ABSI CAB Meeting July 2022

Assessment and simulation models

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Notes and Disclosure

- Ed Camp, Assistant professor at UF
  - PI on a FWC-UF oyster mgmt. & restoration project
  - Tasked with helping ABSI with modeling
- Showing some estimation and some simulation results

- ALL RESULTS ARE PRELIMINARY

- Some simulation results are based on **unrealistic assumptions**
  - Data show no meaningful number of harvestable oysters
  - **Data show no meaningful number of harvestable oysters**

- **DO NOT** take these optimistic simulations as a promise of what will be there.

Outline

- Background
  - Estimation models and simulation models
- Assessment model
  - Catch at Size model developed by Nick Fisch
    - Predictions, projections
- Implications for CAB work

Background: Estimation vs Simulation

- Estimation
  - What is/was in terms of fish/fishers
  - Population productivity, original size, etc.
  - Catchability, selectivity, etc.
  - Squeezing information from data
  - Assessment model fit

Background: Estimation vs Simulation

- Simulation
  - Take estimated parameters, and change something to ask "what if?"
  - E.g., what if effort was this and recruitment was that.
  - *This is what people want to see to evaluate alternative mgmt. options*
  - Projections

  - Ideally we have an estimation model first, then we use that same model, or other similar models to run simulations

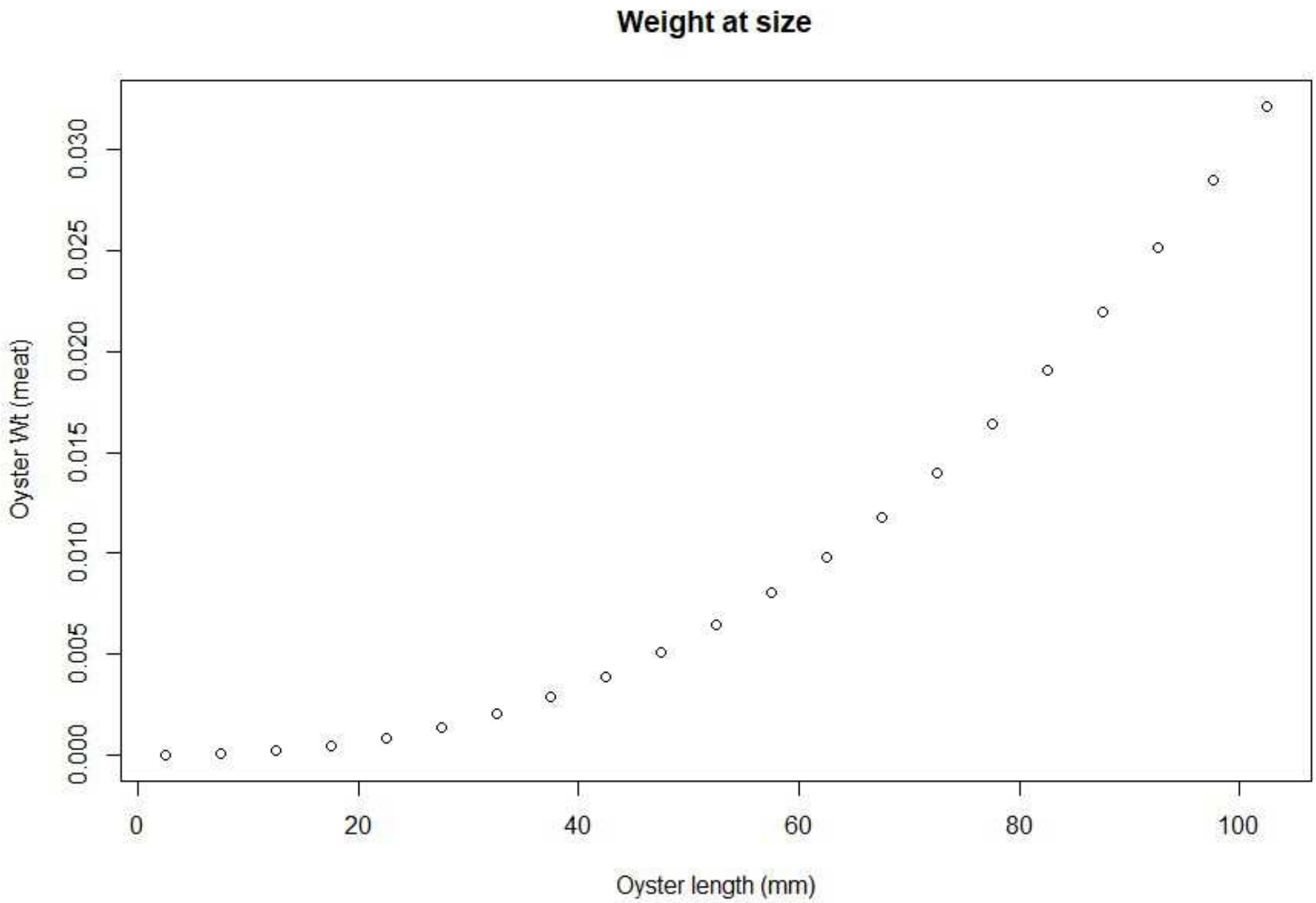
Assessment model—Catch as size model

- Notes!!!
  - Developed by Nick Fisch, NMFS
  - Borrows some from Pine (Walters) et al. 2015
  - DRAFT! NOT YET PUBLISHED!

Catch at Size Assessment model--Assumption

- Assumptions of model
  - Monthly time-step
  - Tracks size groups rather than ages (catch at size)
  - Uses classic fisheries recruitment (Bev Holt) NOT explicitly modeling shell dynamics
  - <Discuss why this still worth paying attention to>
  - Uses fisheries dependent and independent data (technically an “integrated assessment model” or “synthesis” model

Catch at Size Assessment model—Assumptions II



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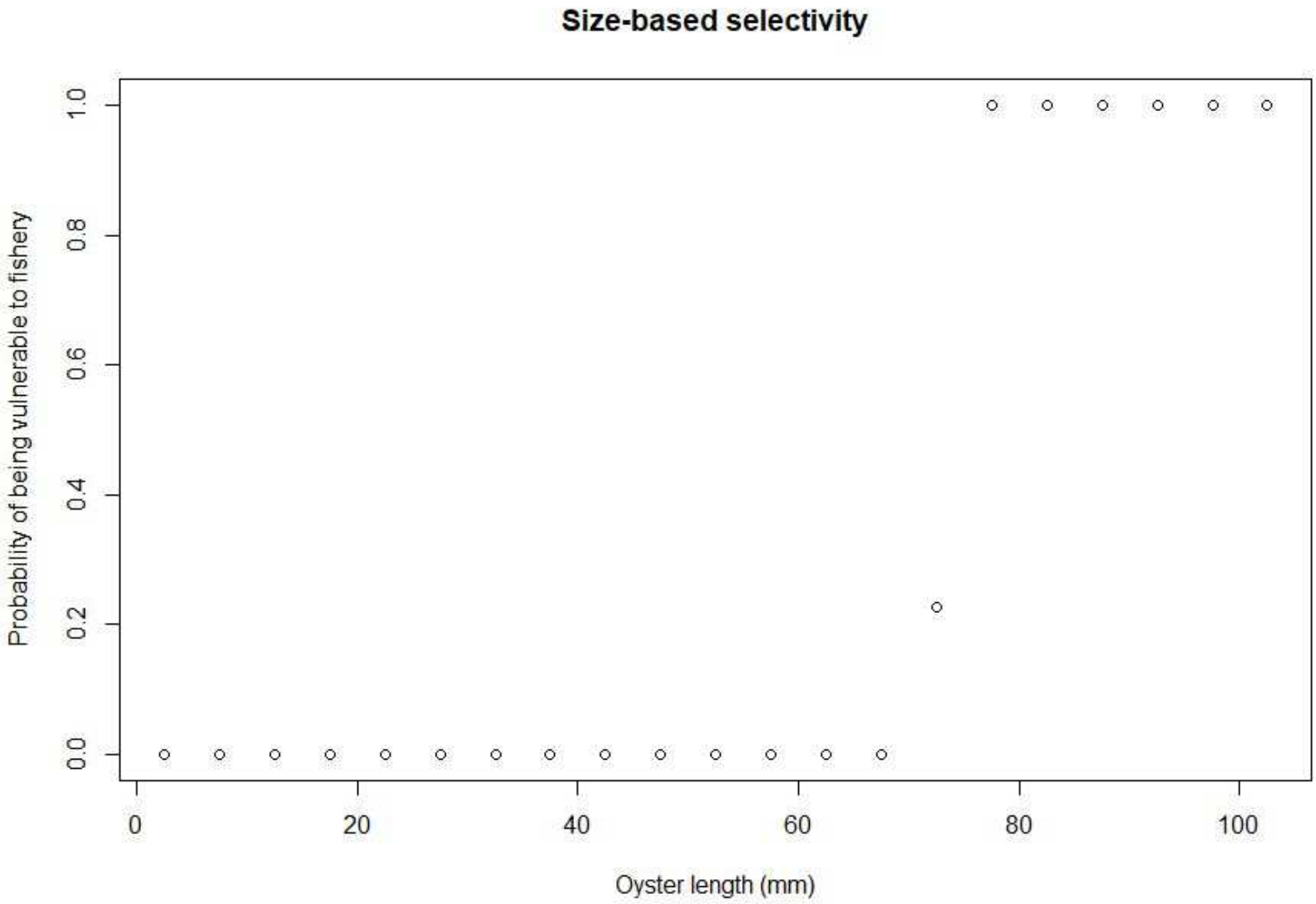

