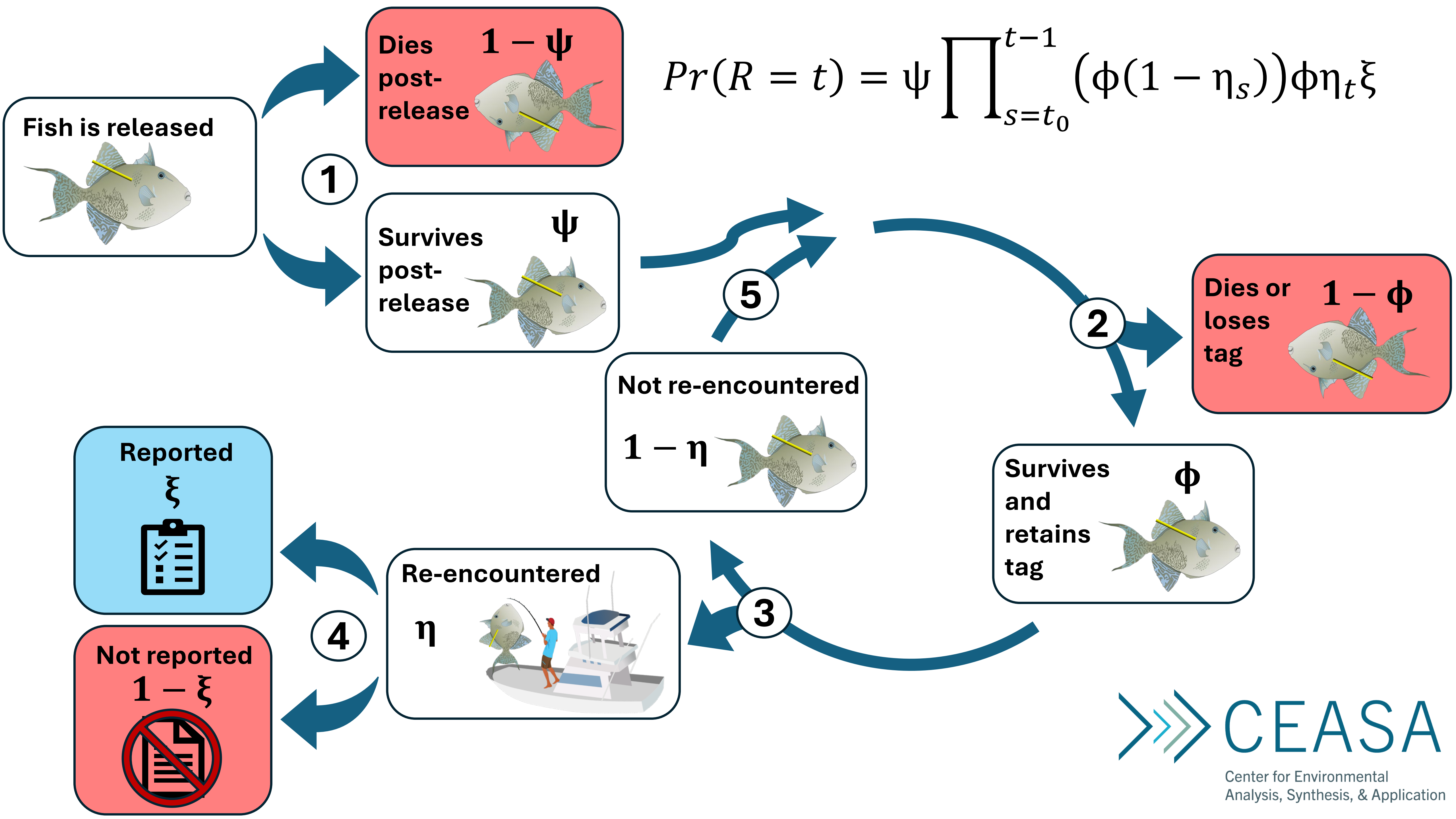

$Pr(R = t) = \psi \prod_{s=t_0}^{t-1} (\phi(1 - \eta_s))\phi\eta_t\xi$
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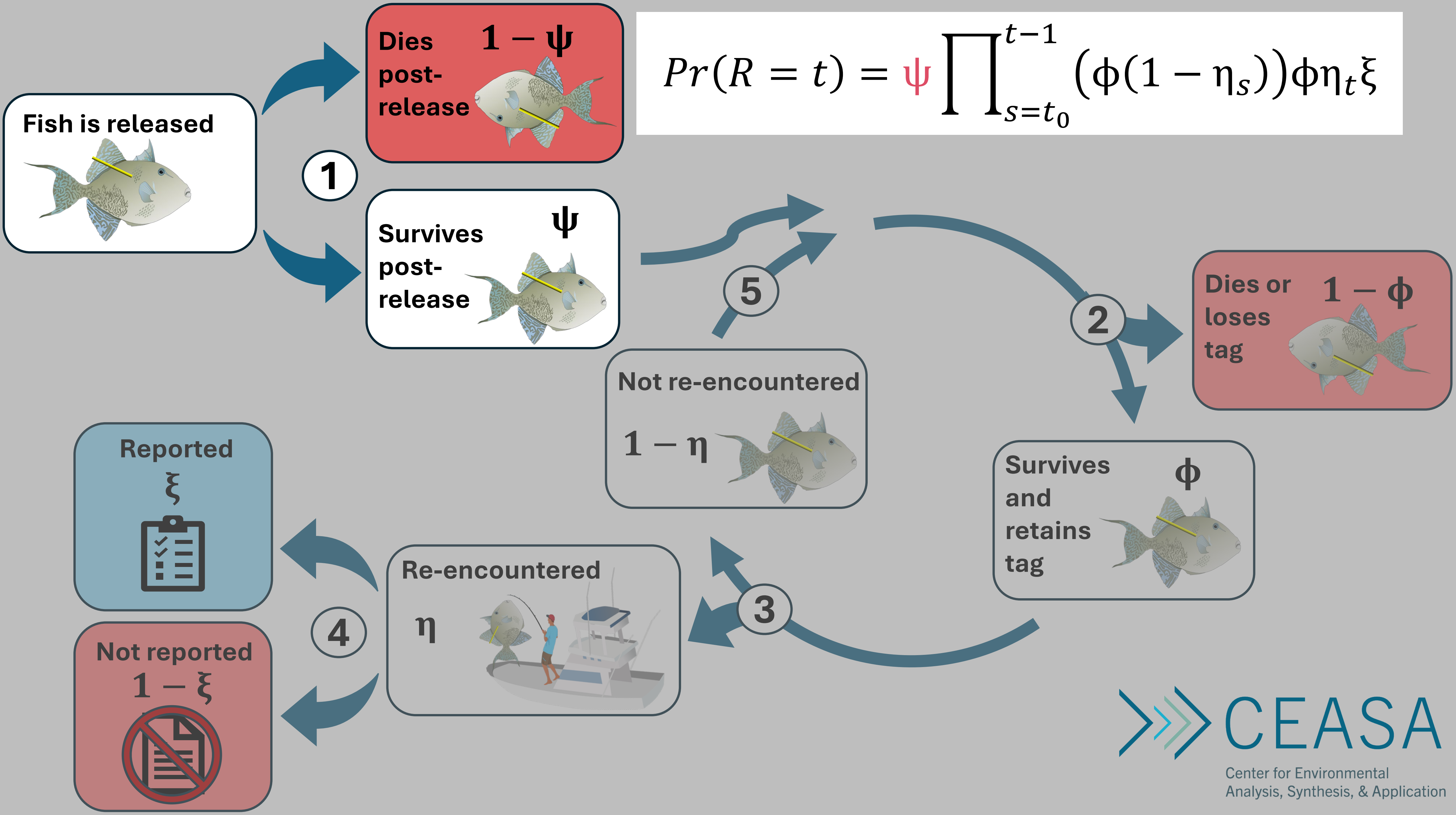

