Oyster Modeling Description (and Intro Demonstration)

ABSI CAB 07/16/2020

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What I want to show you :

1. Review my role & provide “mental model”
2. Review models: in general, estimation, simulation
3. This model description – current state
4. Simple demonstration
5. This model – what’s missing
6. Questions and concerns

Two images for talk:

1. Reviewing my role: broadest picture

- Hydrologic model
  - Climate, water use & mgmt. → water, nutrients entering bay
- Hydrodynamic model
  - Water entering bay → water qual. throughout bay
- Oyster model
  - Fishery, mgmt. & rest., water → oyster populations and fisheries
  - Complement FWRI (Melanie Parker's) sampling and analyses
  - Inform FWC (Estes & Norberg) mgmt. actions

1. Reviewing my role: broad picture

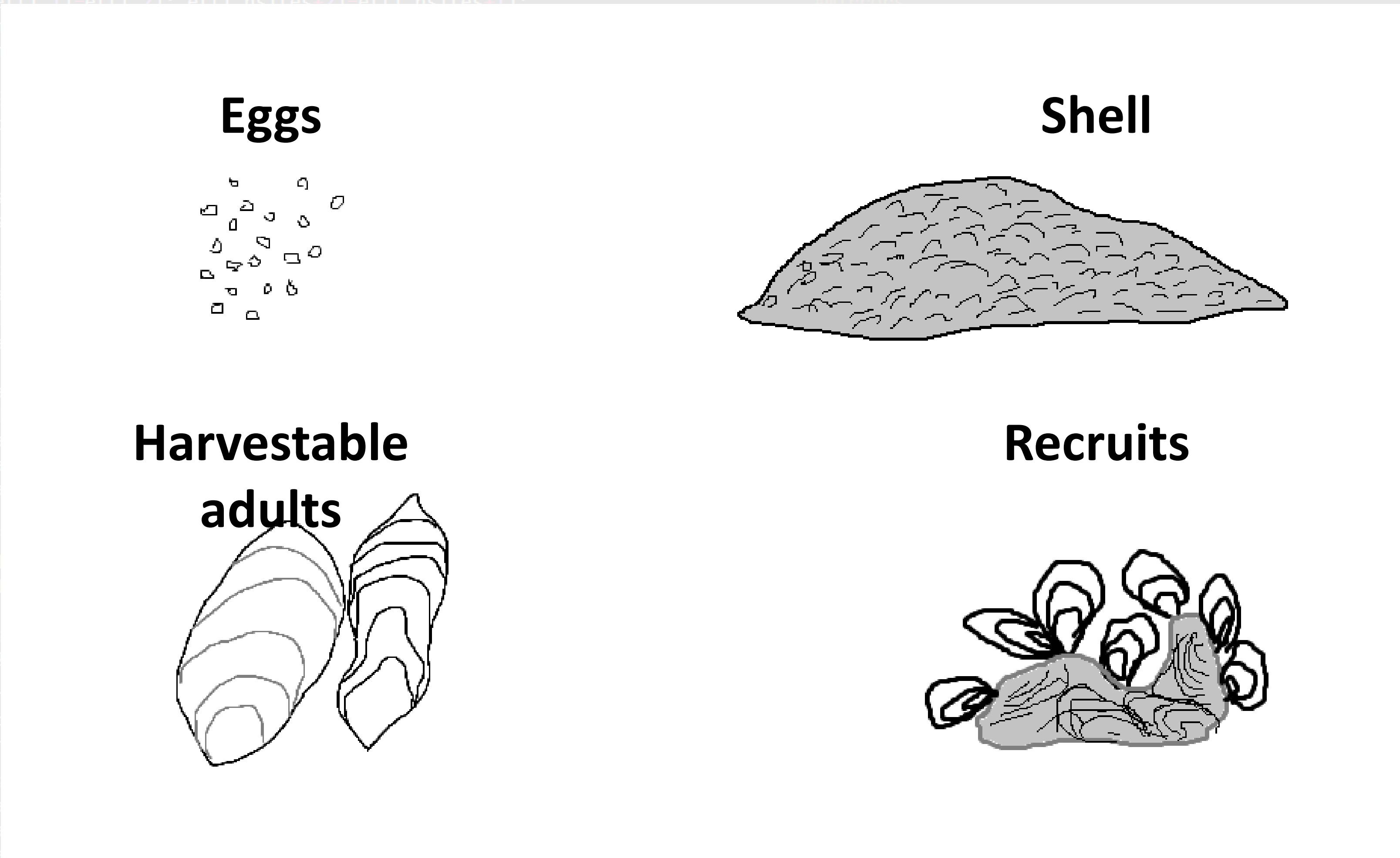
- Guide development of oyster model
  - Oyster populations, fisheries
  - Scientifically rigorous and CAB-approved

1. Reviewing my role: What I need from CAB

- Healthy but productive skepticism
- Input and help
- Discussion

2. Review models: models as drawings of reality

```
for (i in 2:years){
   for (k in 2:(nsites+1)) {                          #open site loop back up again
      #actual effort
#       et[i,k] <- total_et * eff[k]                   #assuming fixed effort, so just a function of total state-wide ef
      et[i,k]=0;     if(i>=fish_strt) et[i,k] = total_et * eff[k]    #not stocking for first 30 years, then stocking at number stock,
      et[i,1]=et[i,2]; et[i,nsites+2]=et[i,nsites+1];
```




```
     nage_hat[i,1,1] = nage_hat[i,1,2]; nage_hat[i,1,nsites+2] = nage_hat[i,1,nsites+1] #mirros
     nage_st[i,1,k] = R_st[i,k]*So.5                      #note here is where you would have added post recruit s
     nage_st[i,1,1] = nage_st[i,1,2]; nage_st[i,1,nsites+2] = nage_st[i,1,nsites+1]     #mirrors
```