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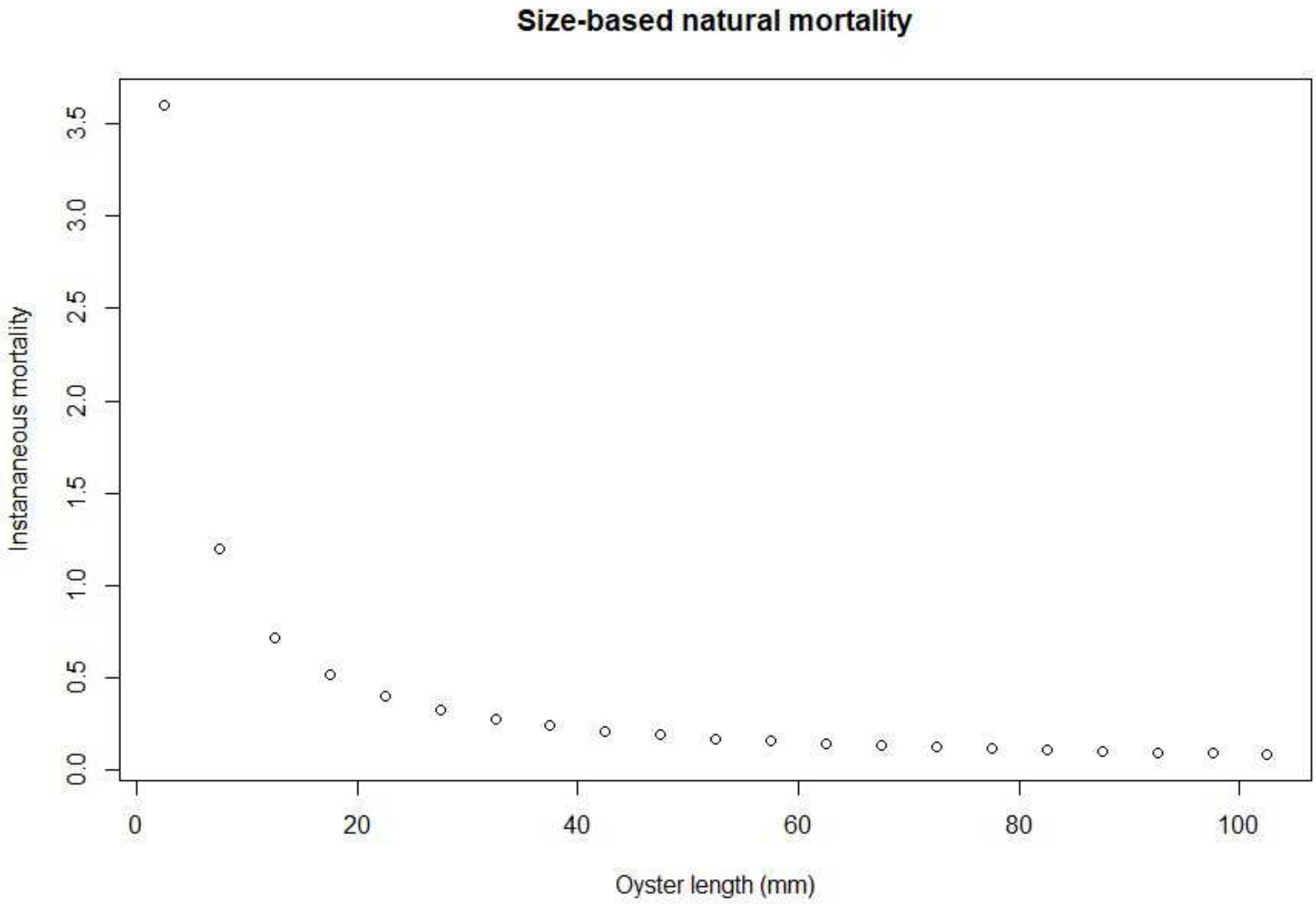

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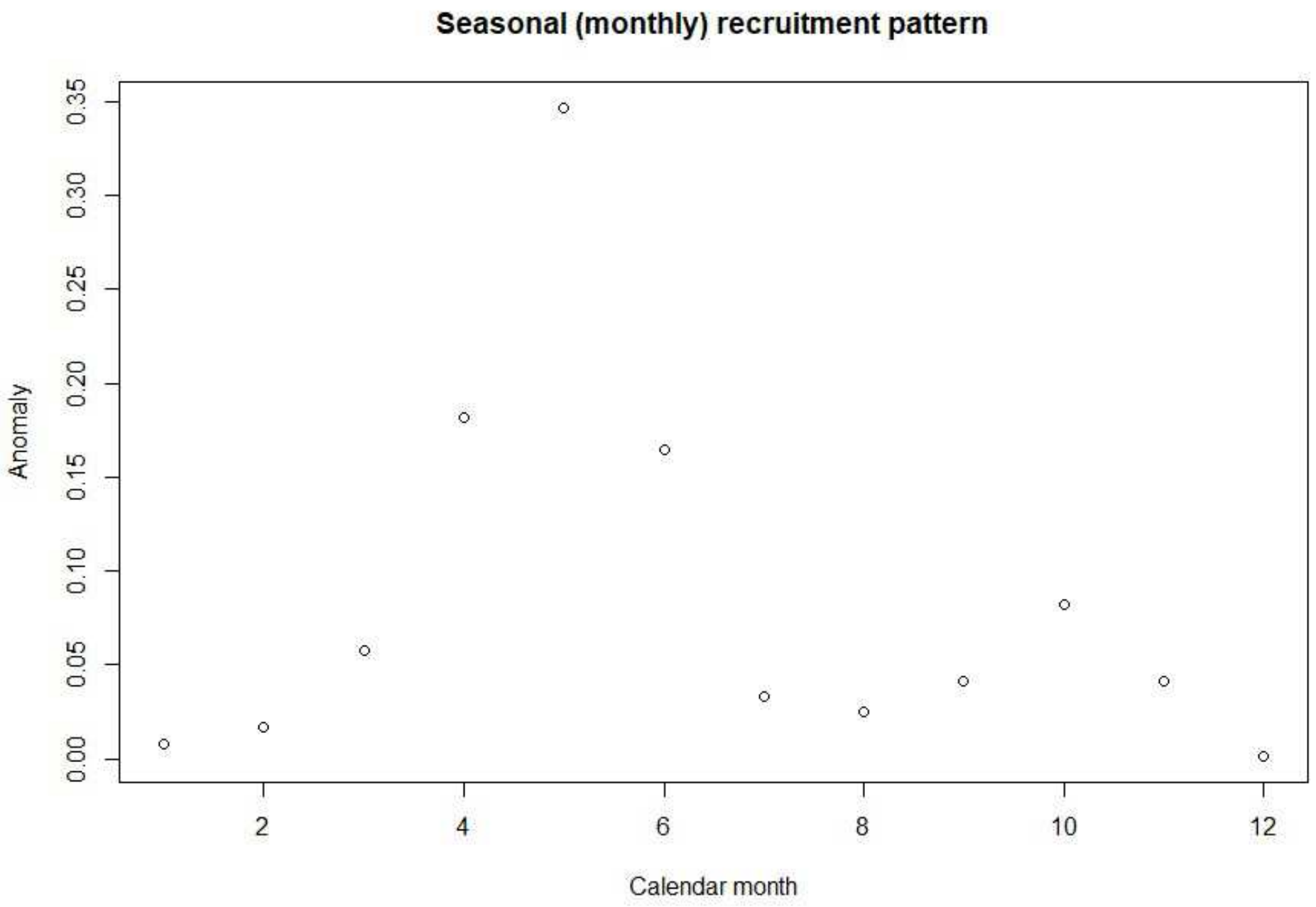


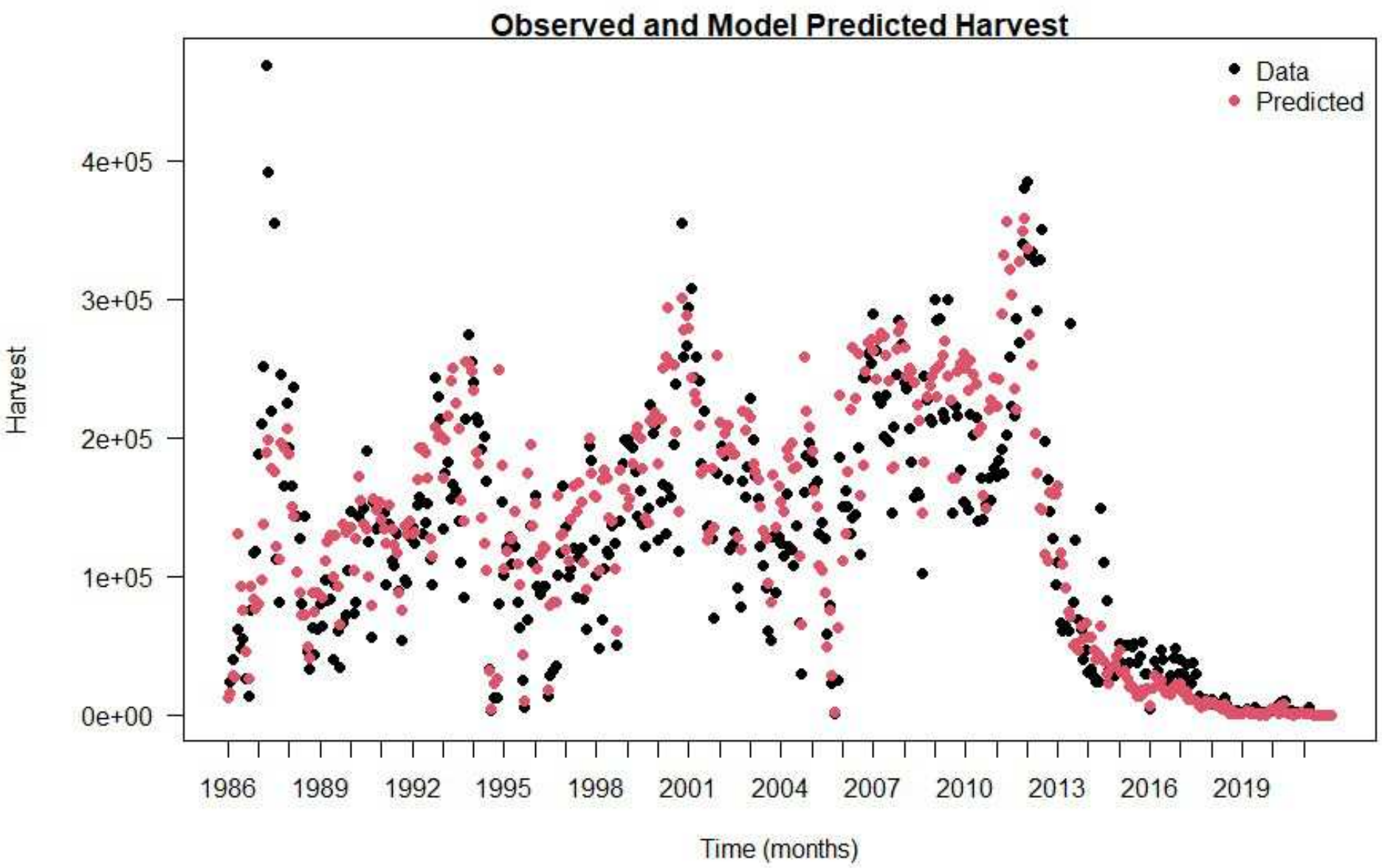
Catch at Size Assessment model—Assumptions II

- Bio and Fishery assumptions pretty reasonable
- Biggest point of interest is that very high M at low sizes, but probably real
  - This has implications for how we view fisheries independent data that measures very small oysters and includes them in “spat” group (0-25mm).
  - Should we still be measuring oysters that small?