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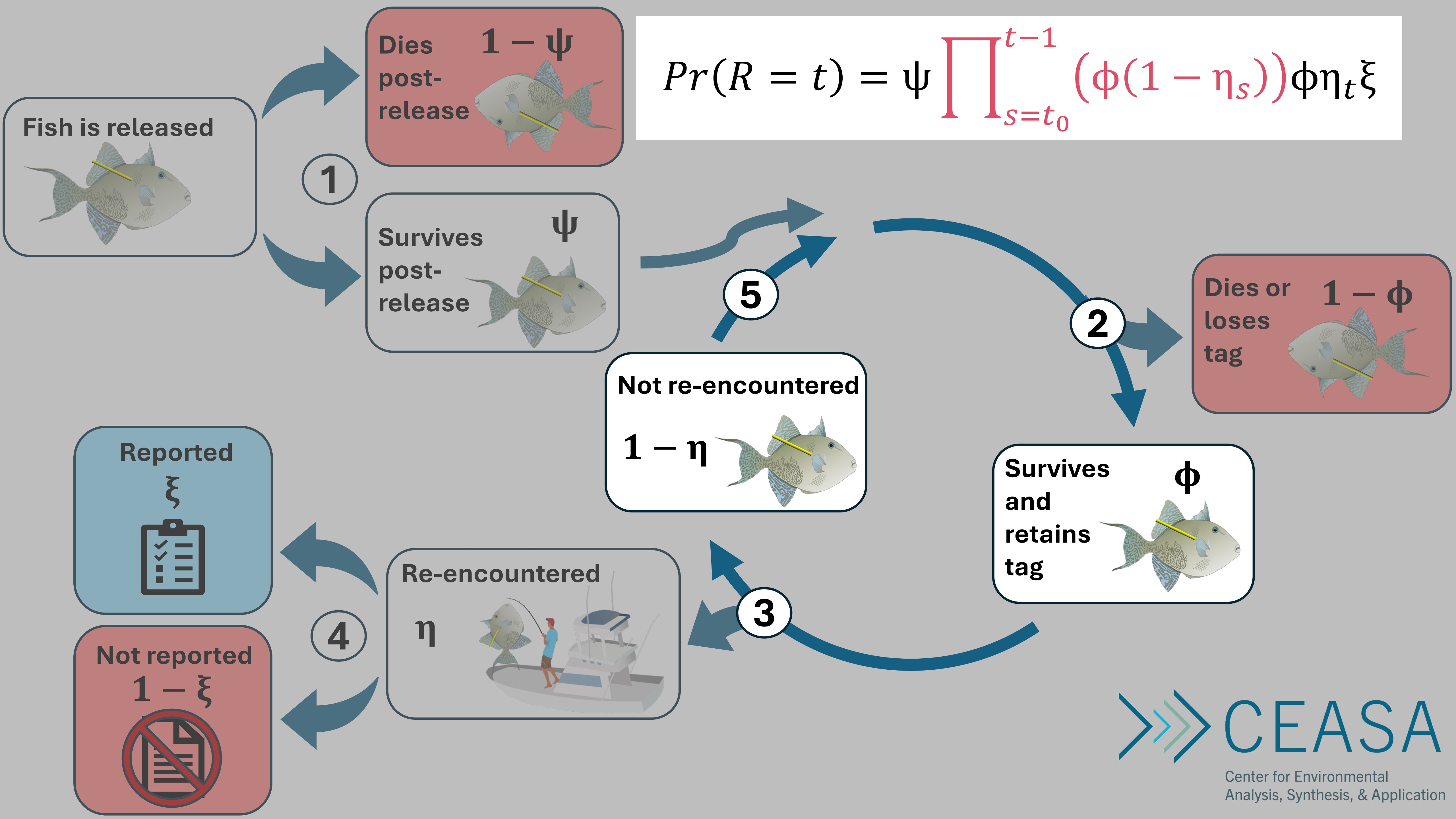
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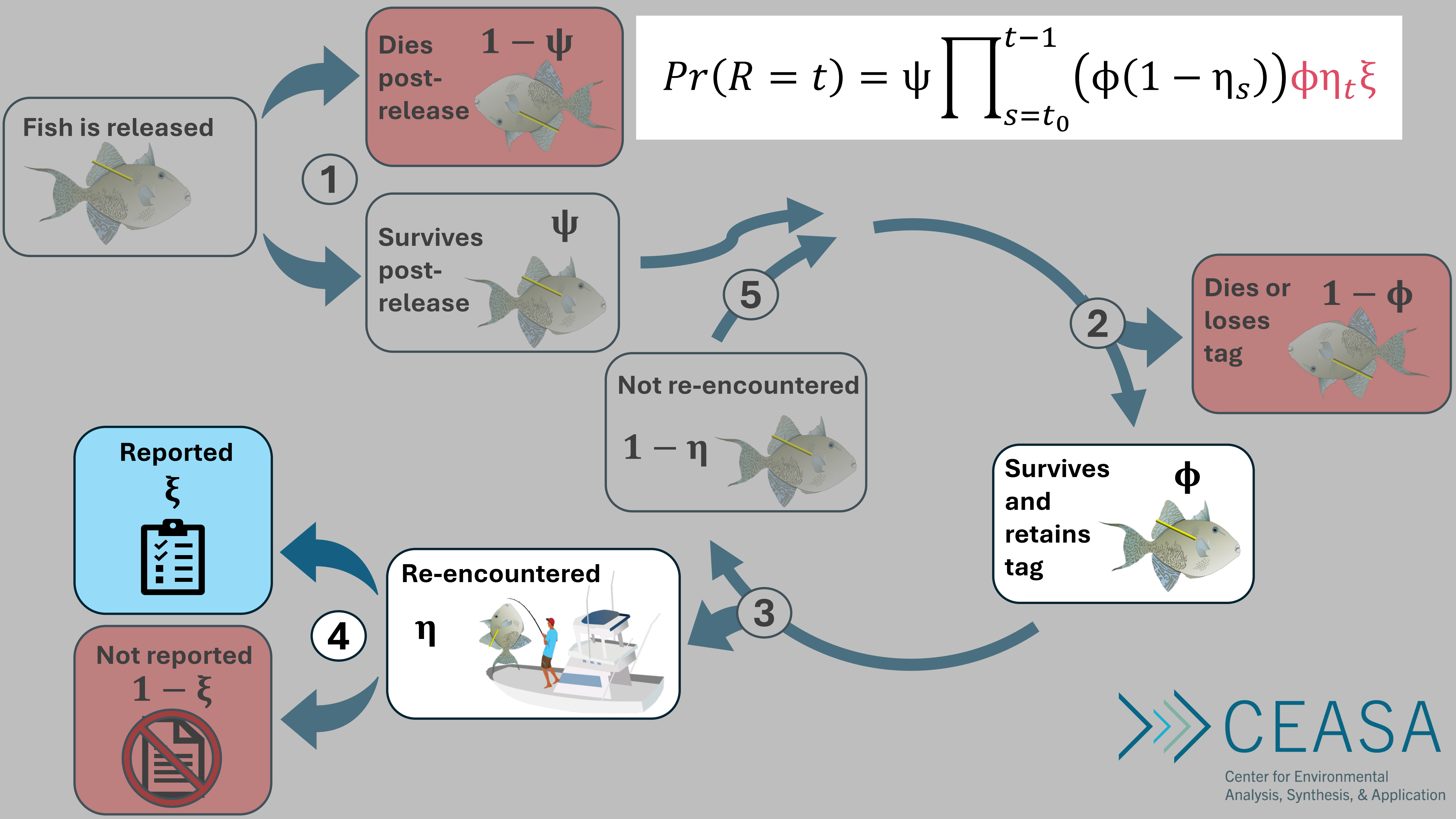
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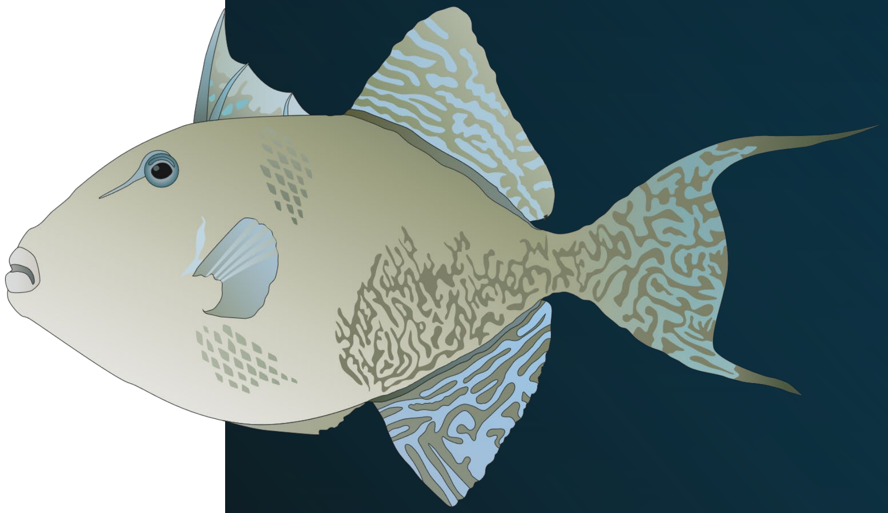

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$$Pr(R = t) = \psi \prod_{s=t_0}^{t-1} (\phi(1 - \eta_s))\phi\eta_t\xi$$