2. Review models: process

1. Oysters and fisheries assumptions

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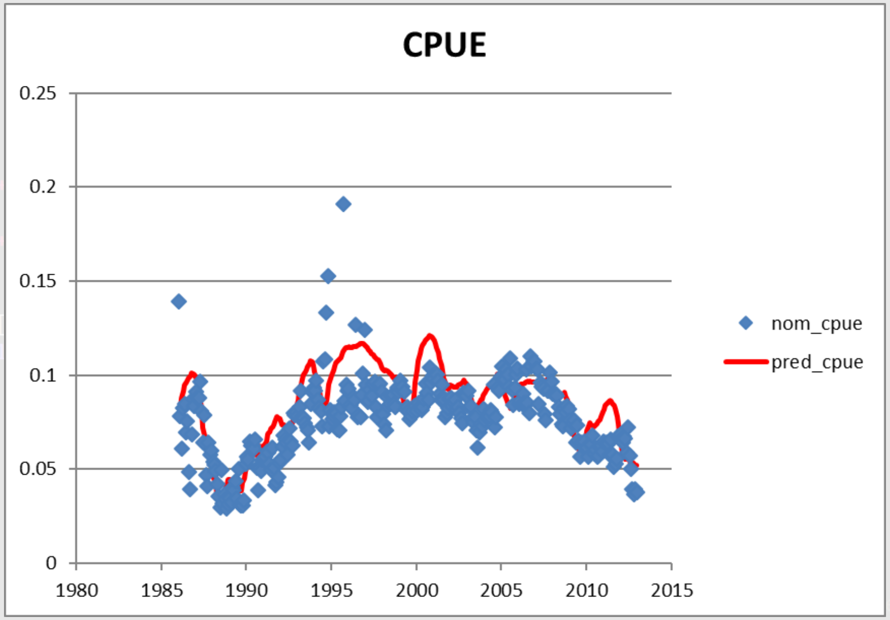
4. Fit to data



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5. Repeat 3-4

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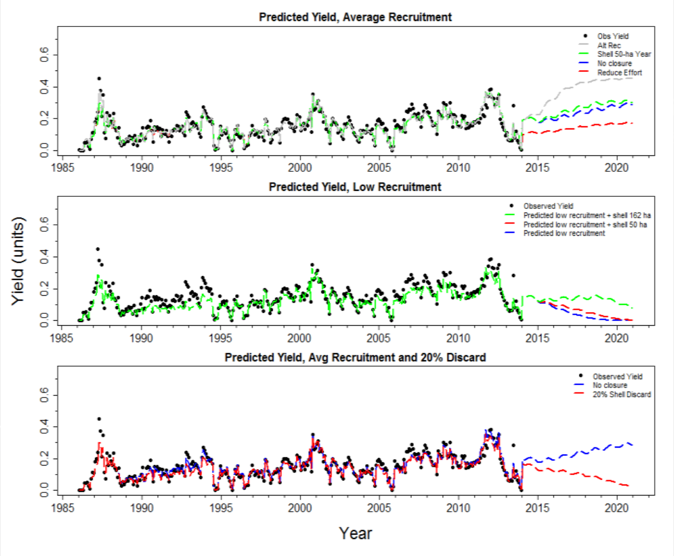
6. Make predictions

   -Environment

   -Management

   -Restoration



2. Review models: purpose

1. Make discussions easier/more fruitful

2. Predict likely and unlikely outcomes of action

3. Increase understanding of oysters & fisheries

4. ~~Be a perfect representation of reality~~

3. This model: current state

- System: simulated fished oyster population
- ***NOT fit to Apalachicola yet***

- Spatially implicit now, explicit later

- Key dynamics
  - Natural Mortality
  - Fishing mortality
  - Recruitment
  - Shell dynamics

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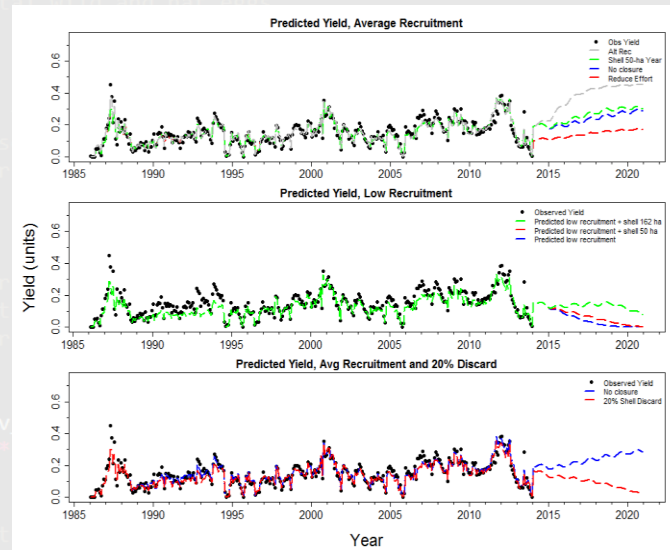

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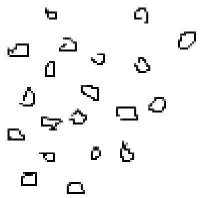
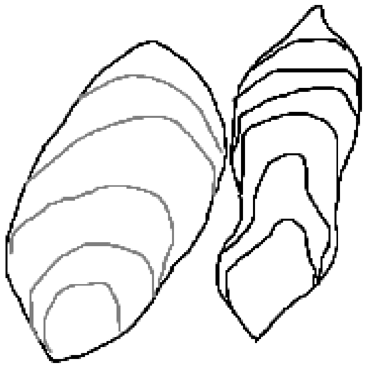
4. Simple demo: A (too simple) oyster life cycle