Catch at Size Assessment model—Fits to data

- Fit in ADMB (about the best tool we have for non-spatial models/models without random effects)
- Again, all of this is draft and has not been peer reviewed.

Catch at Size Assessment model—Predictions



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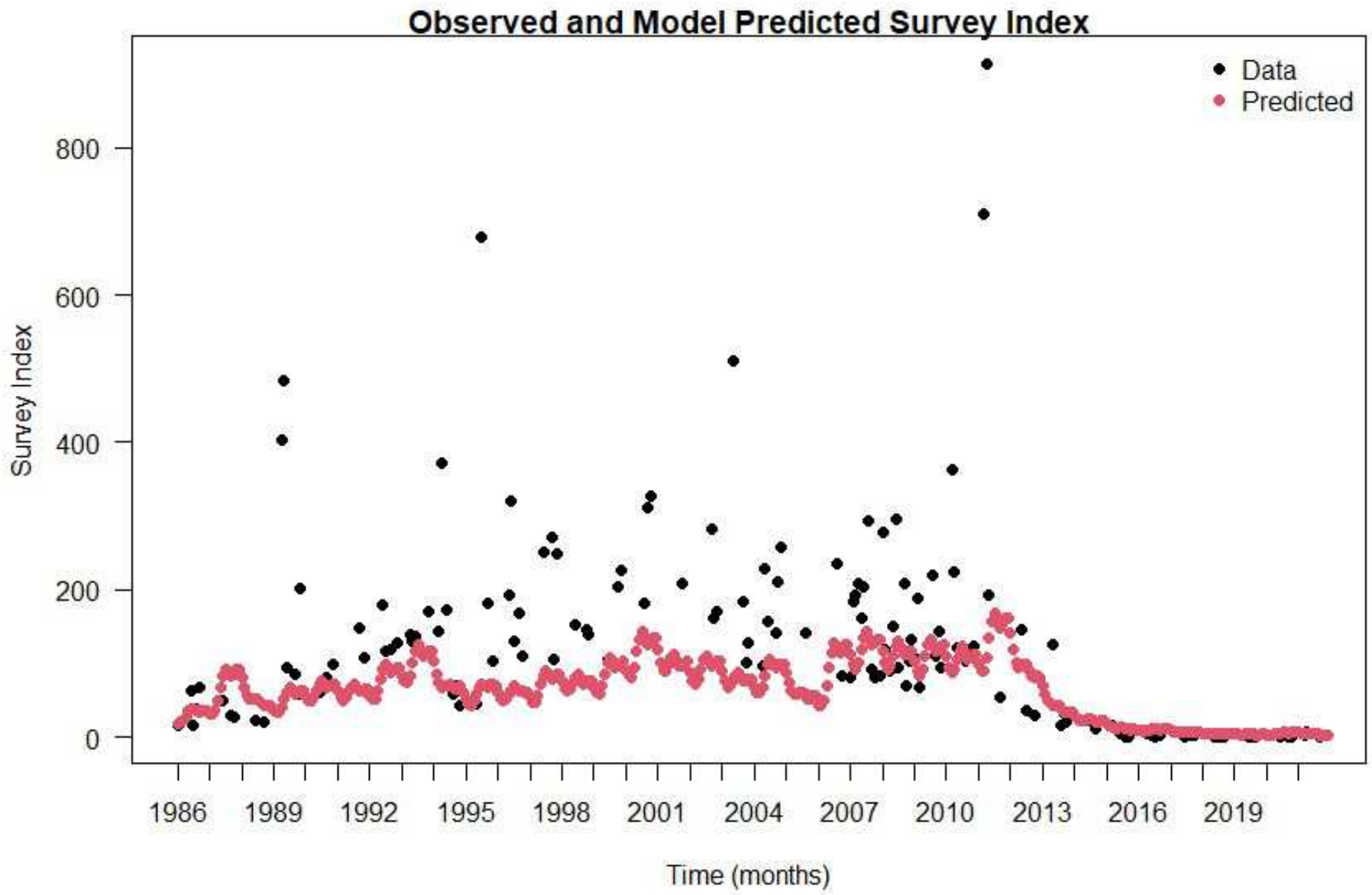

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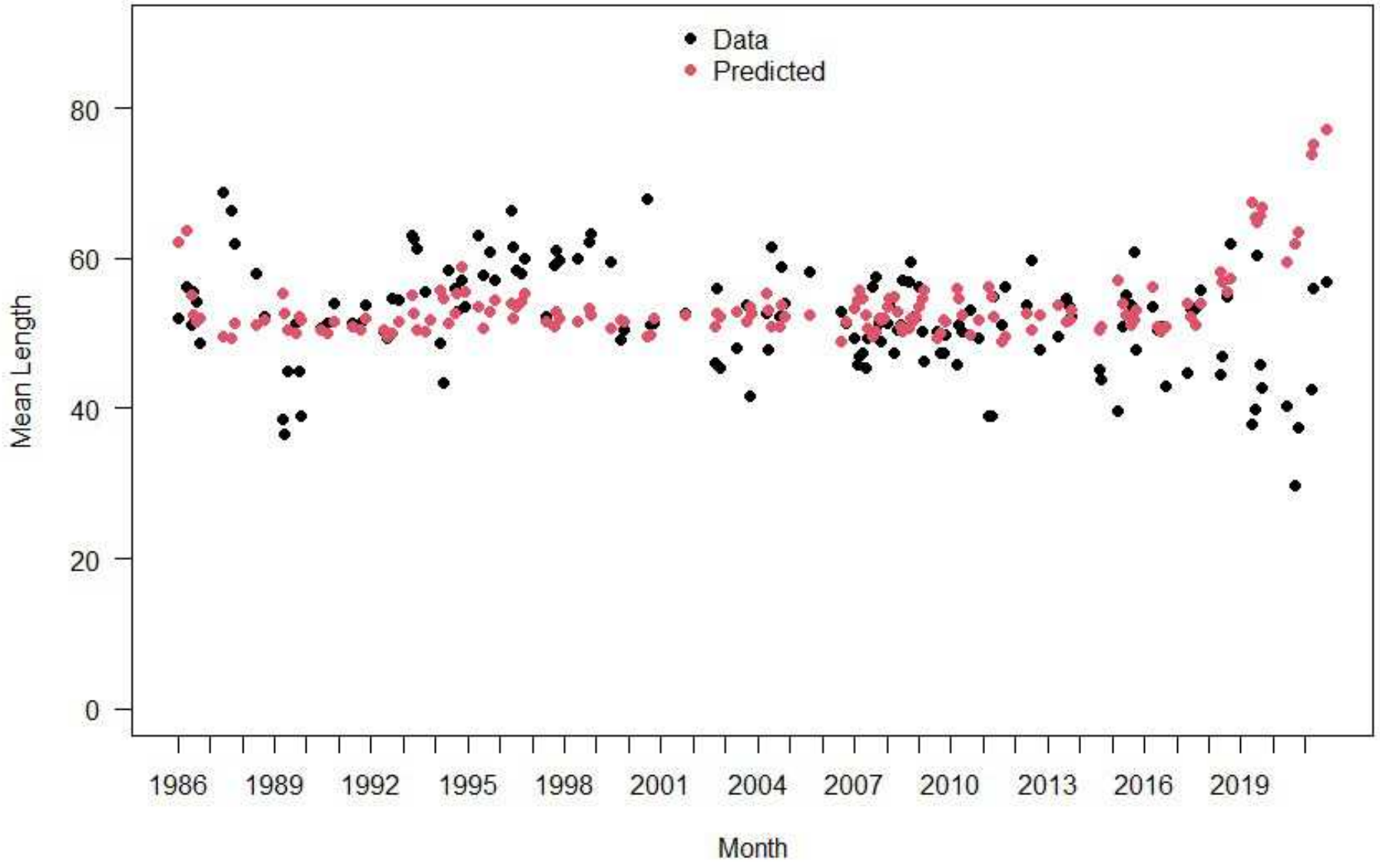

Catch at Size Assessment model—Predictions

- Apparent vs. predicted confirm general math seems appropriate
- Observed Harvest well-fit
- Observed Index less well-fit, similar issue to Pine et al. 2015
- Note, both harvest and index well-fit in recent years

Catch at Size Assessment model—Projections

- This is taking fit model and projecting what would happen in the future under different assumptions

- 2 main assumptions explored
  - What happens with recruitment?
  - How much effort is exerted?

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  - What happens with recruitment?
  - How much effort is exerted?

- Take a minute to talk about these first

Assumption 1: recruitment levels

- Technical definition: surviving some very early life history stage where mortality is density dependent
- Basically, how well are little oysters surviving
- Three assumptions
  - Recent recruitment patterns continue in future (v. poor)
  - Recruitment returns to long-term average (slightly poor)
  - Recruitment returns to 2000-2010 average (good)

Assumption 2: How much effort?

- Simulating various levels of fixed effort
- That's similar to trip limits (not done) or limited entry (not done with oysters in FL)

- **Purpose here is to consider intensity of effort, NOT way that effort is controlled (e.g. limited entry). That we will assess more later.**