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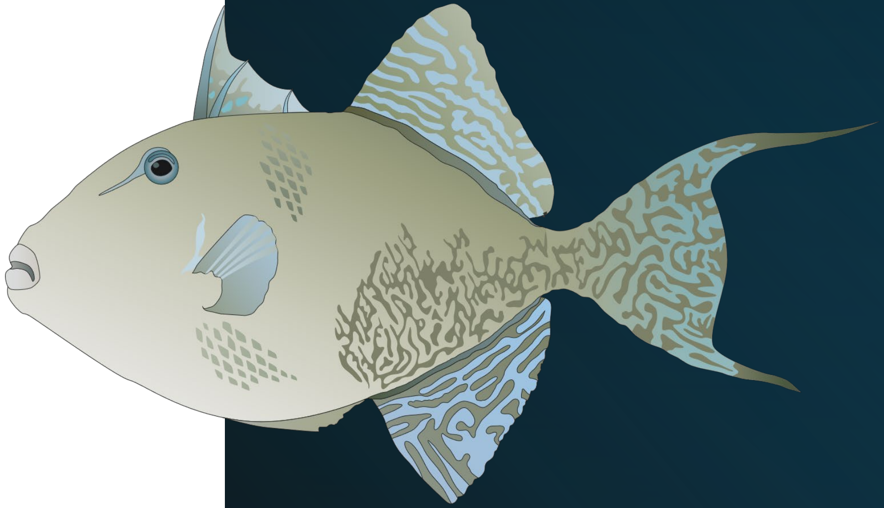

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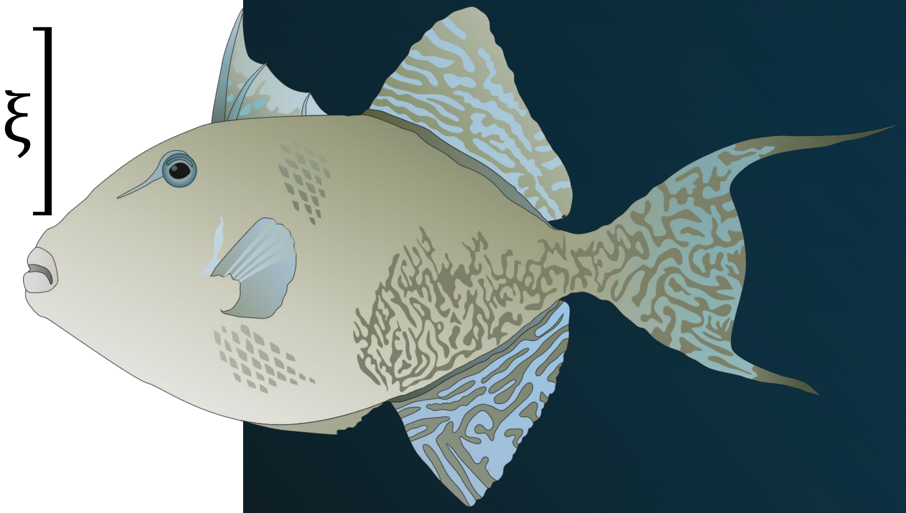

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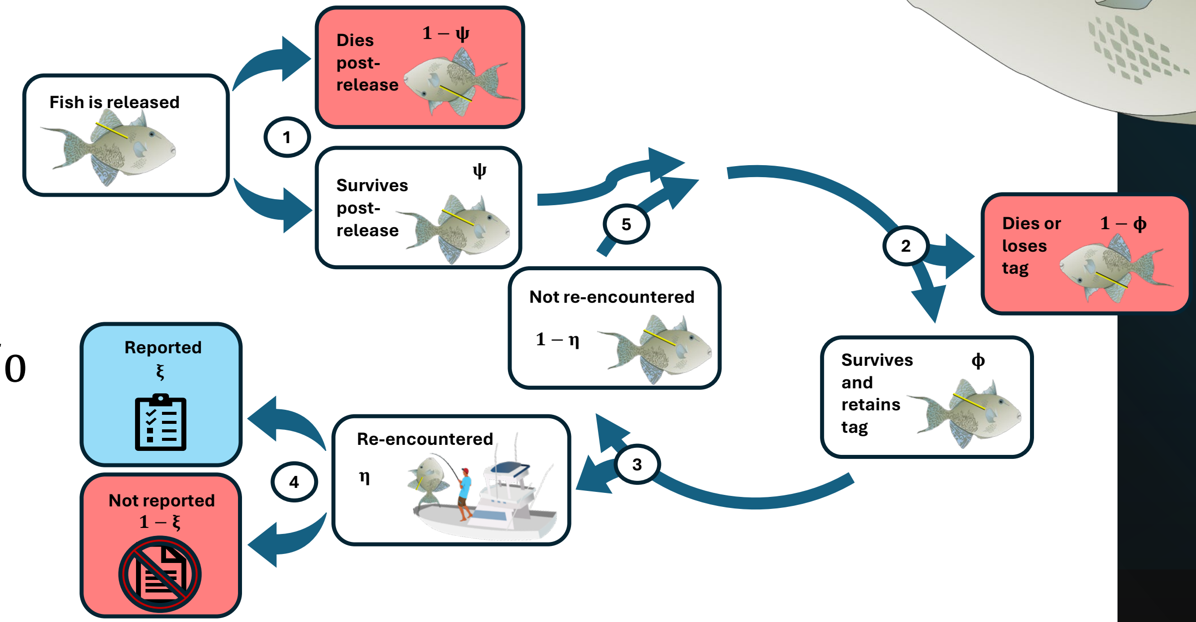

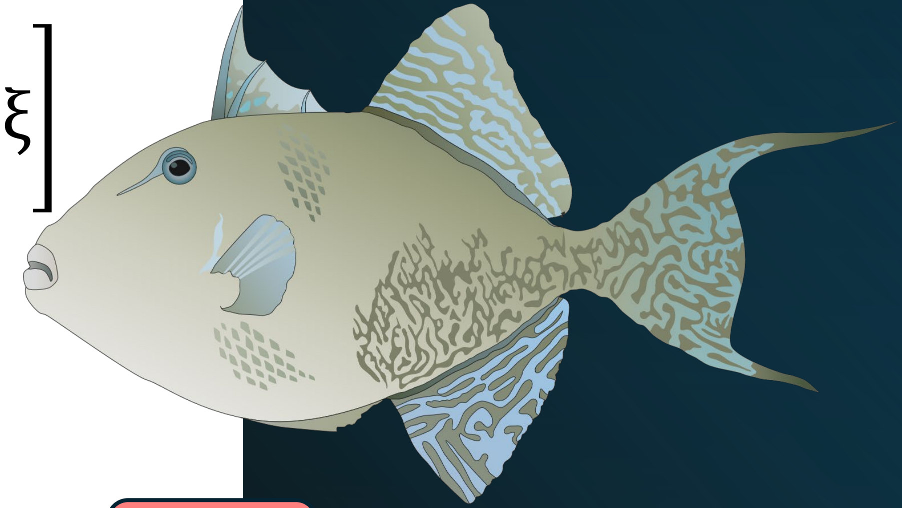

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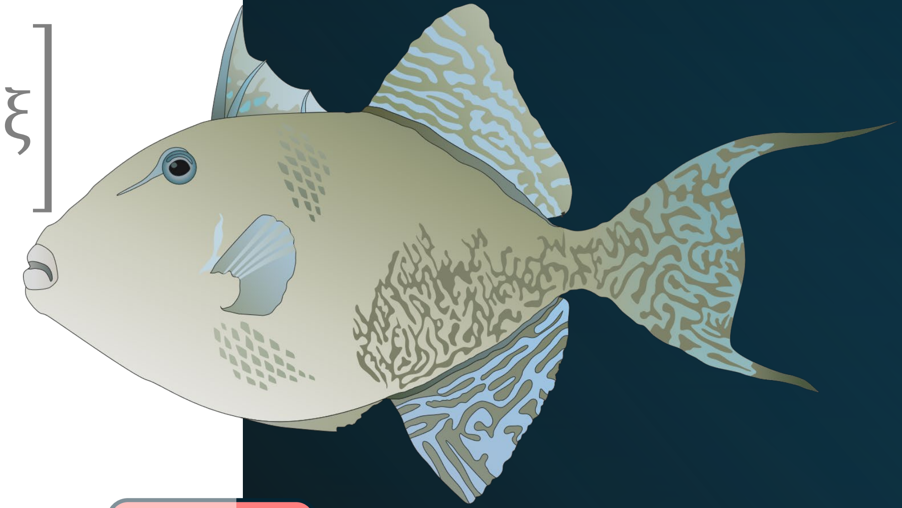