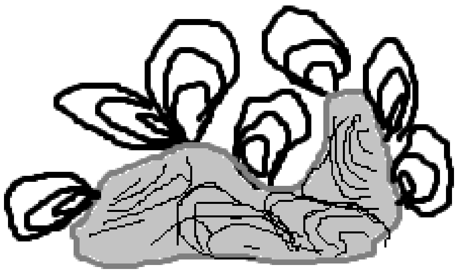
Eggs



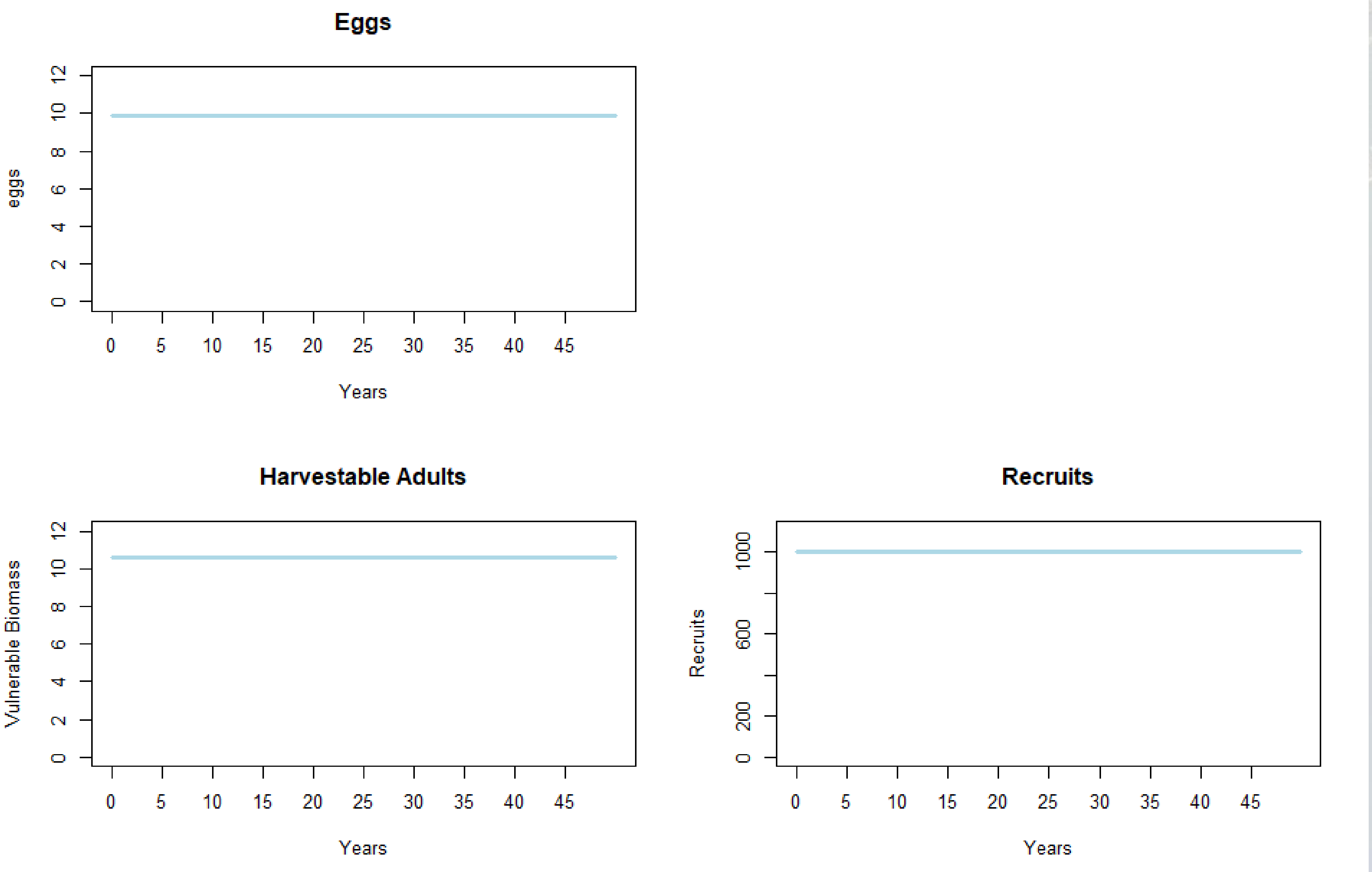
Harvestable adults



Recruits



4. Equilibrium without fishing, oysters = fish



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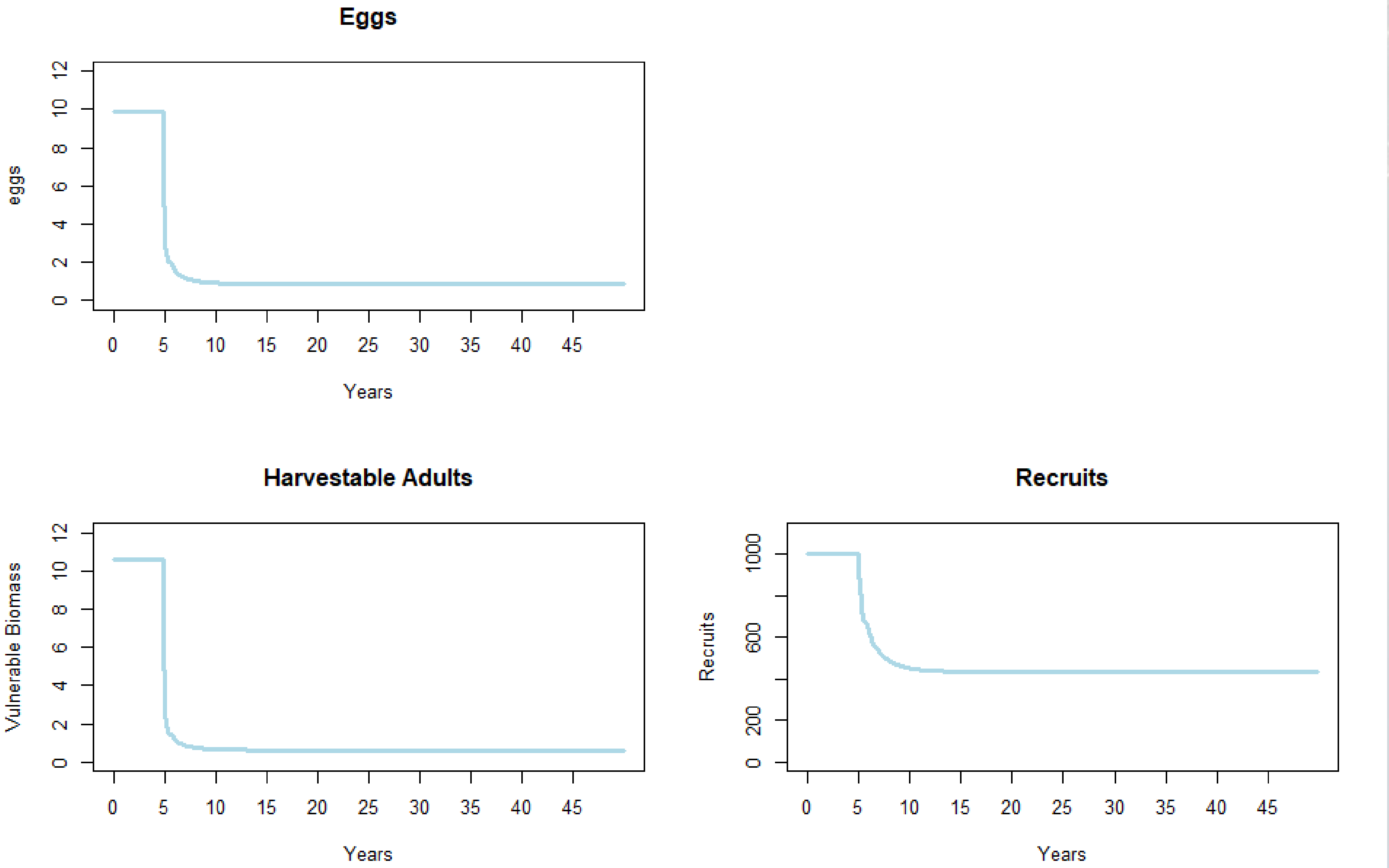