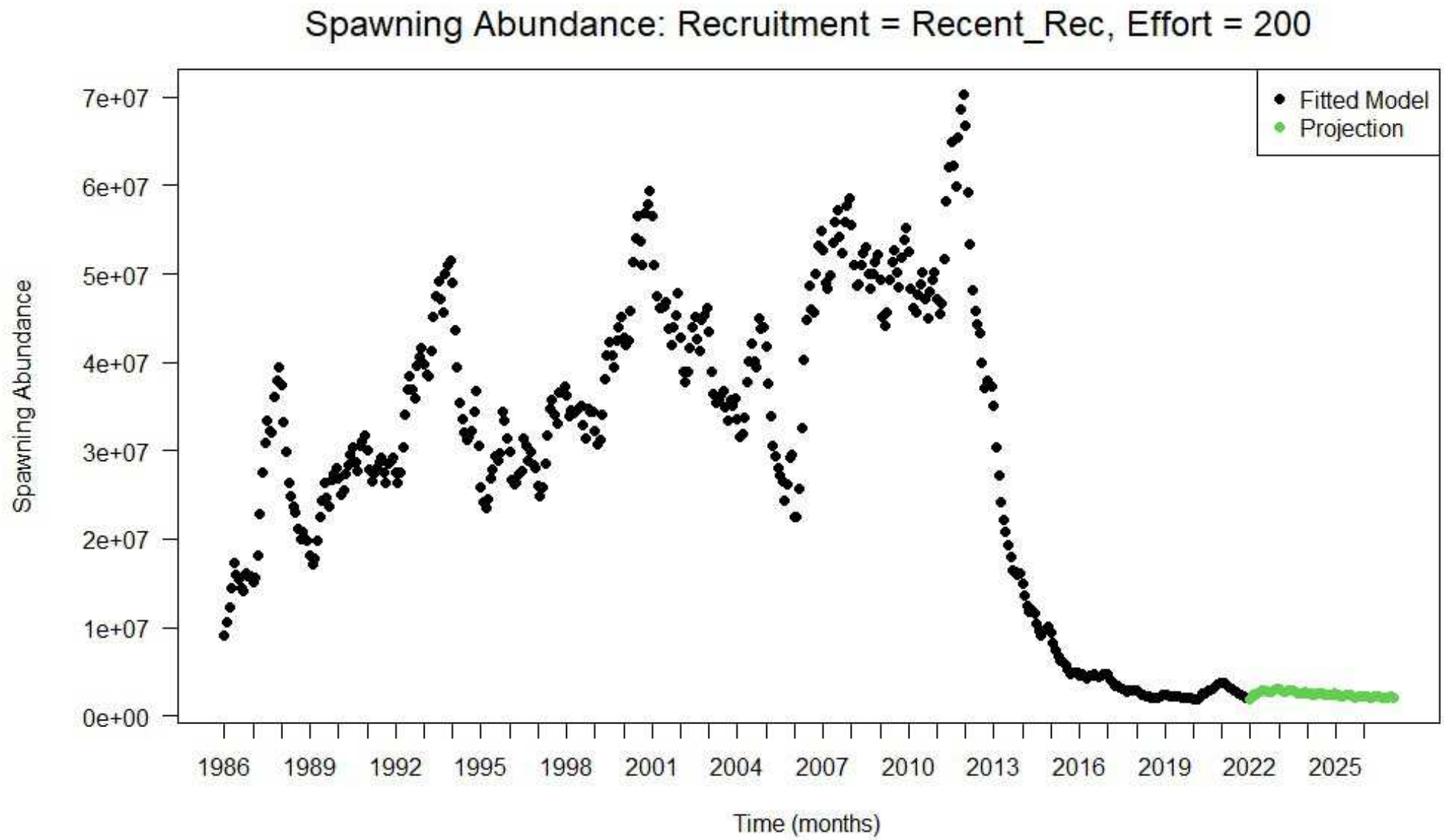
- Three assumptions about effort*
  - Low: 200 trips/month (10 fishers * 20 days/month)
  - Med: 1200 trips/month (60 fishers * 20 days/month)
  - High: 2400 trips/month (120 fishers * 20 days/month)

REMINDER ABOUT CAVEAT!

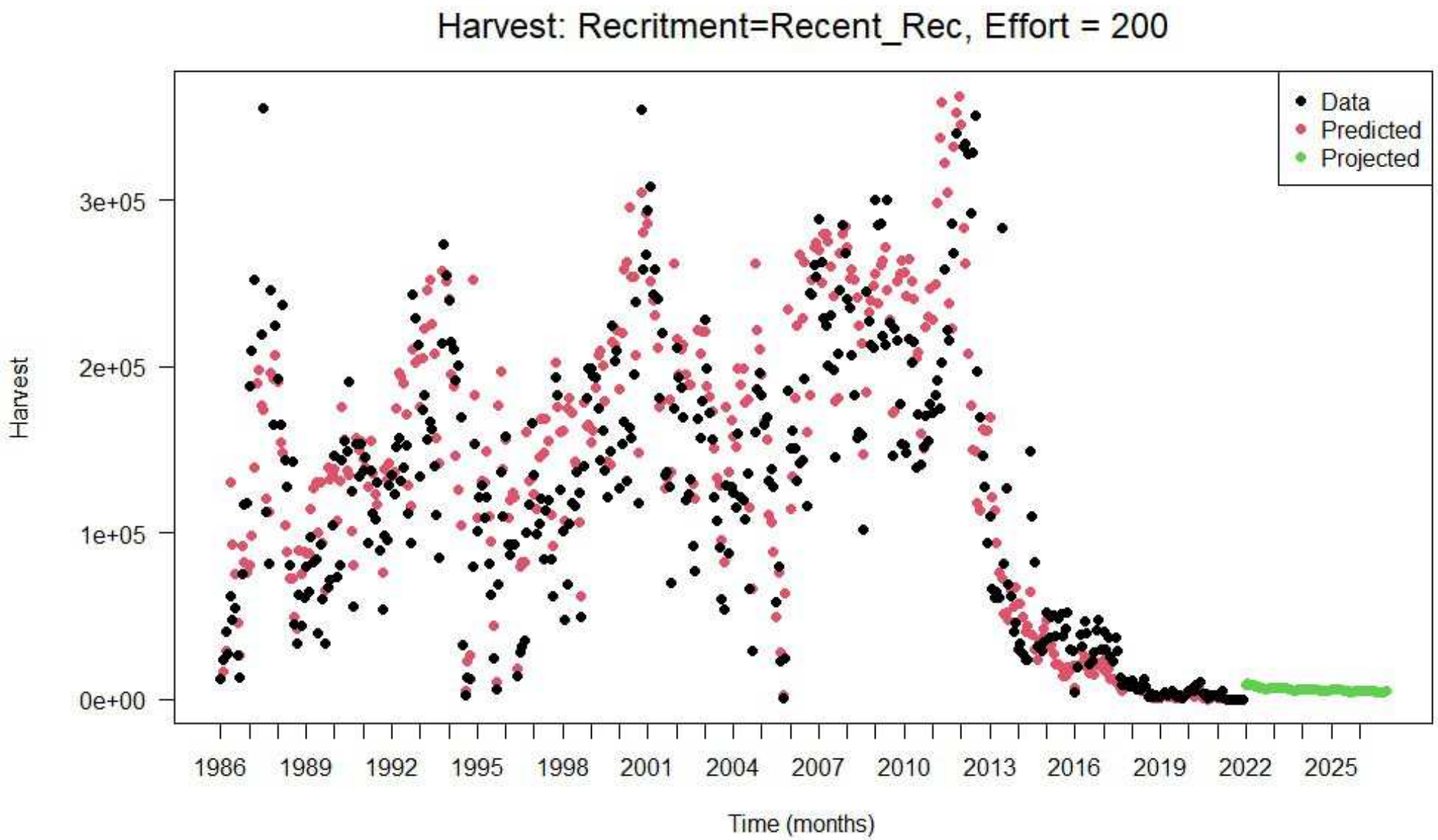
- These are initial simulation runs, they are for learning.
- Showing the following does not constitute my scientific opinion that any of the following will occur, or could realistically occur.
- We are simulating some things that I think are unlikely to happen.
- DO NOT MAKE PERSONAL DECISIONS BASED ON THESE RESULTS

Low effort, recent recruitment

Low effort, recent recruitment: Spawning abundance



Low effort, recent recruitment: Harvest



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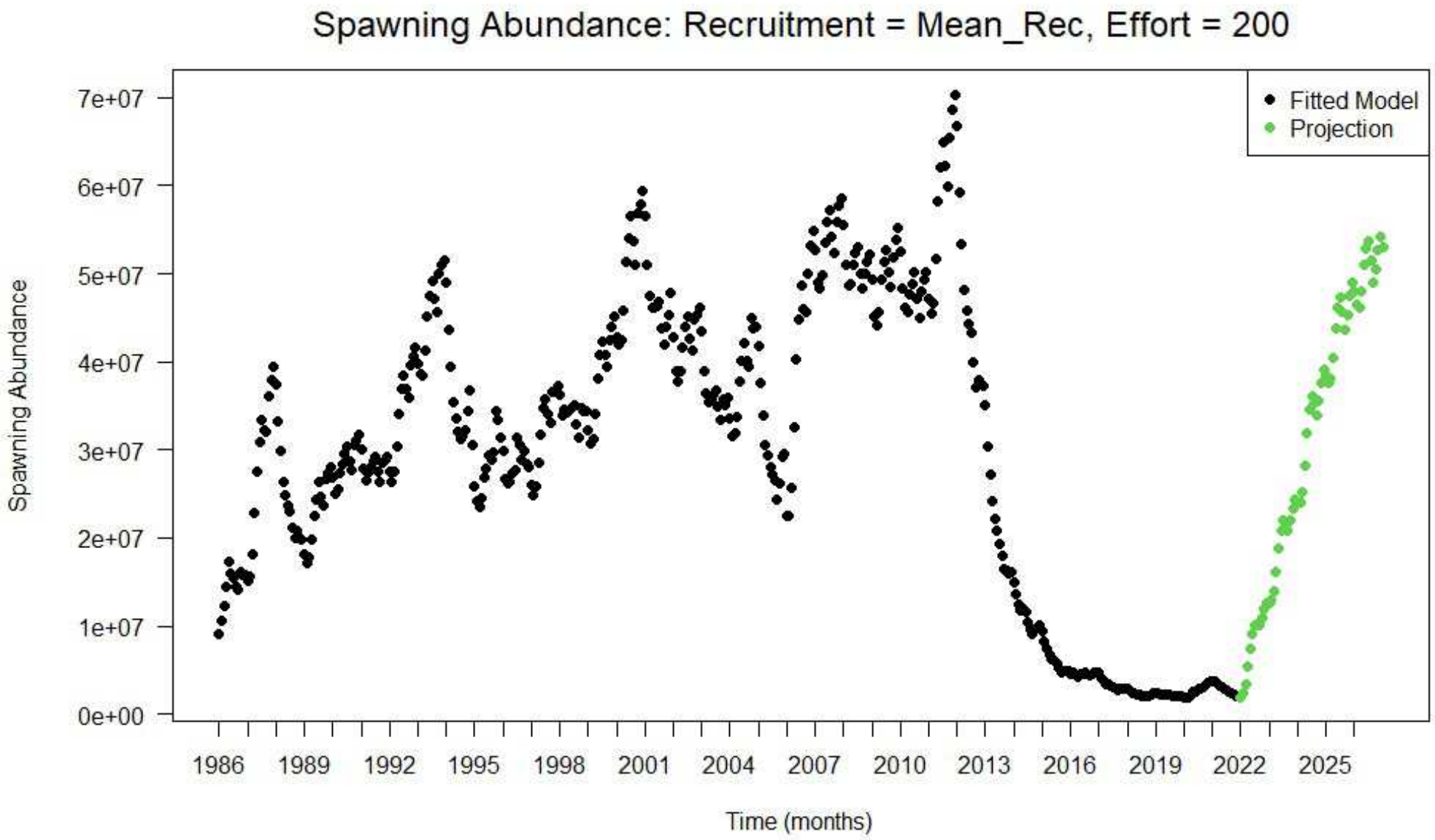