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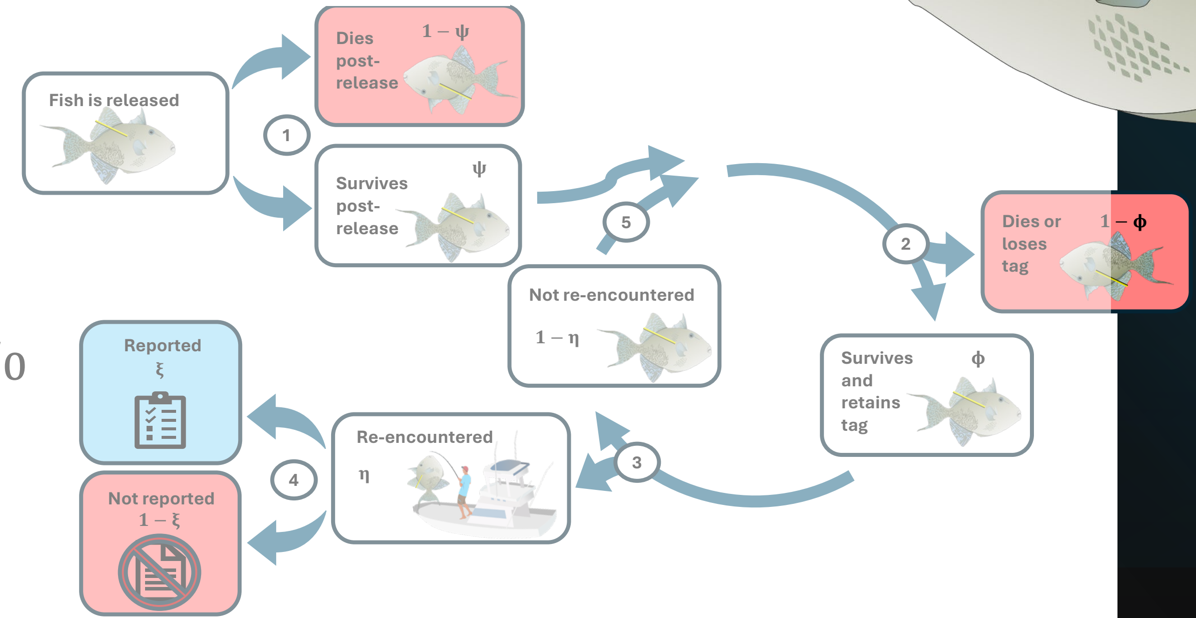

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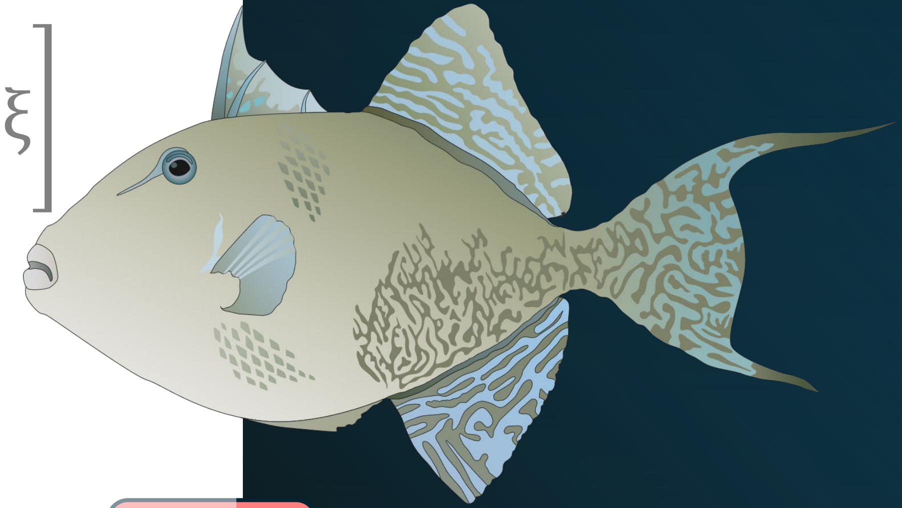

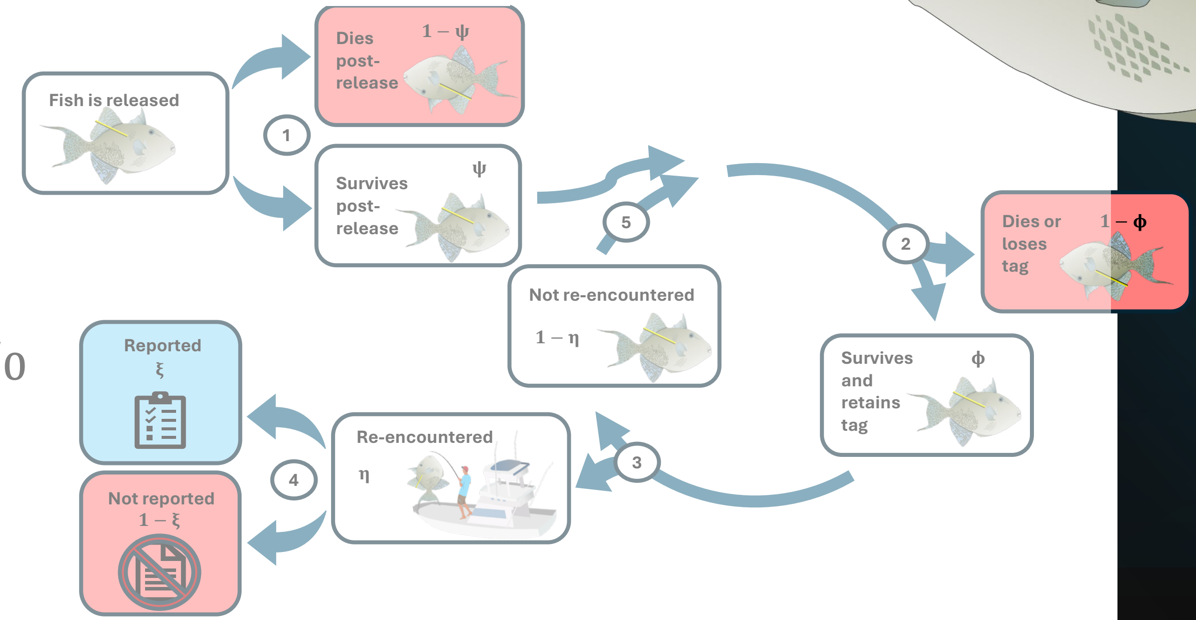

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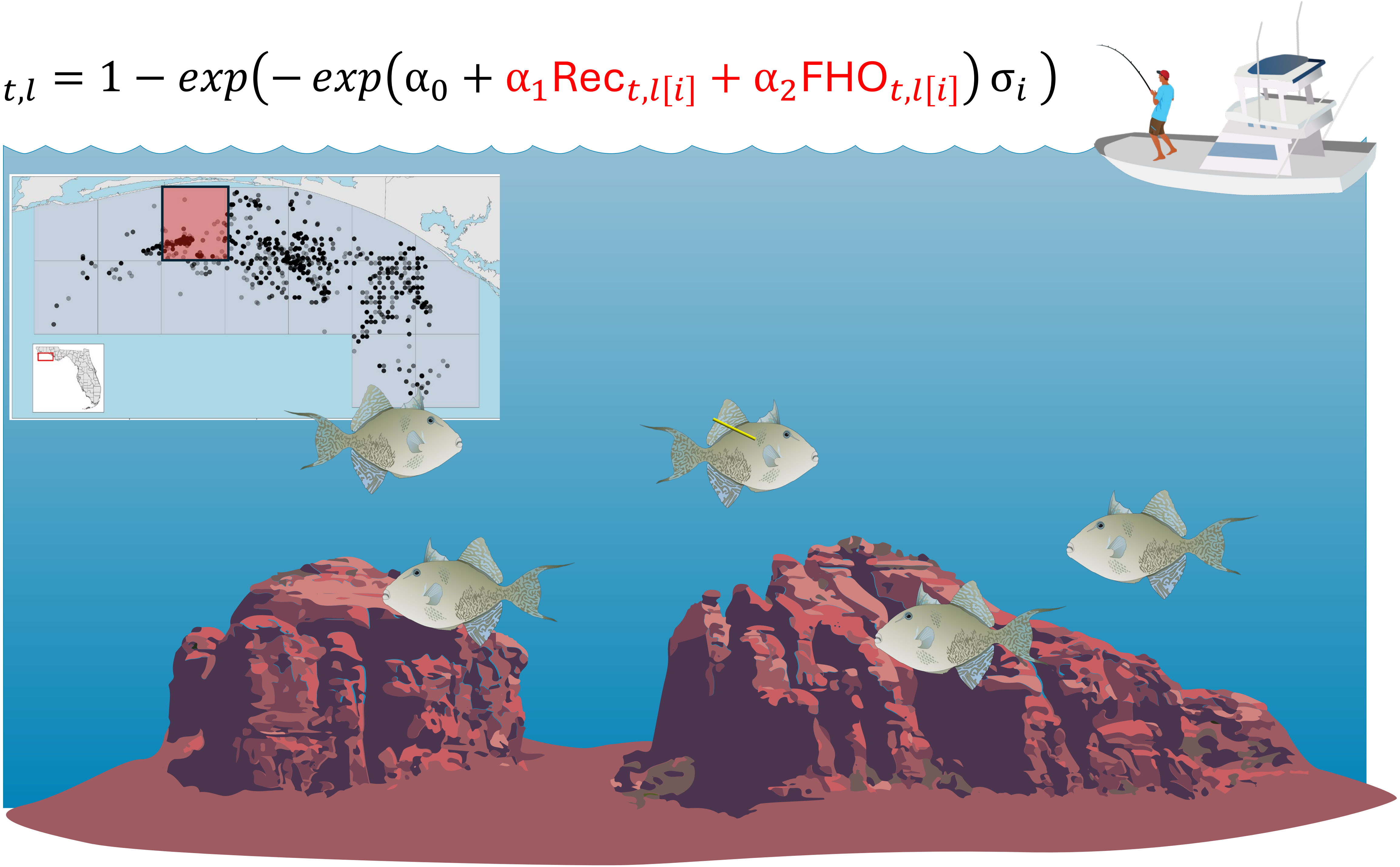
$$\eta_{t,l} = 1 - exp\left(-\,exp\left(\alpha_0 + \alpha_1 \mathrm{Rec}_{t,l[i]} + \alpha_2 \mathrm{FHO}_{t,l[i]}\right)\sigma_i\right)$$