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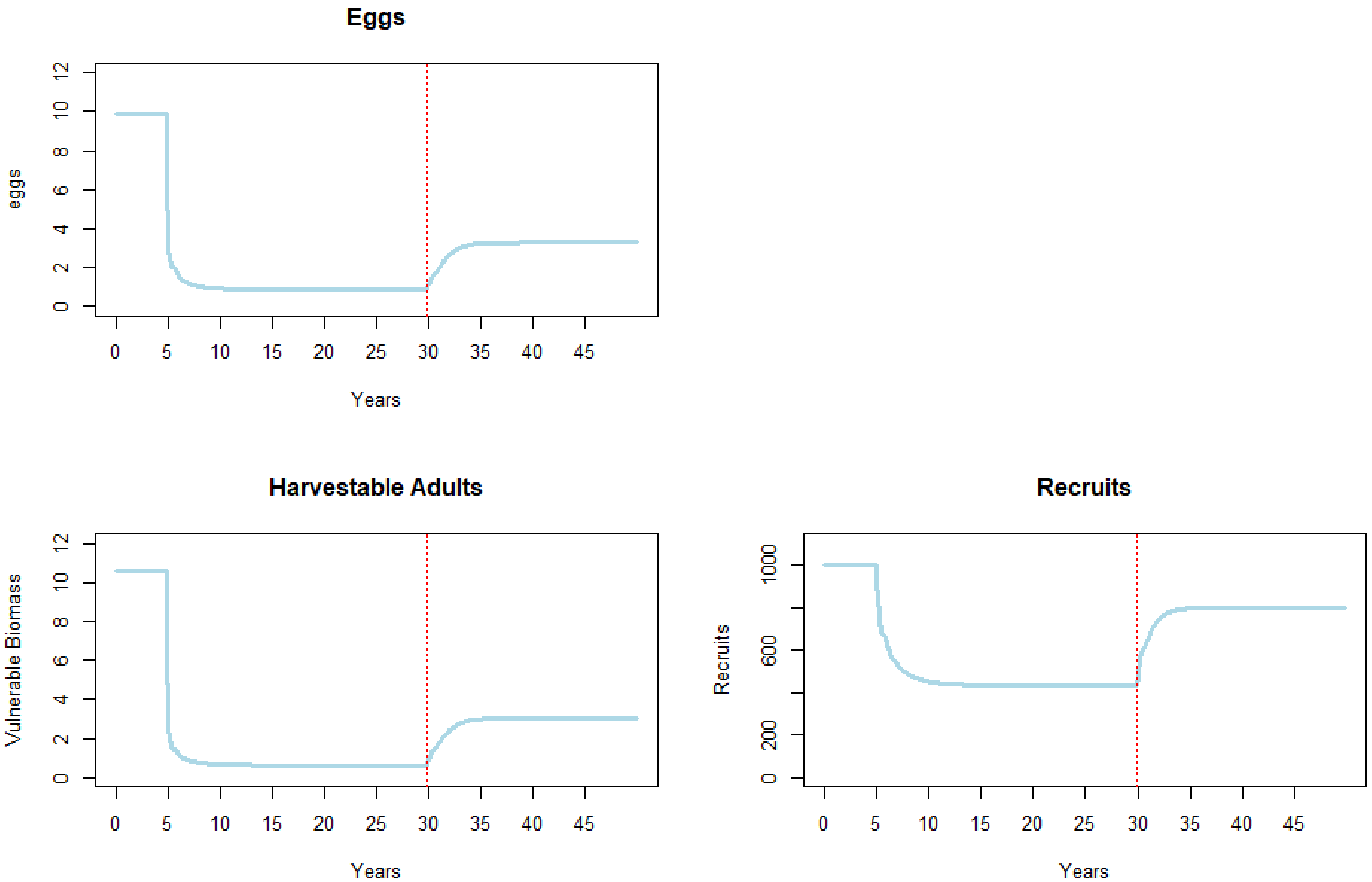