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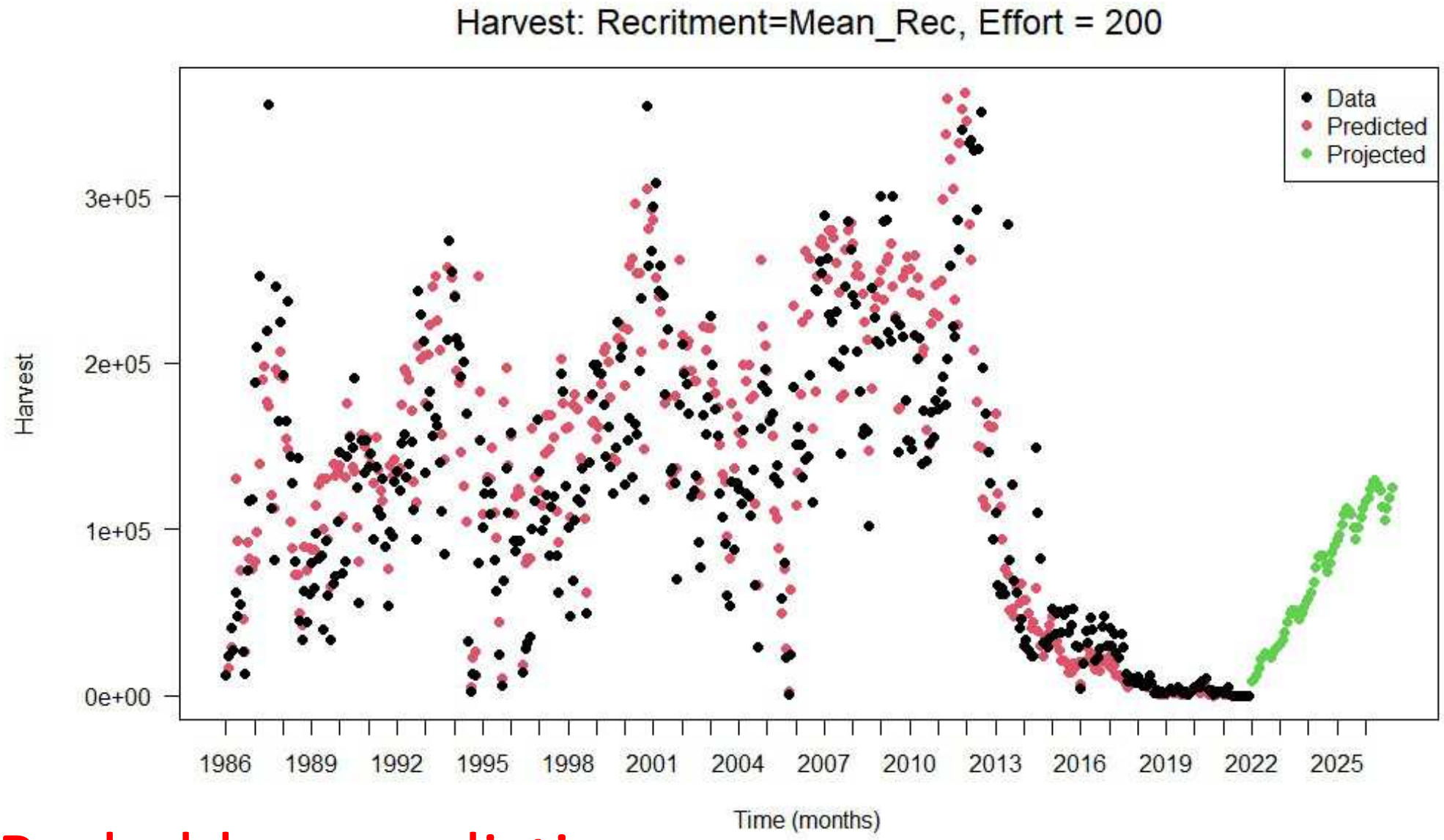

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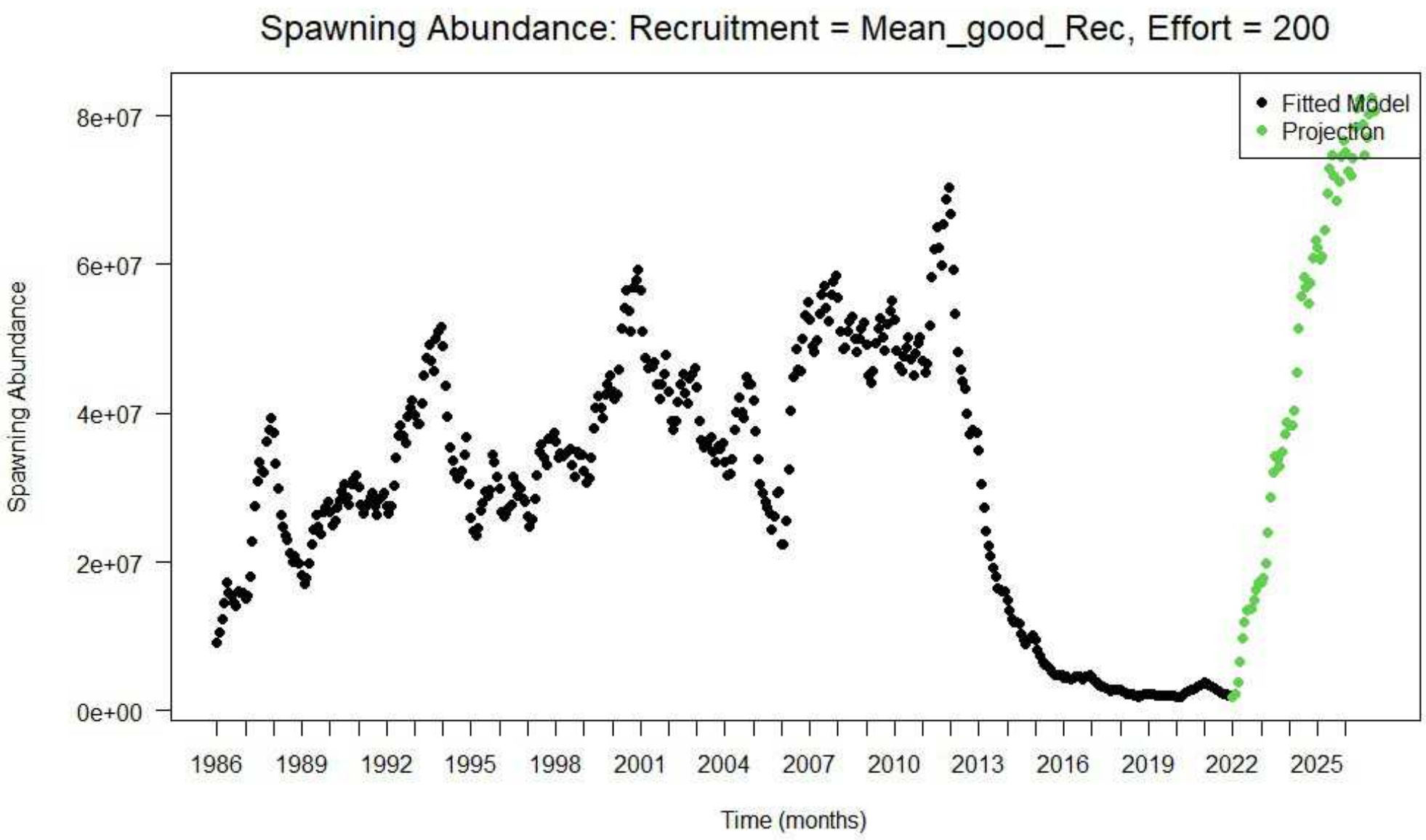

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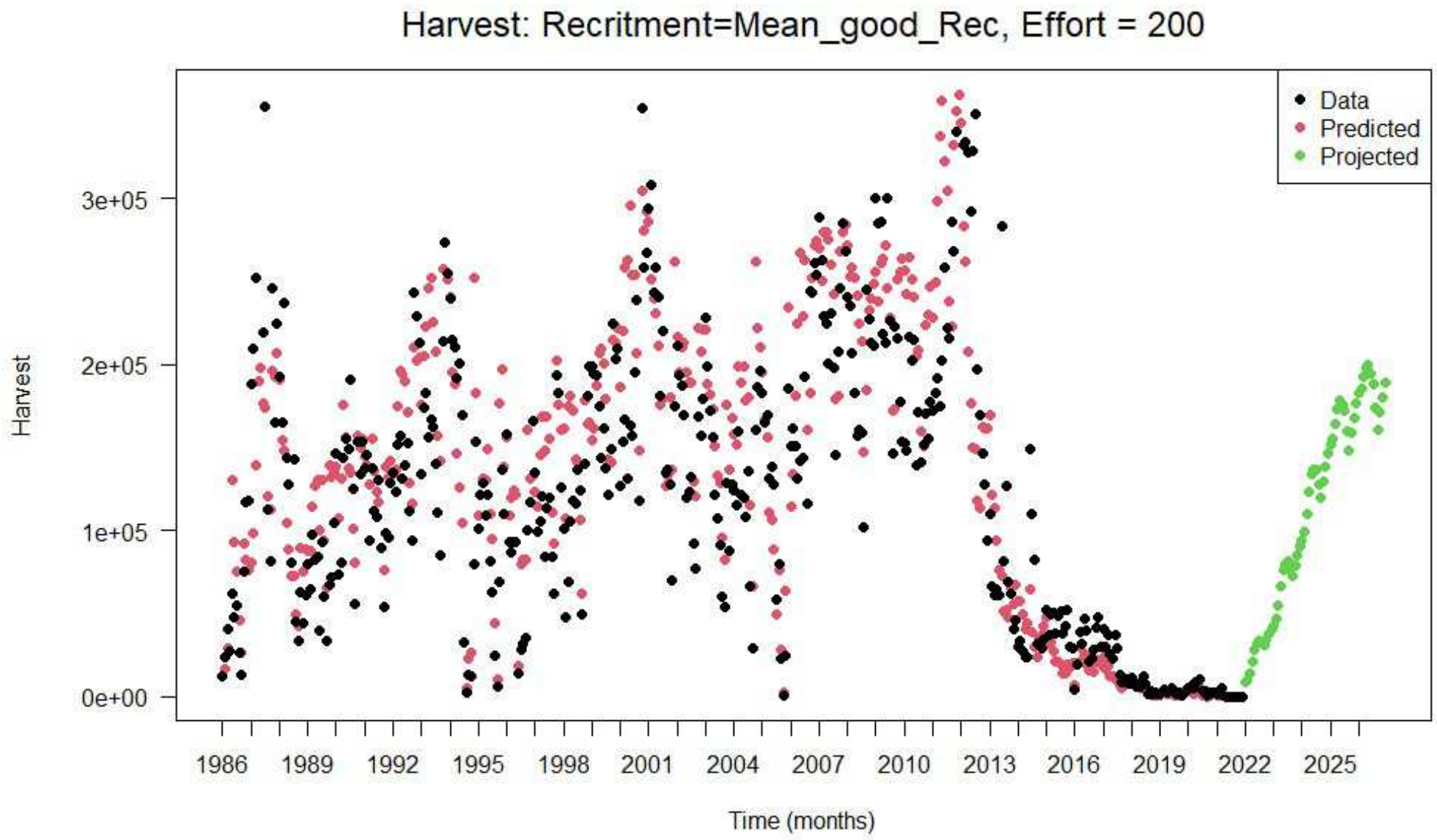