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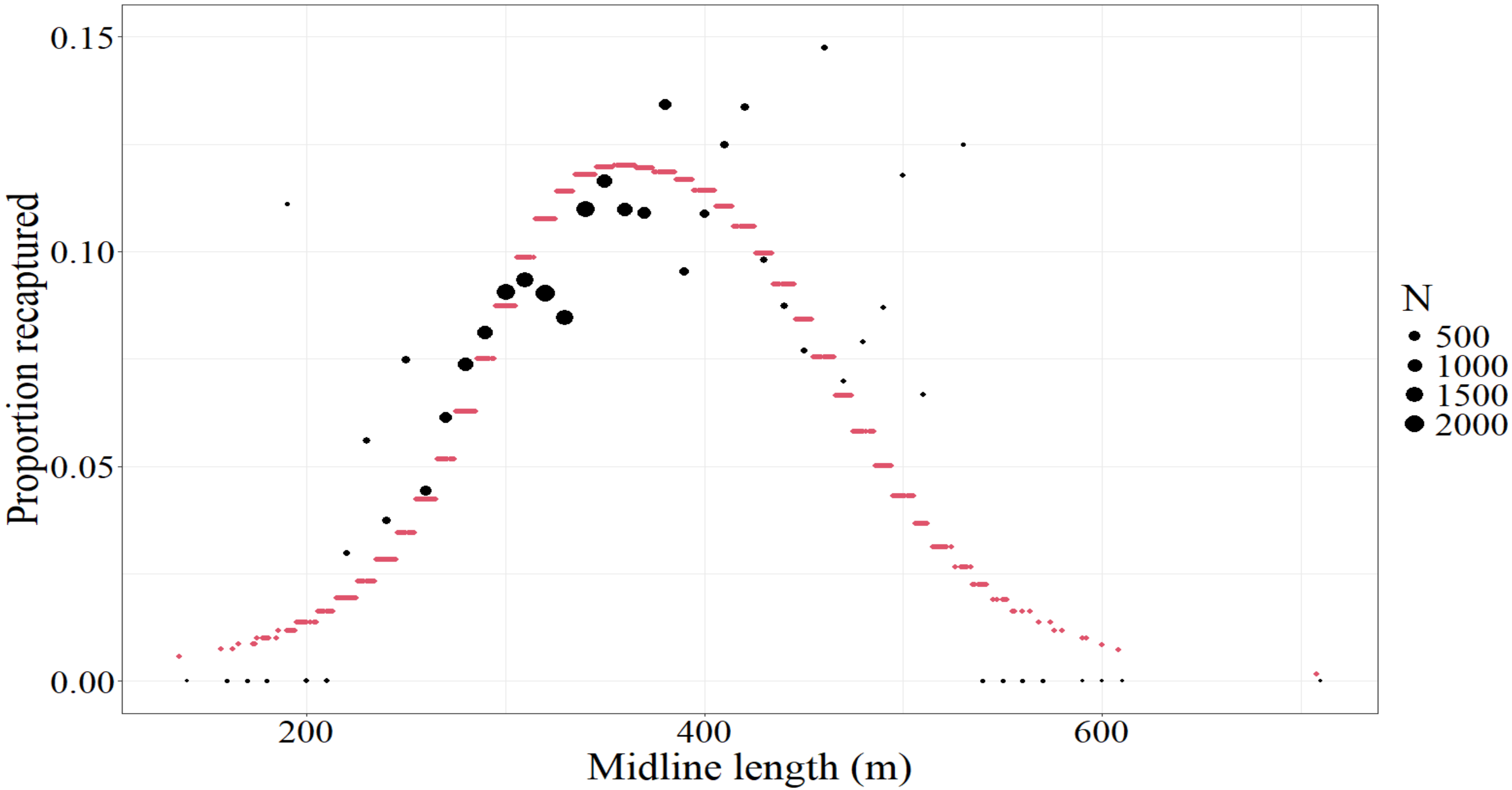

$$Pr(R = t) = \boldsymbol{\psi} \prod_{s=t_0}^{t-1} \big(\phi(1 - \eta_s)\big) \phi \eta_t \boldsymbol{\xi}$$

$$\psi_i \propto exp\big(\beta_D f(Depth_i) + \beta_T f(SST_i)\big)$$

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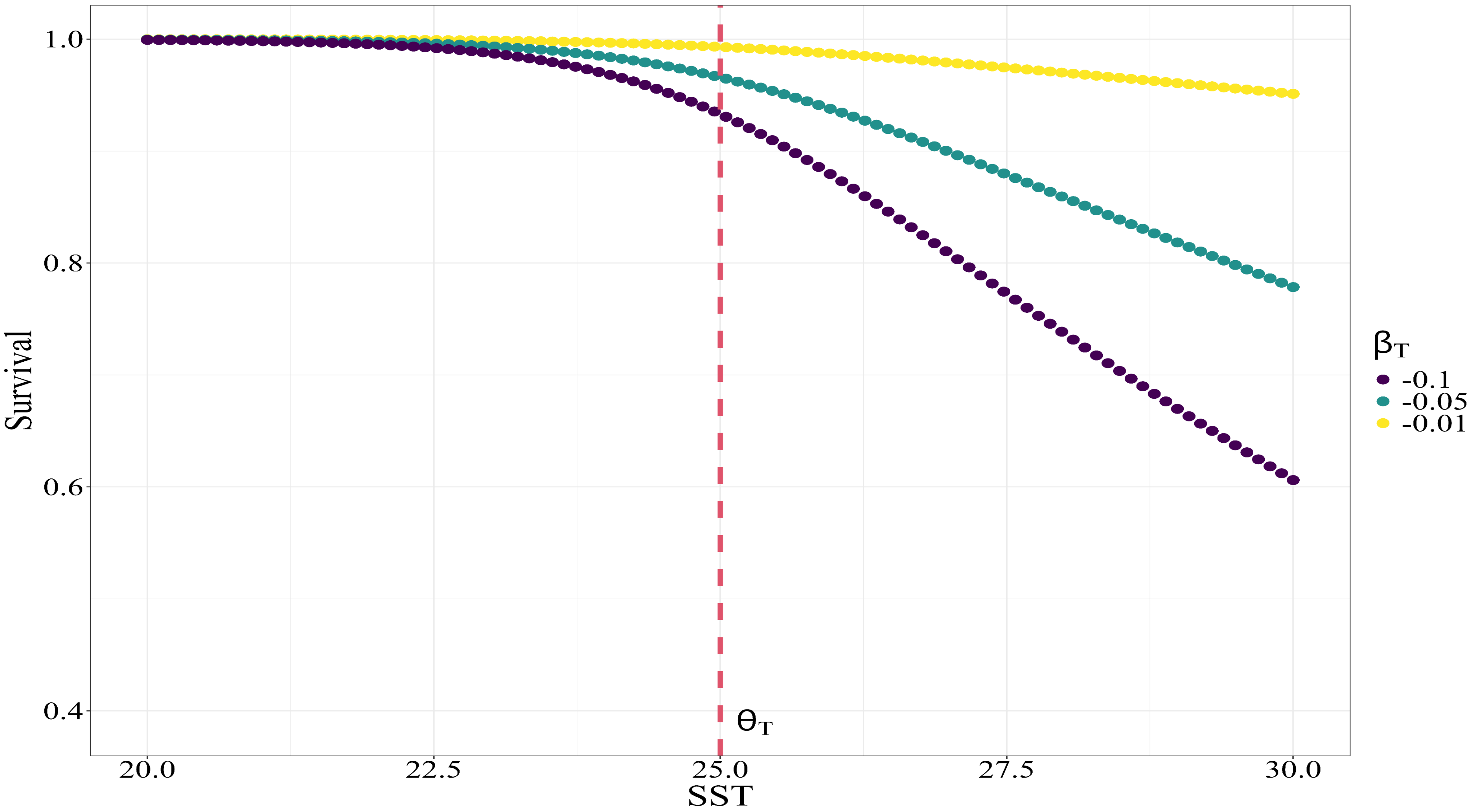
$$f(x) = ln(1 + exp(x - \theta_x)) - ln(1 + exp(-\theta_x))$$