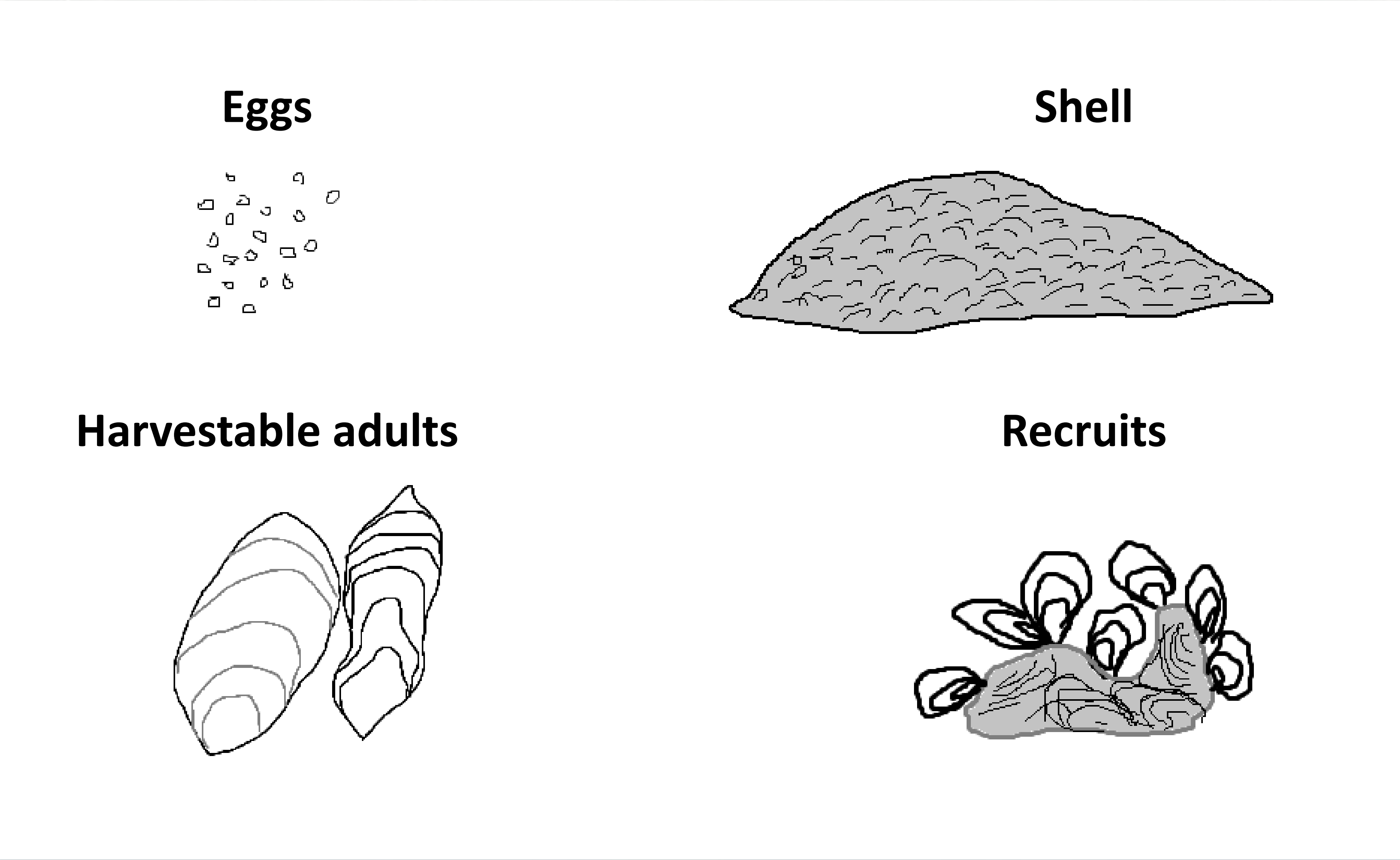
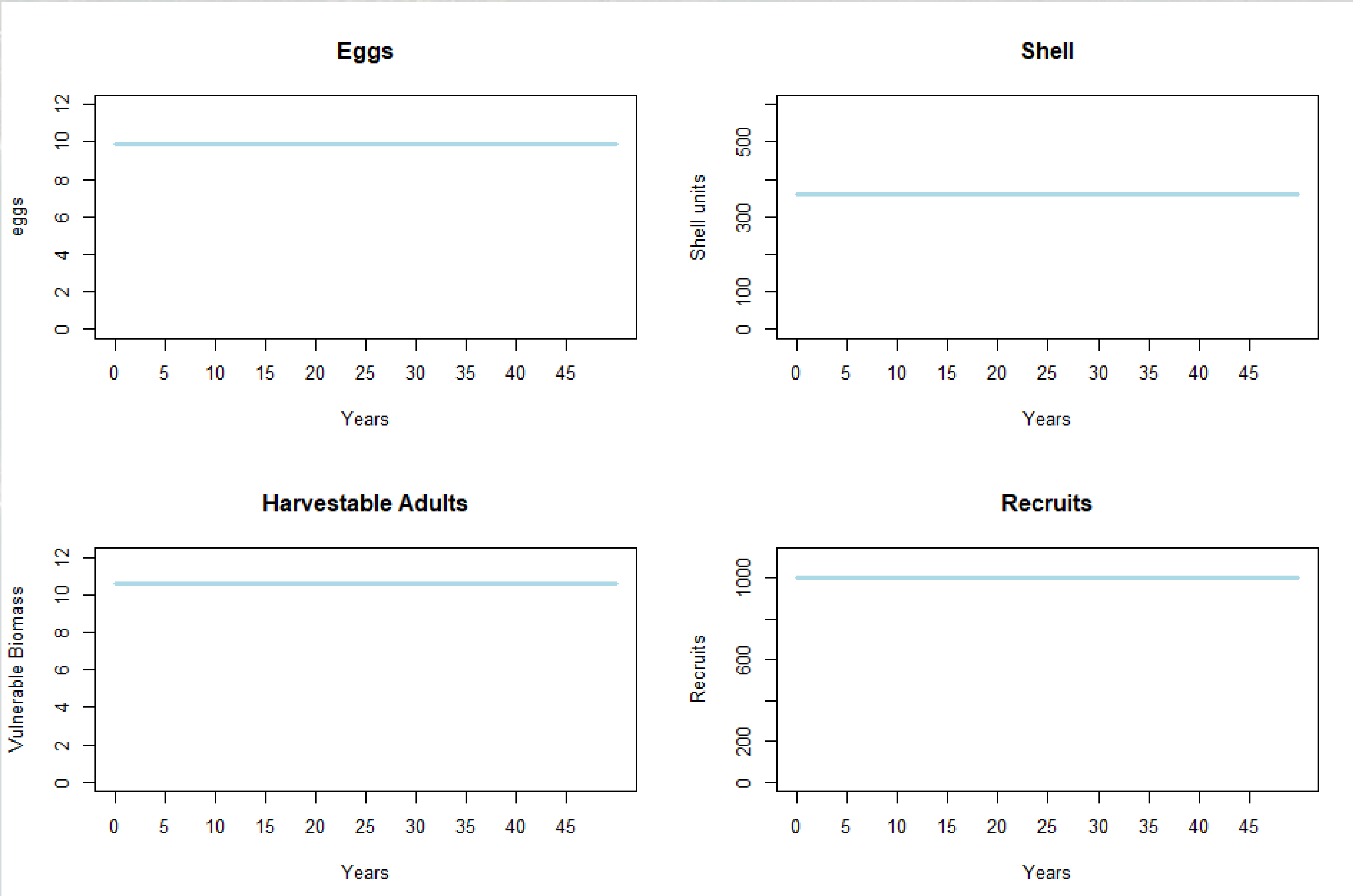