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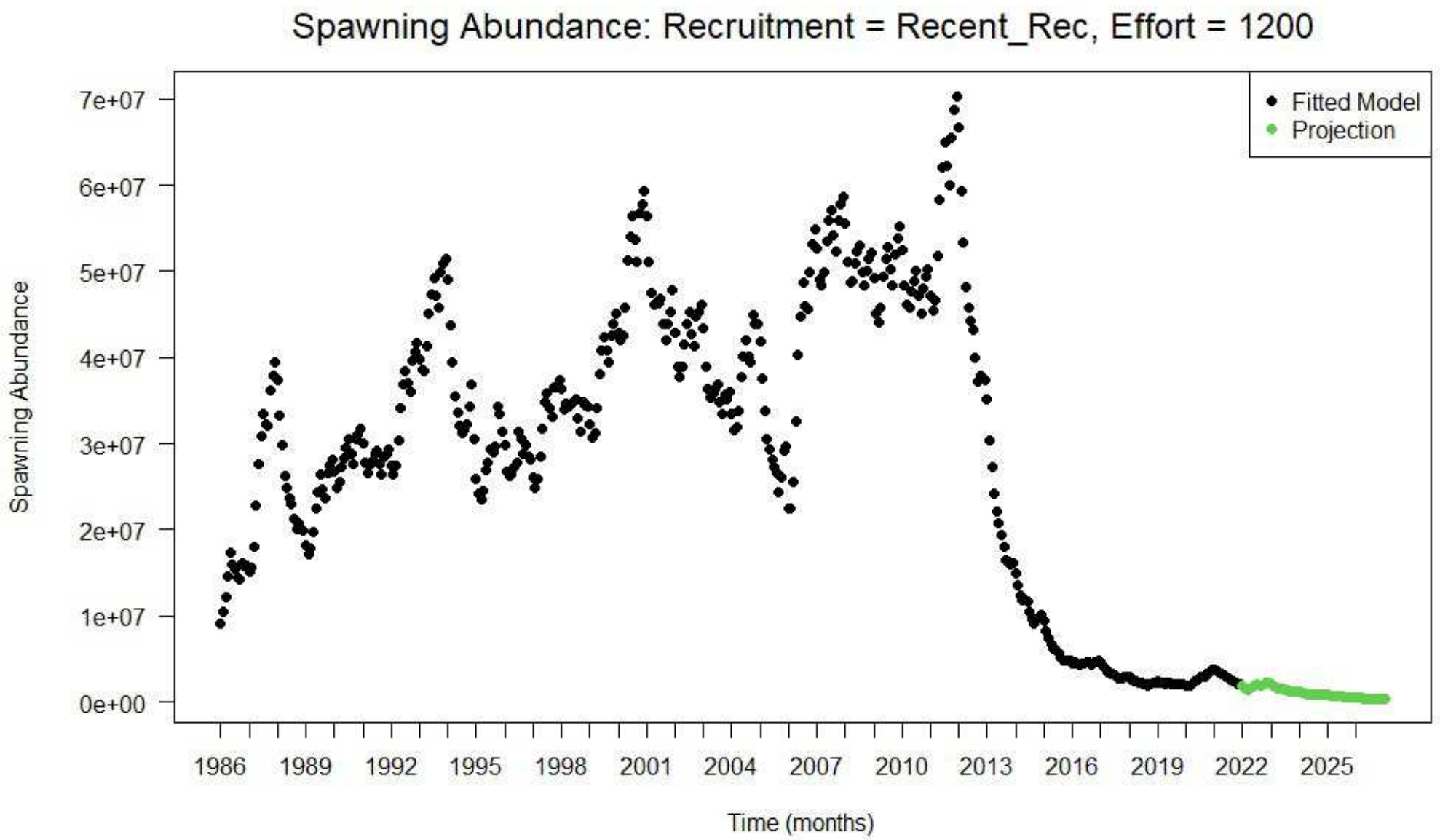

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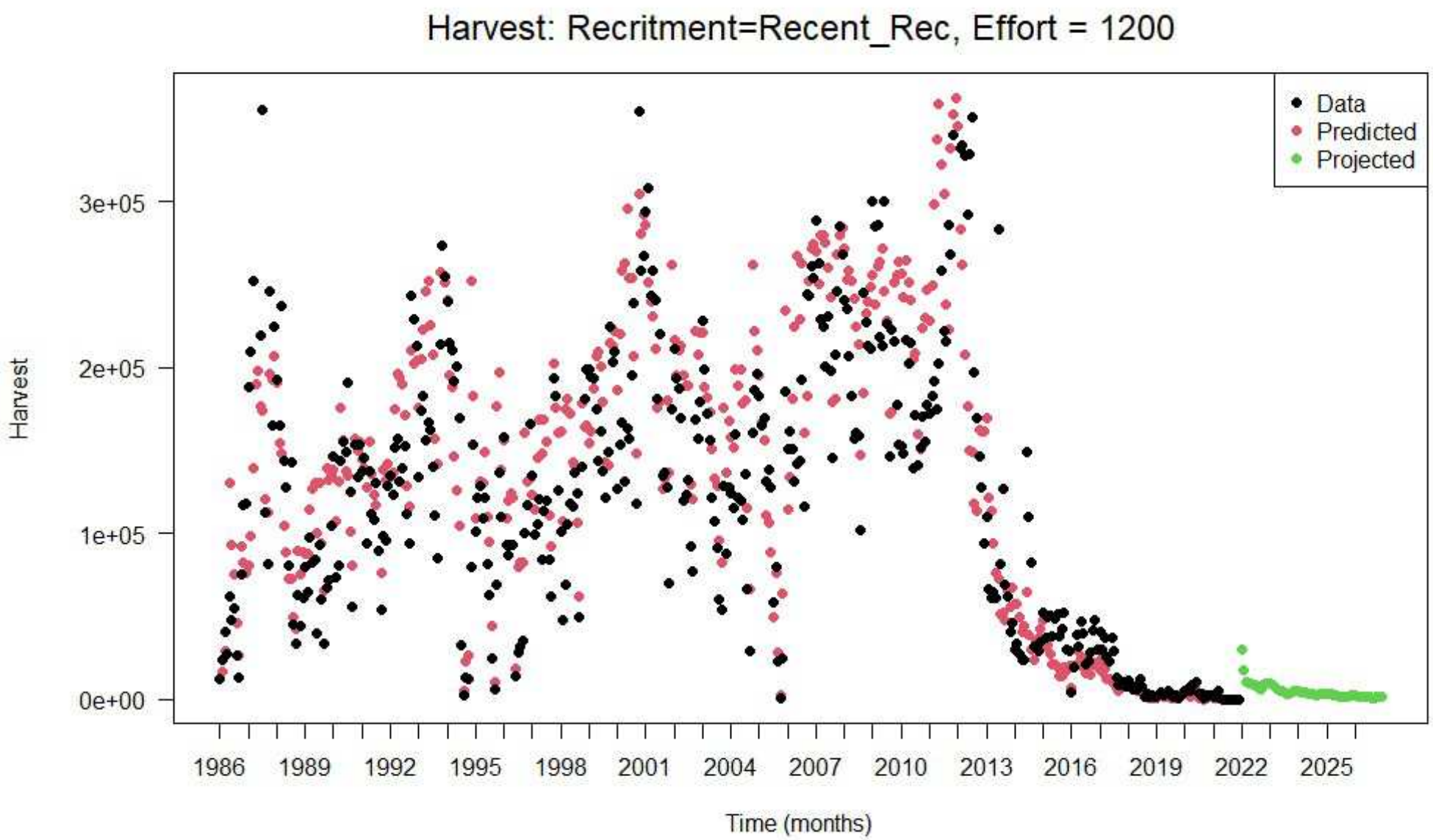