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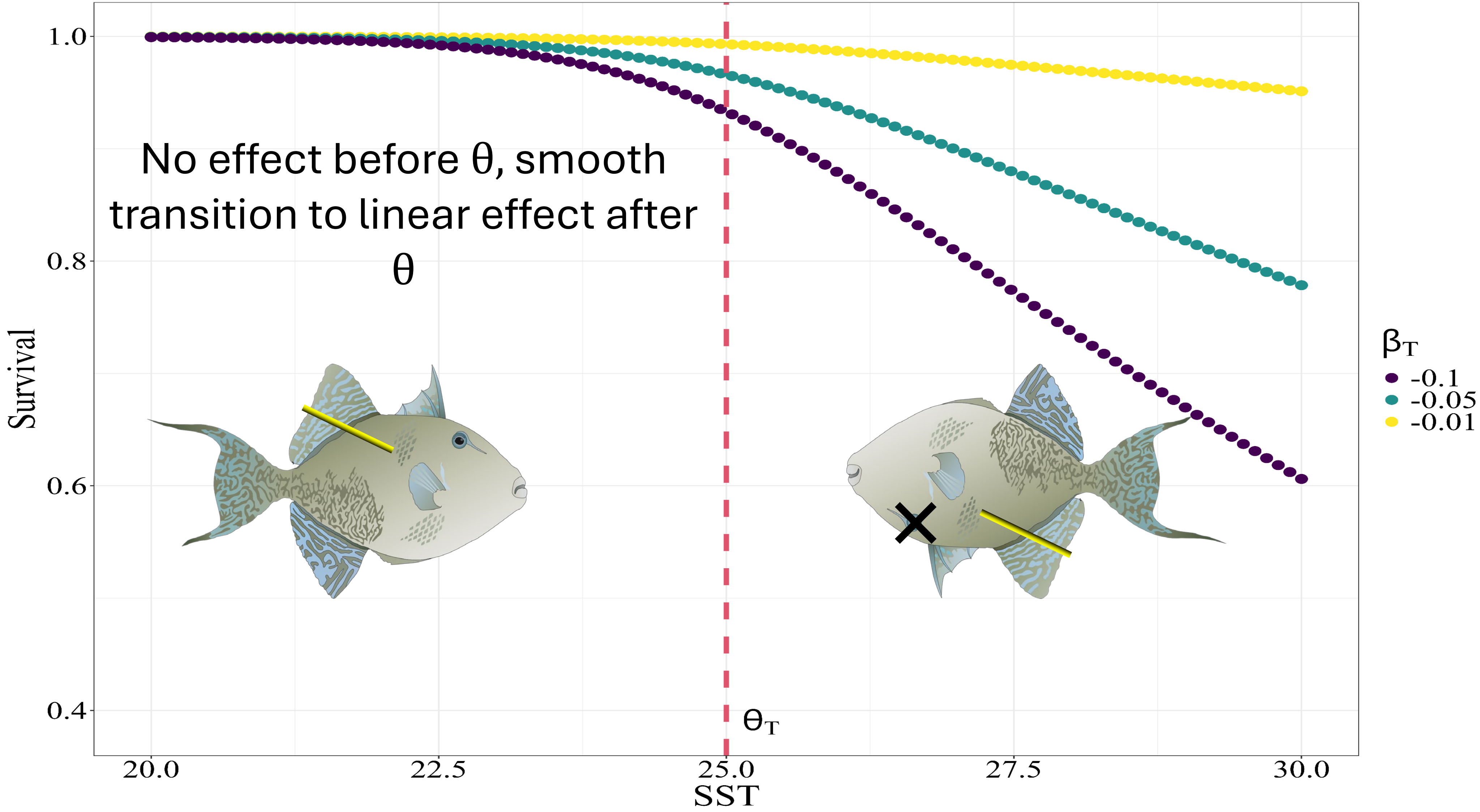
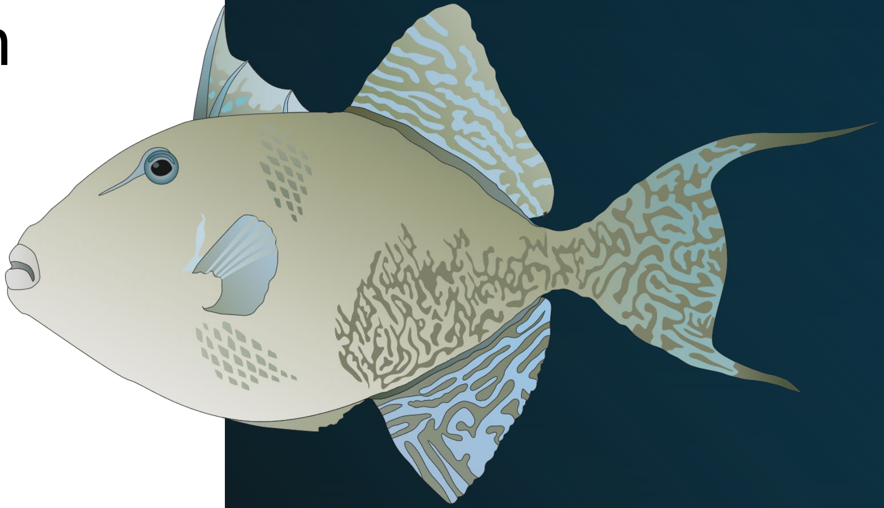


- Depth of capture varied between 20 and 70 m (median 33 m)

- SST varied between 15 and 31 C (median 22 C)

- Time at large varied between 1 and 832 days (median 72)

- Models run using the Stan programming language for Bayesian inference



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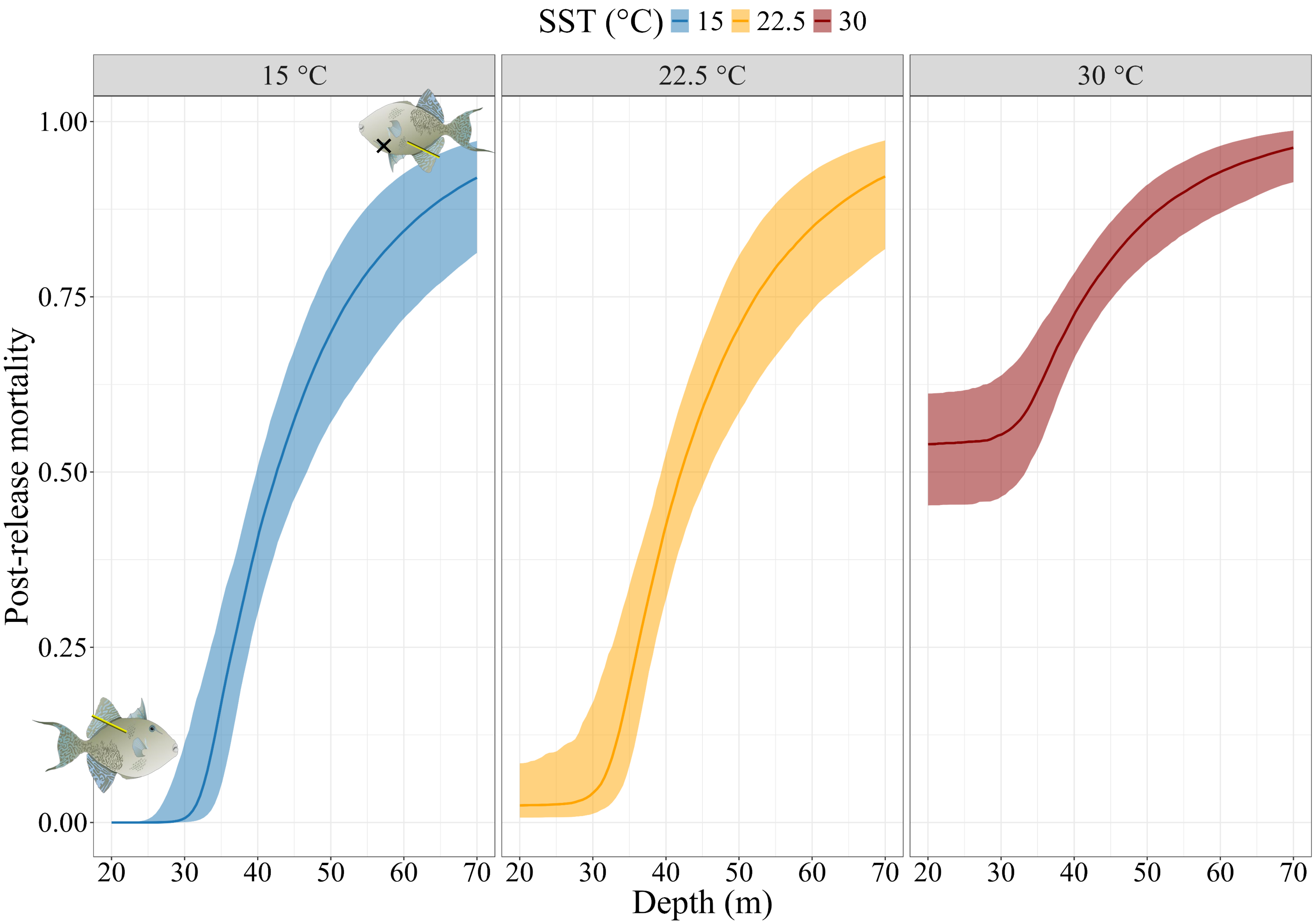
Depths beyond 30 m increased mortality