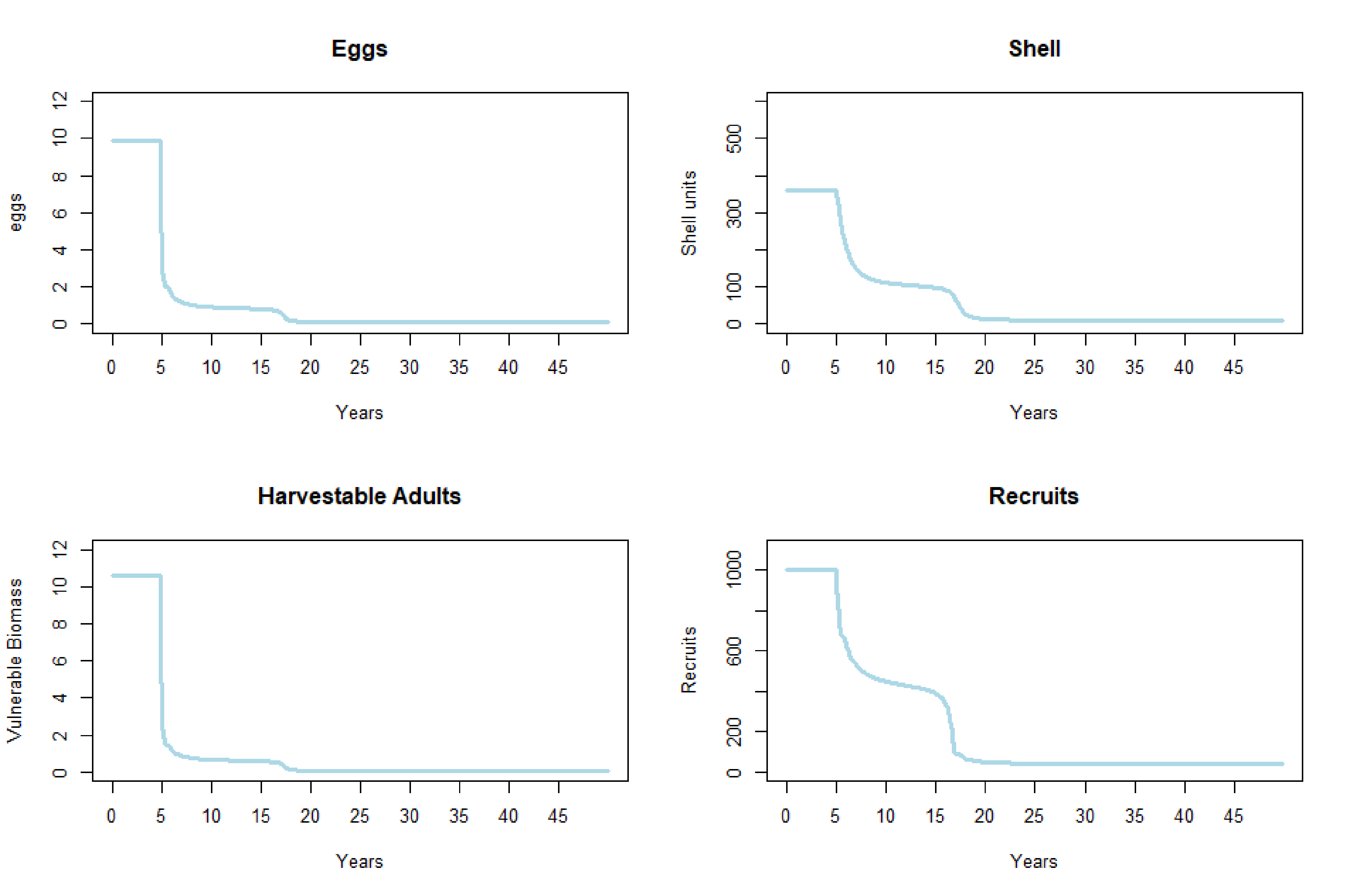
4. Simple demo: A oyster life cycle



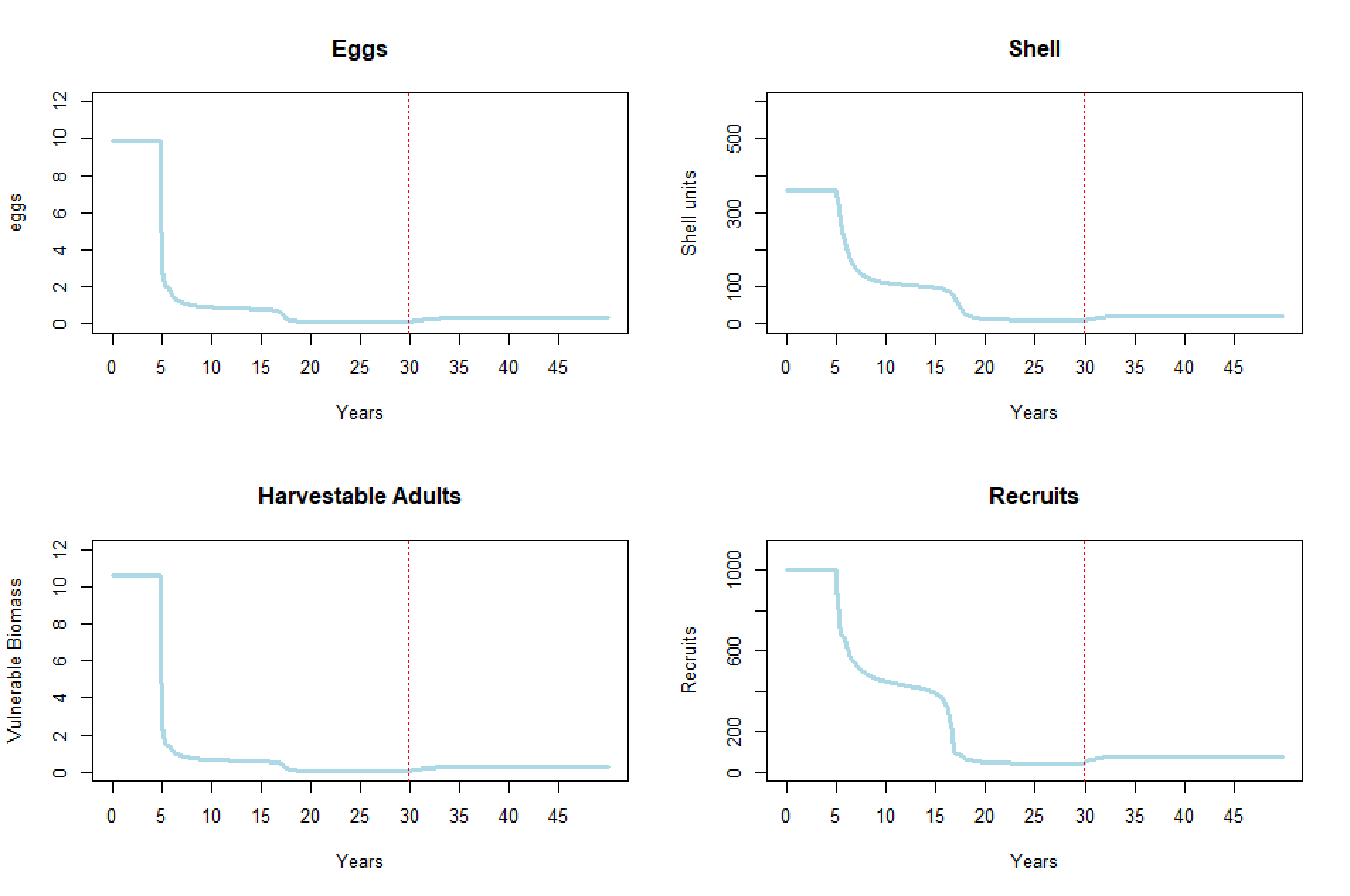
4. Shell model without fishing