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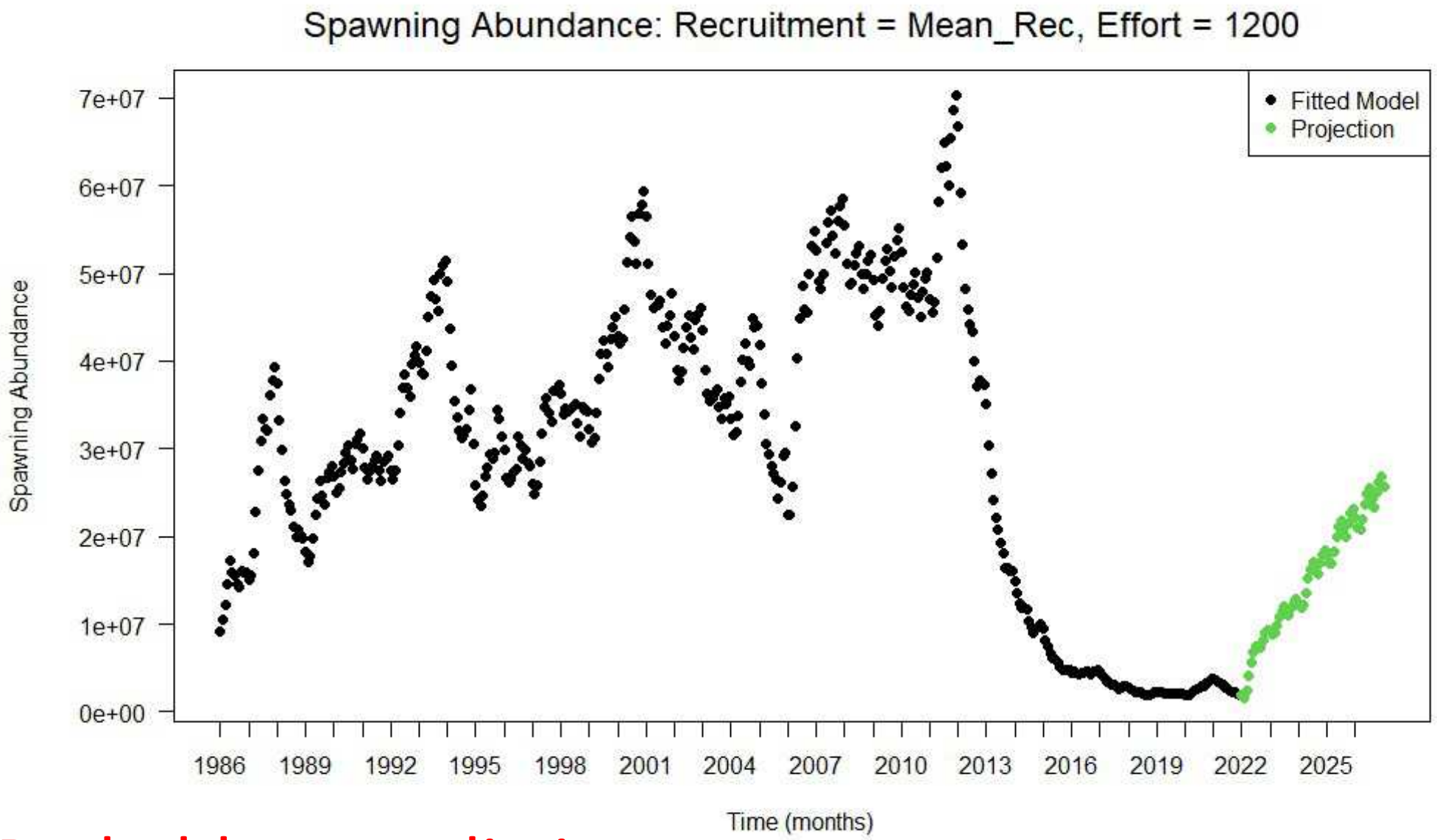

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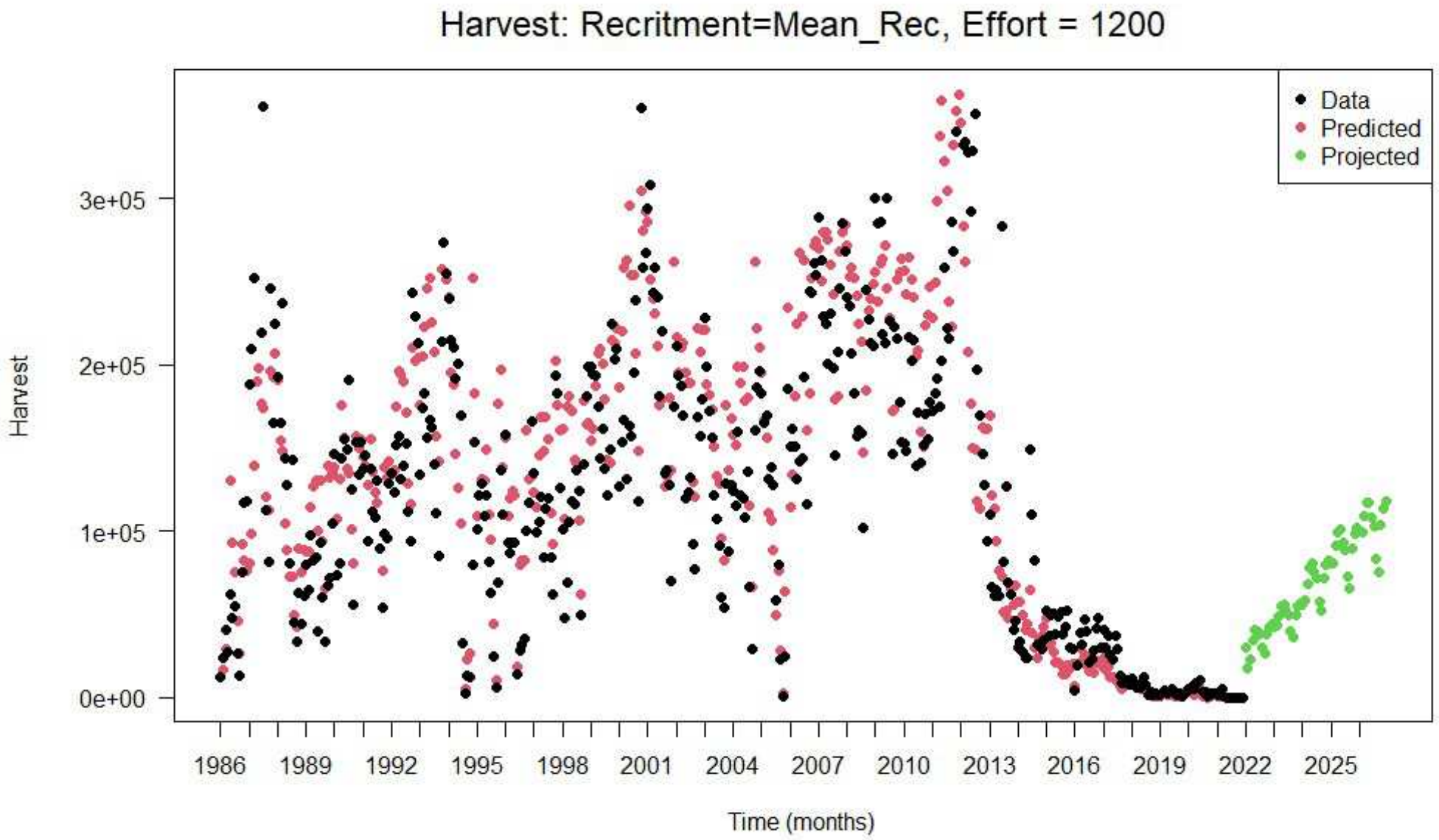

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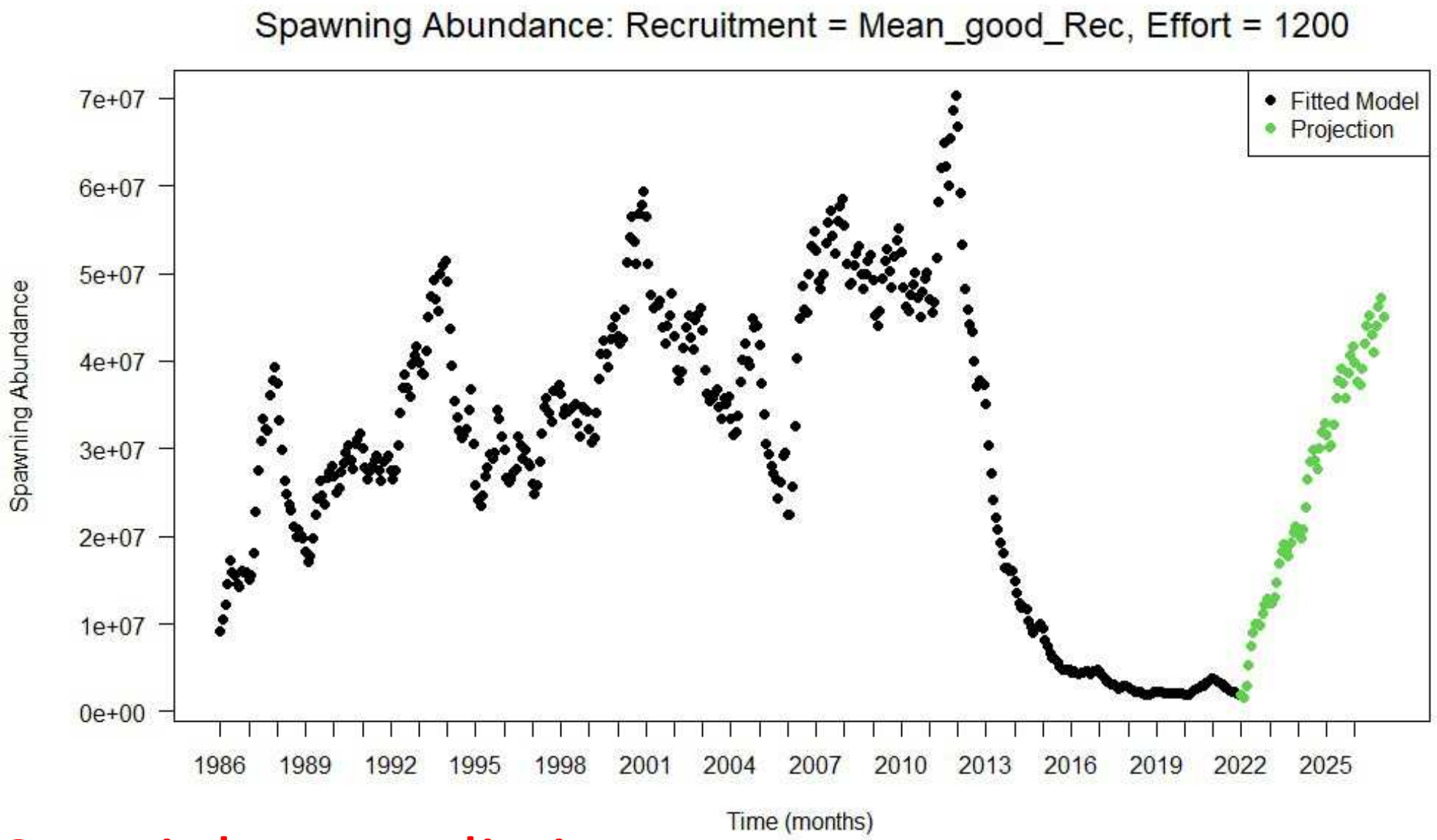