SST beyond 22°C increased mortality



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Median discard mortality assuming:

1. 100% baseline survival: 0.31-0.35

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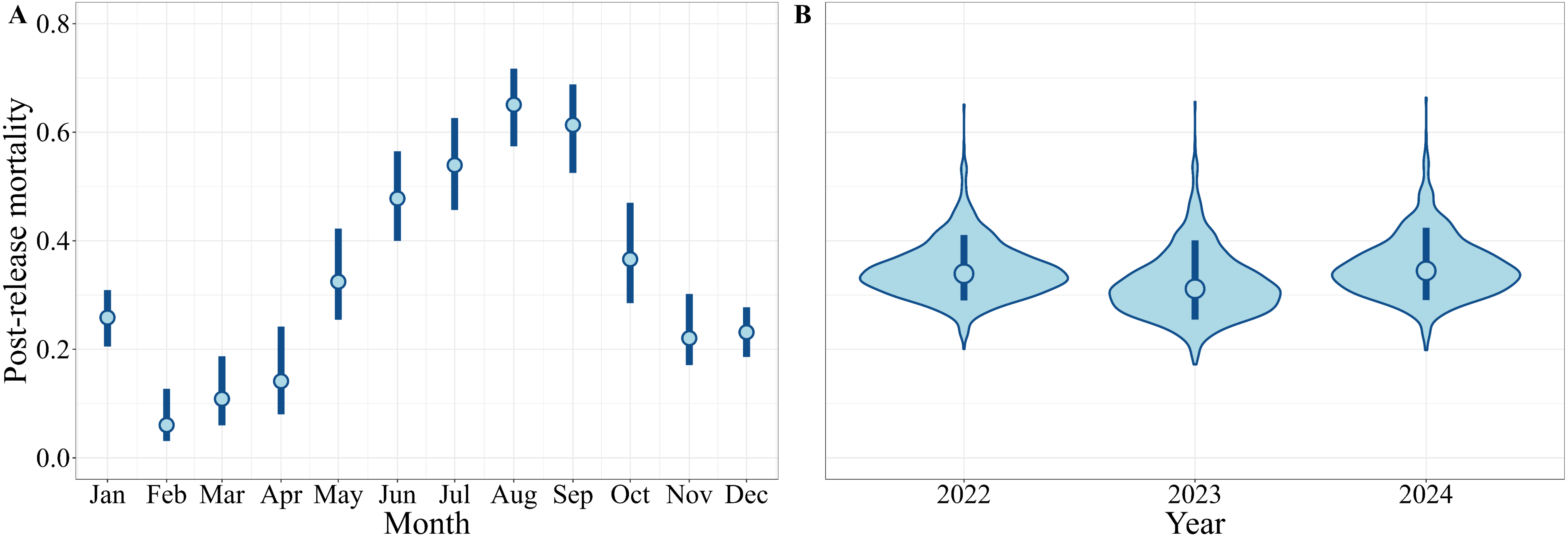
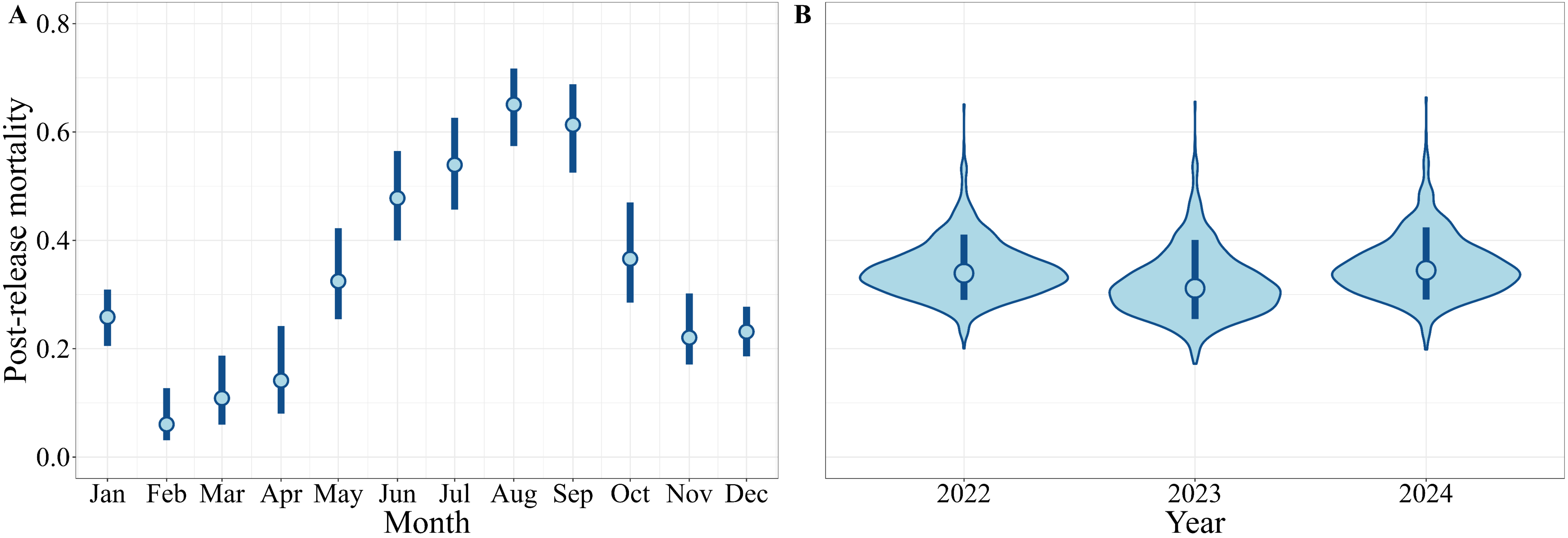


Median discard mortality assuming:

1. 100% baseline survival: 0.31-0.35
2. 92.5% baseline survival: 0.36-0.40
3. 85% baseline survival: 0.42-0.44

$$Pr(R = t) = \boldsymbol{\psi} \prod_{s=t_0}^{t-1} (\phi(1-\eta_s))\phi\eta_t \boldsymbol{\xi}$$

$$\psi_i \propto exp(\beta_D f(Depth_i) + \beta_T f(SST_i))$$



Median discard mortality assuming:

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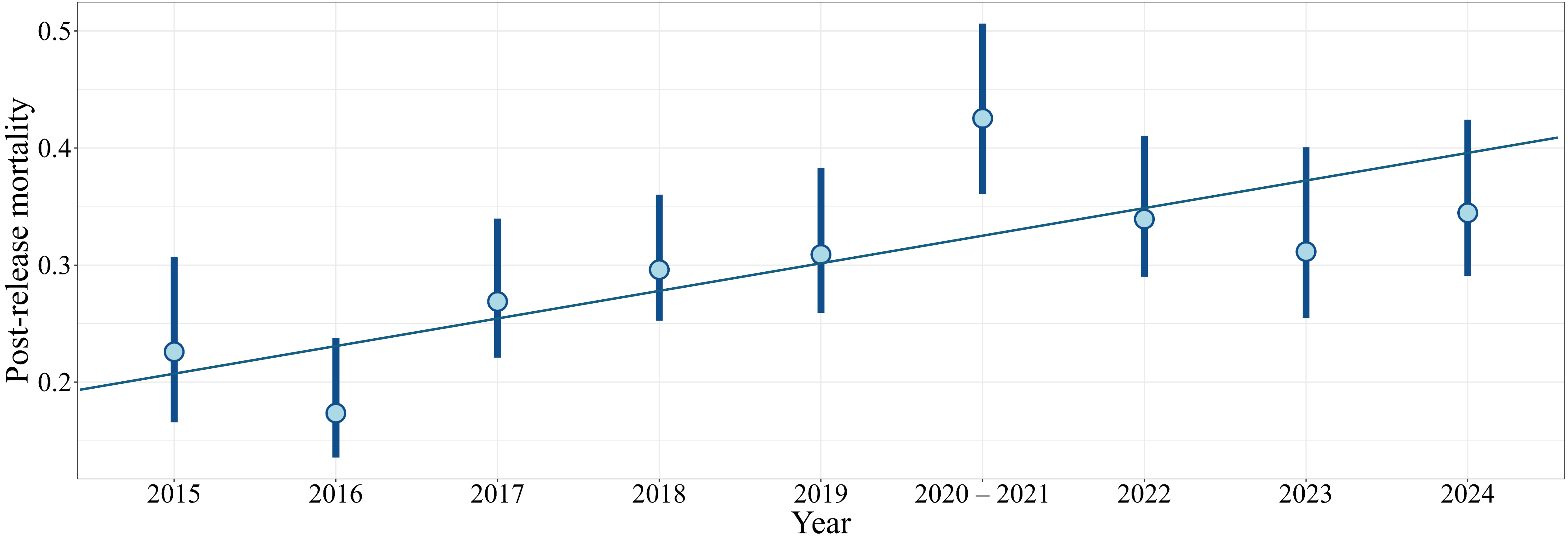
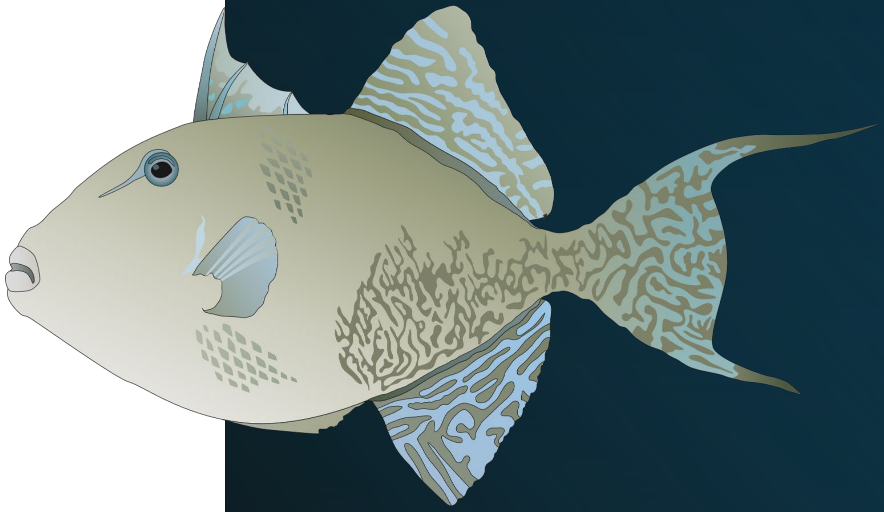
Discard mortality increasing due to increasing capture depths



- Discard mortality estimates are higher than previous stock assessment estimates



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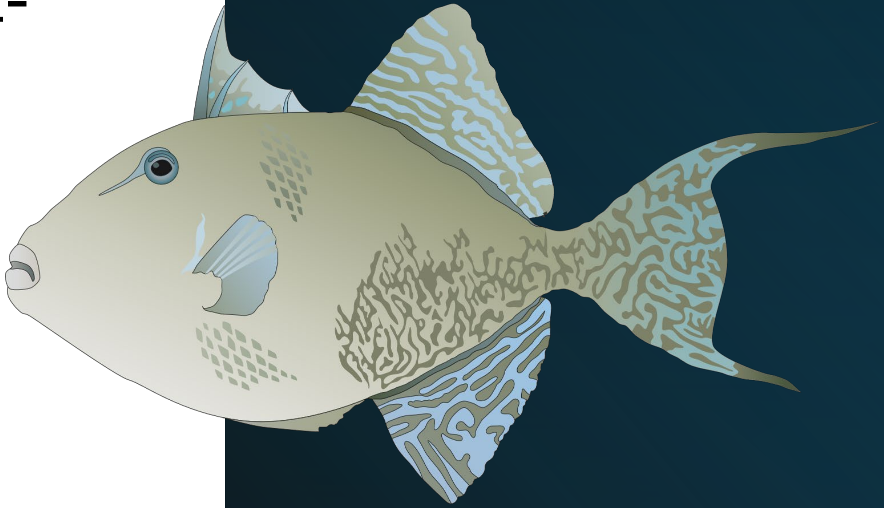
- Discard mortality estimates are higher than previous stock assessment estimates
- Our values ranged from 0.25 to 0.51 depending on baseline assumptions of post-release survival



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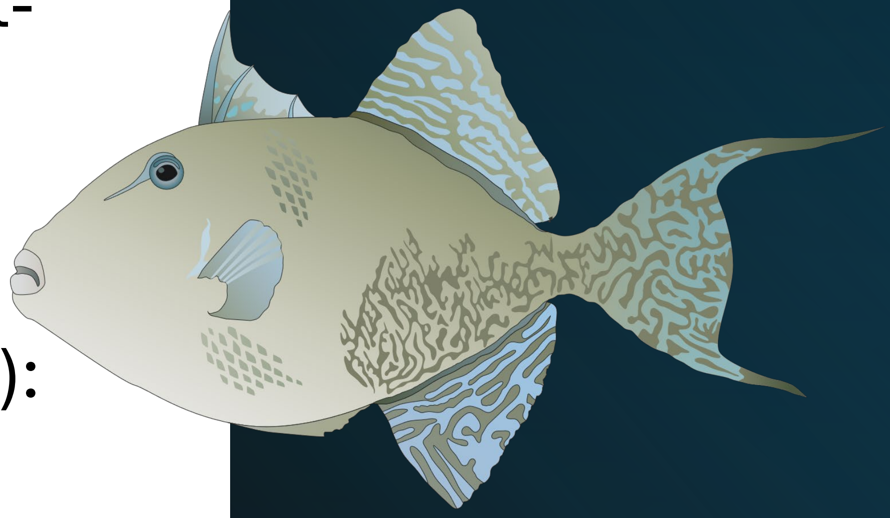
  - Acoustic telemetry (Bohaboy et al., 2020): 0.27 and 0.60



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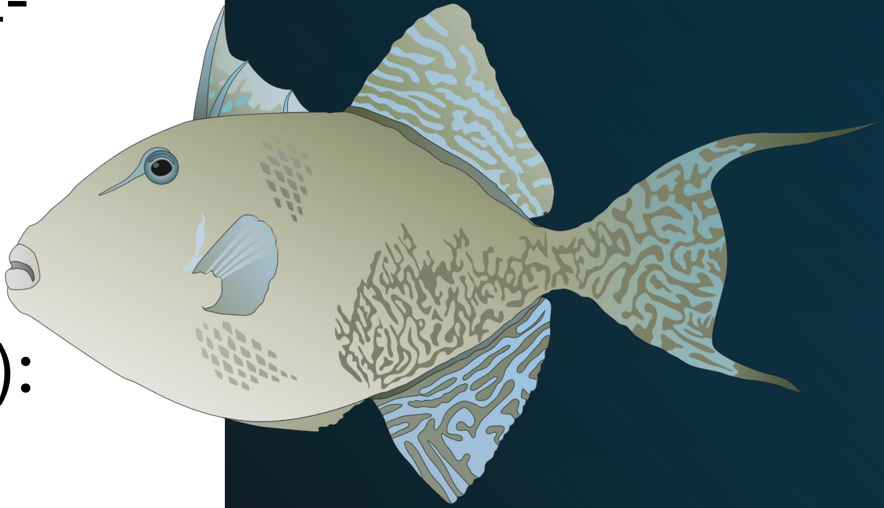
  - Acoustic telemetry (Bohaboy et al., 2020): 0.27 and 0.60
- Not temporally static: varies seasonally and inter-annually



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Questions?

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