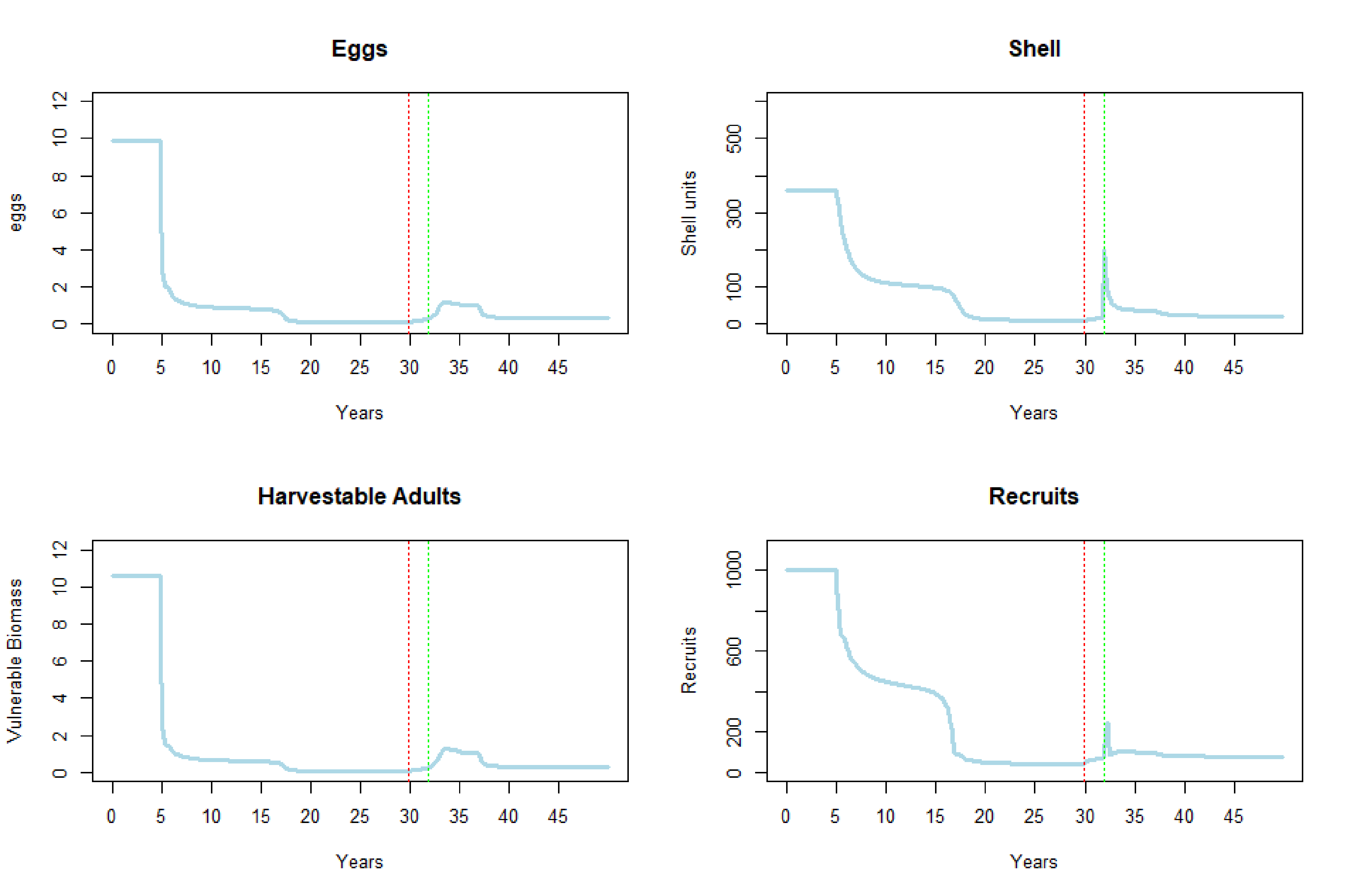
4. Shell model with fishing



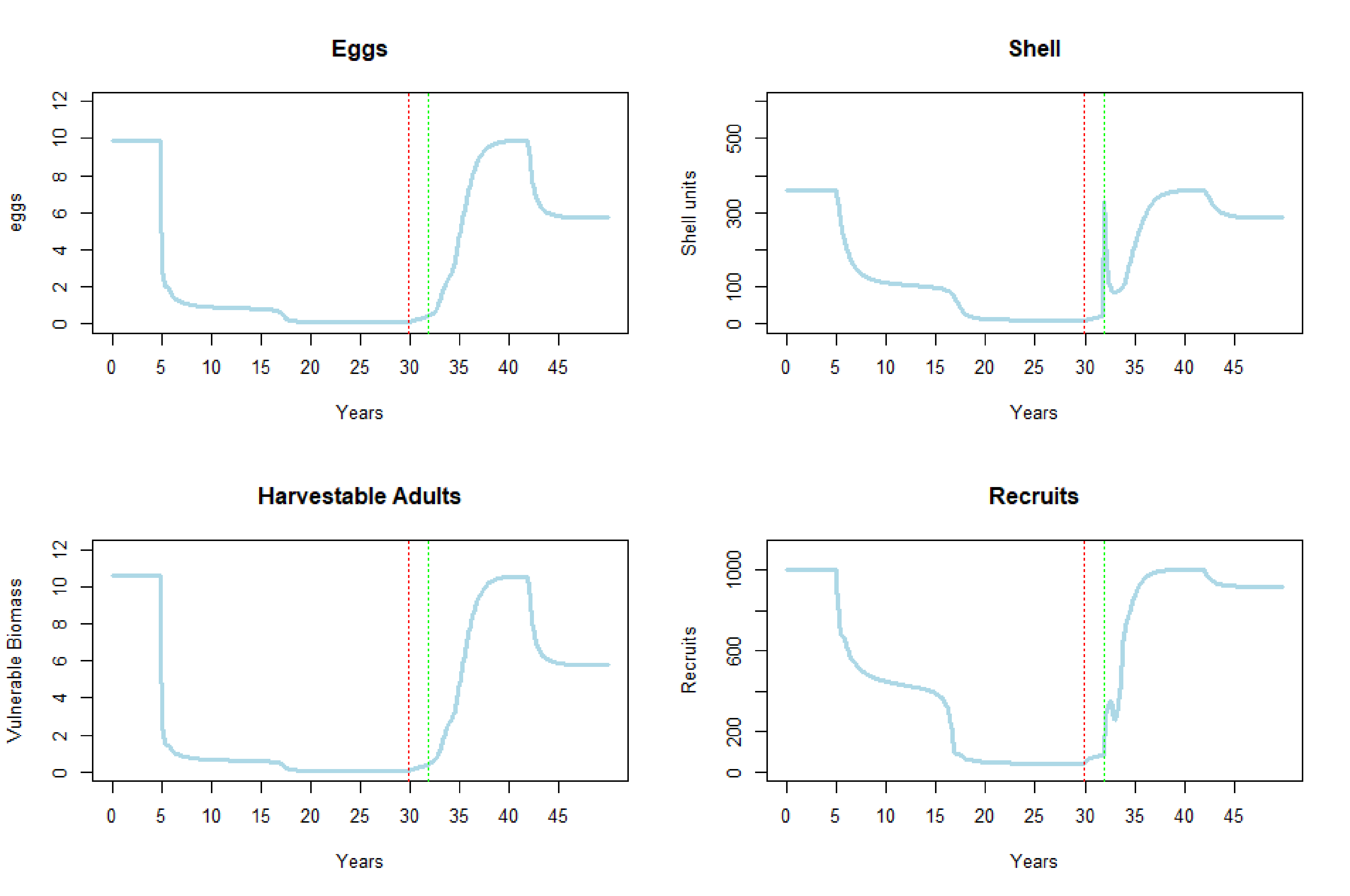
4. Add mgmt. responses like effort reductions…



4. …and add restoration



4. More extreme closures and restoration



4. Demonstration, if time and if screen shared

4. Simple demo: summary

- Let’s us look at what would happen if
  - “we took these mgmt. actions”
  - “the system works like this”

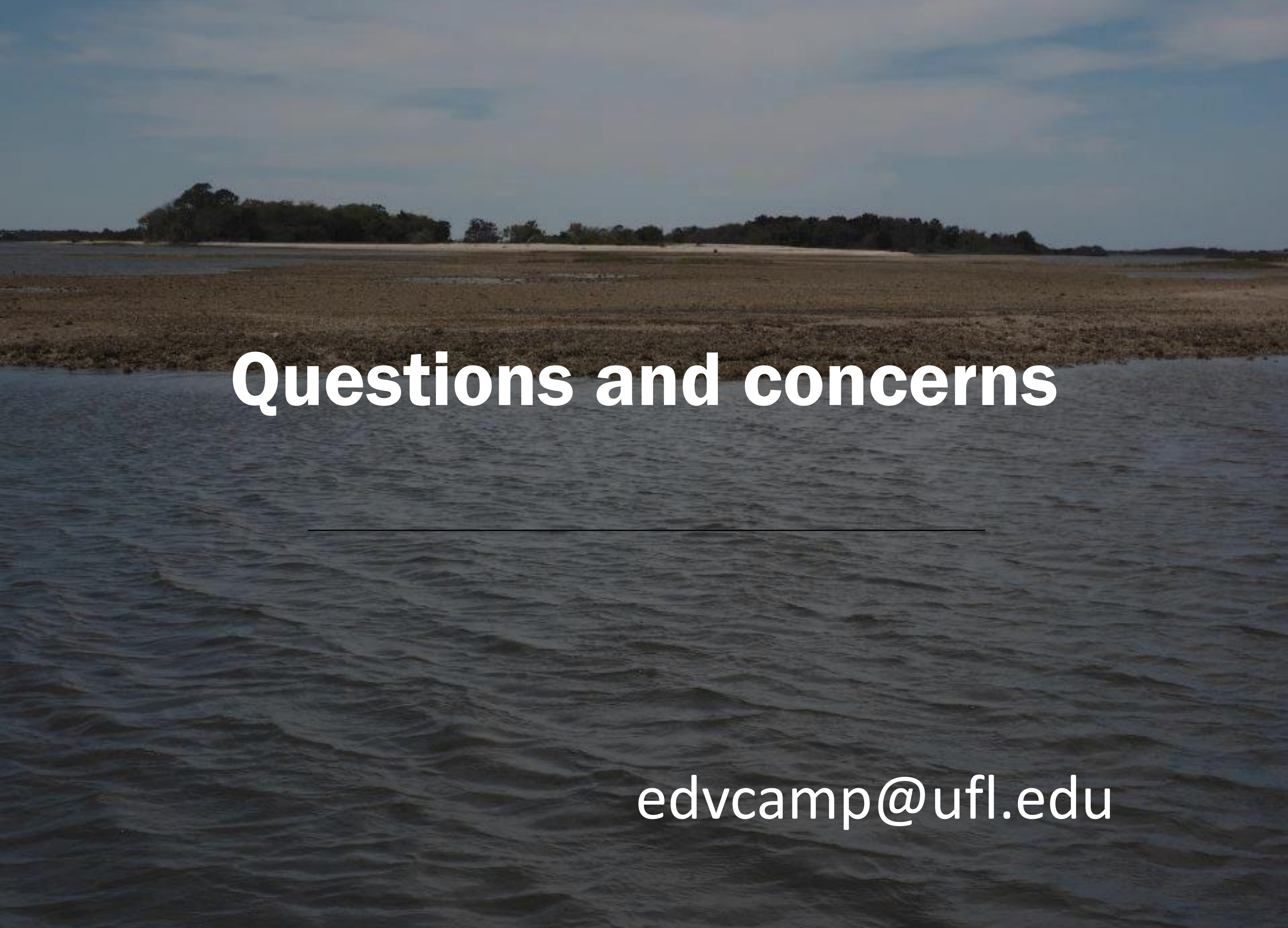
- Reminder: results aren’t prescriptive/predictive until base model is fit to data.

5. What's missing from this model

- Fit model to data
  - Fisheries dependent (oyster harvest)
  - Fisheries independent (FWRI data)
- Make spatially explicit
  - Represent specific bars?
- Fine tune potential mgmt. actions
- Adding in economic components

6. Questions and Concerns

- How to keep people updated about model?
- Timing
  - Takes time and people to build model
  - Need fisheries independent data
  - Ideally everything would be done now



Questions and concerns

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