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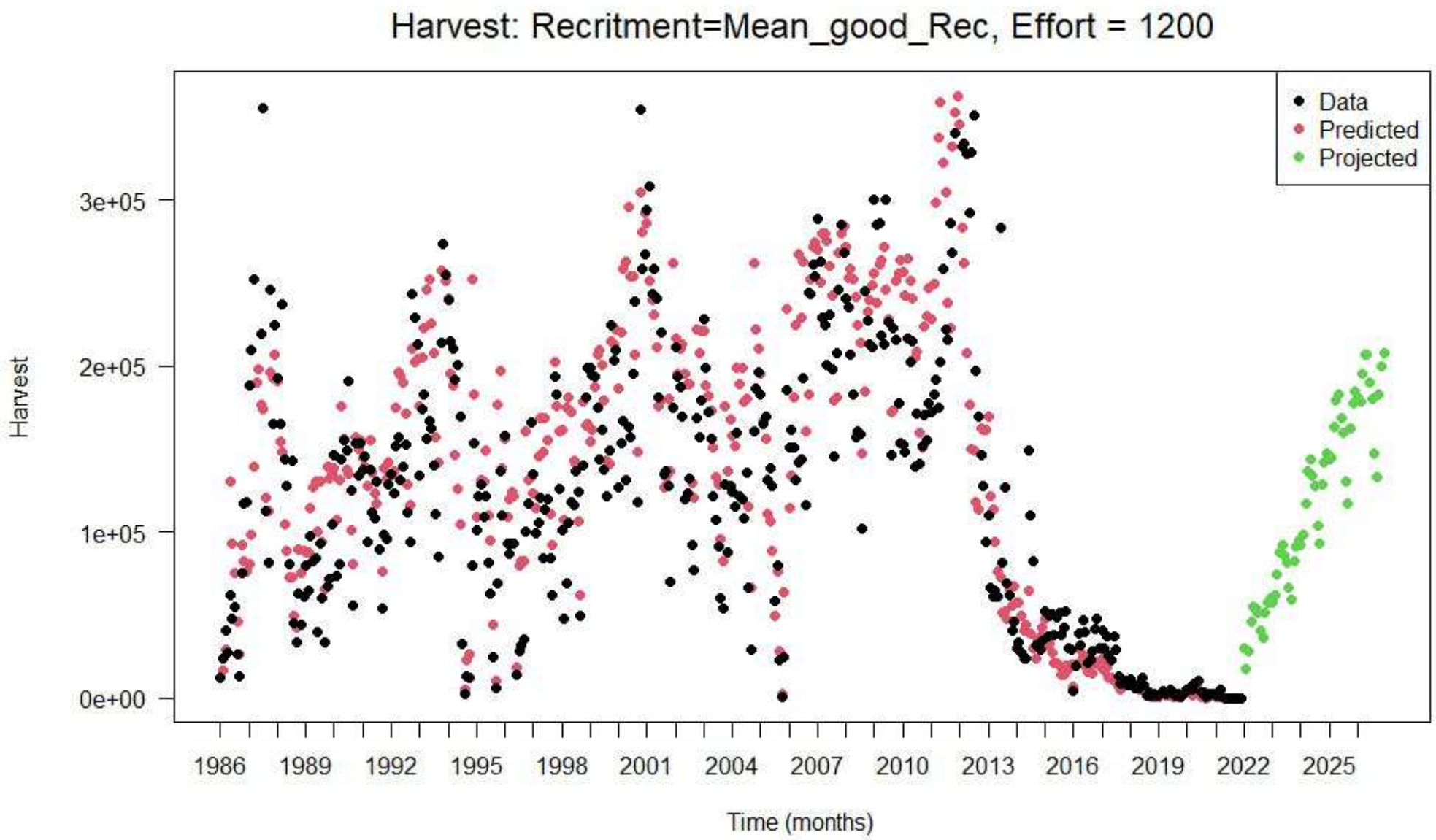

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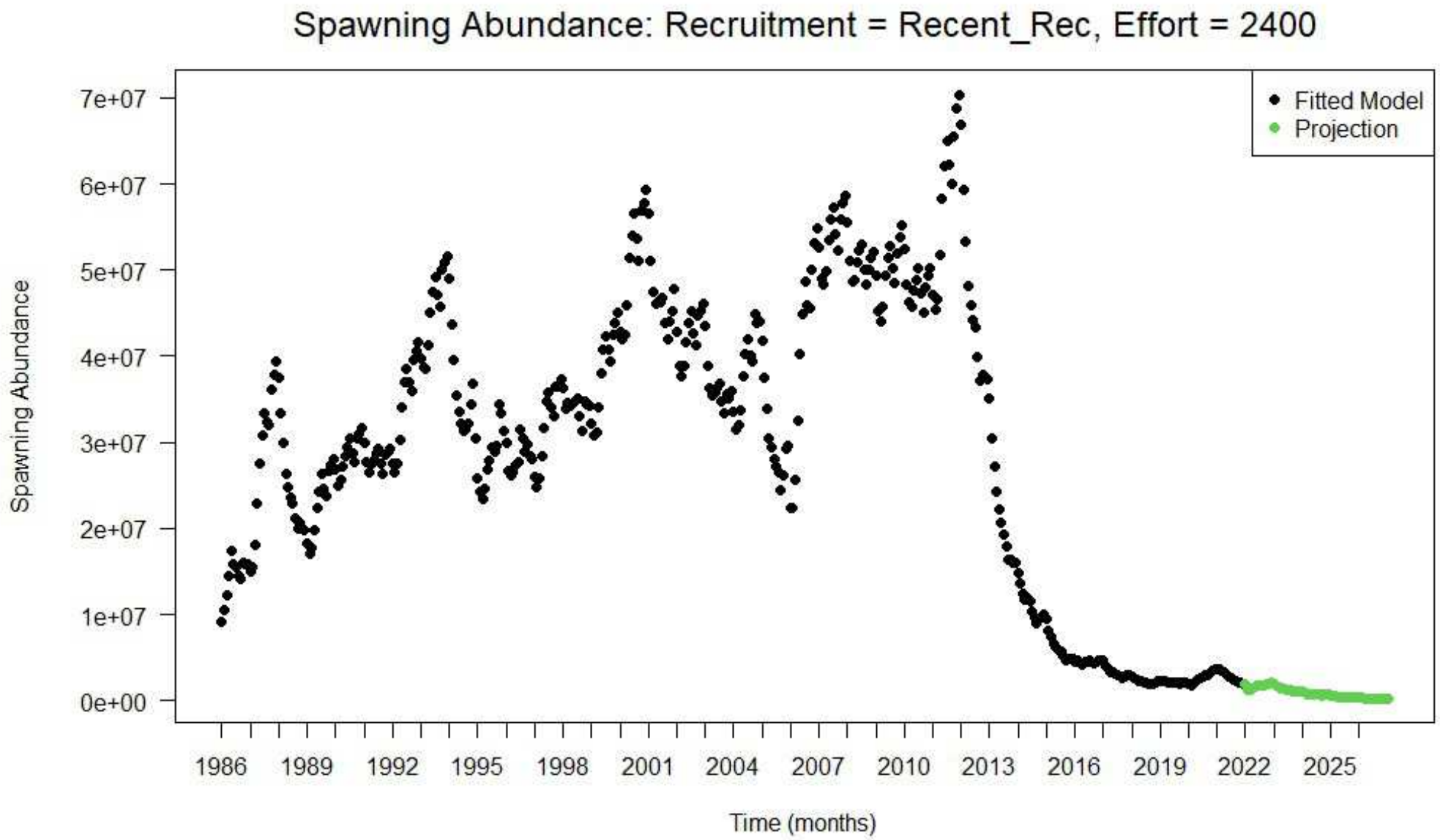

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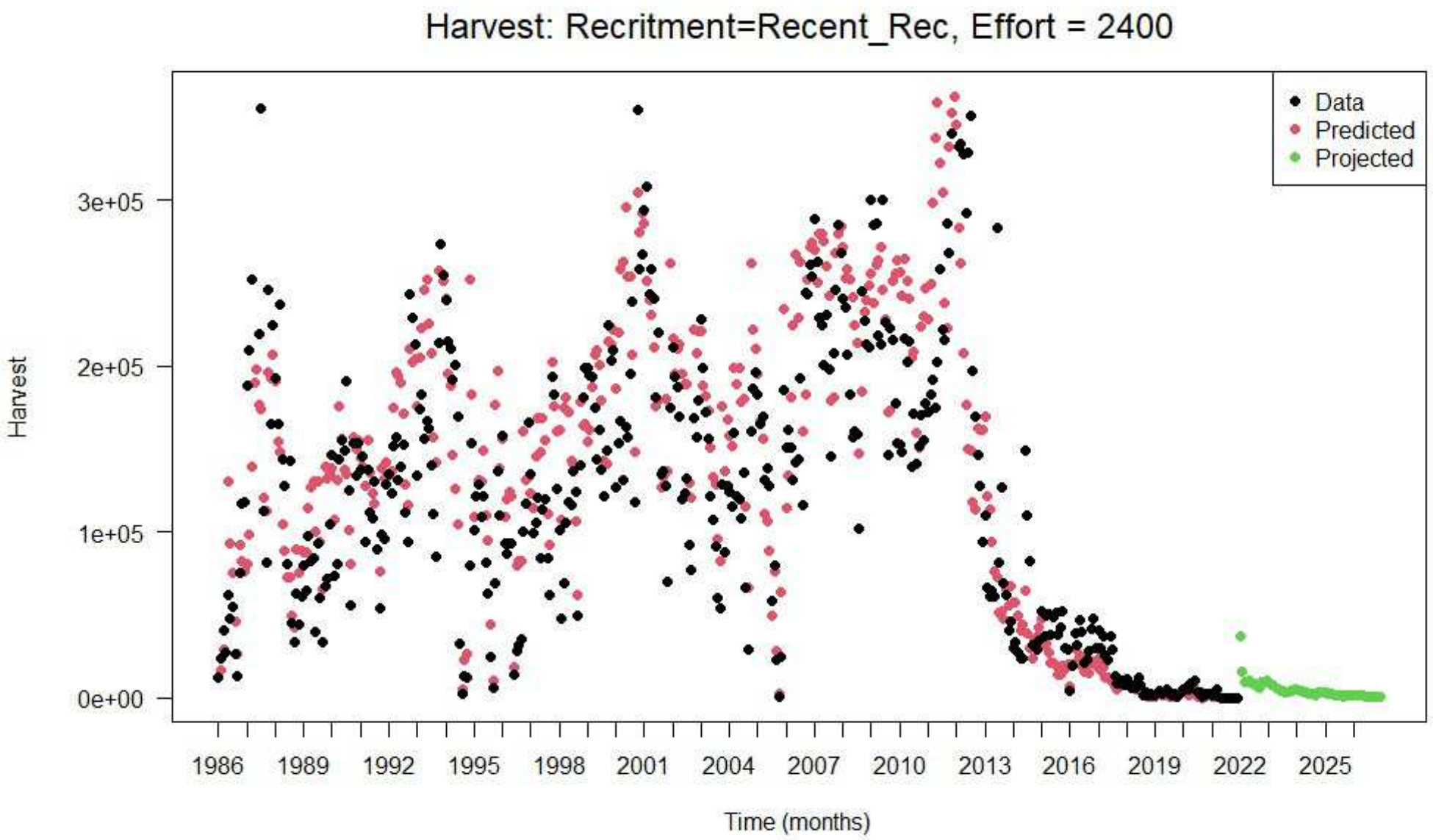

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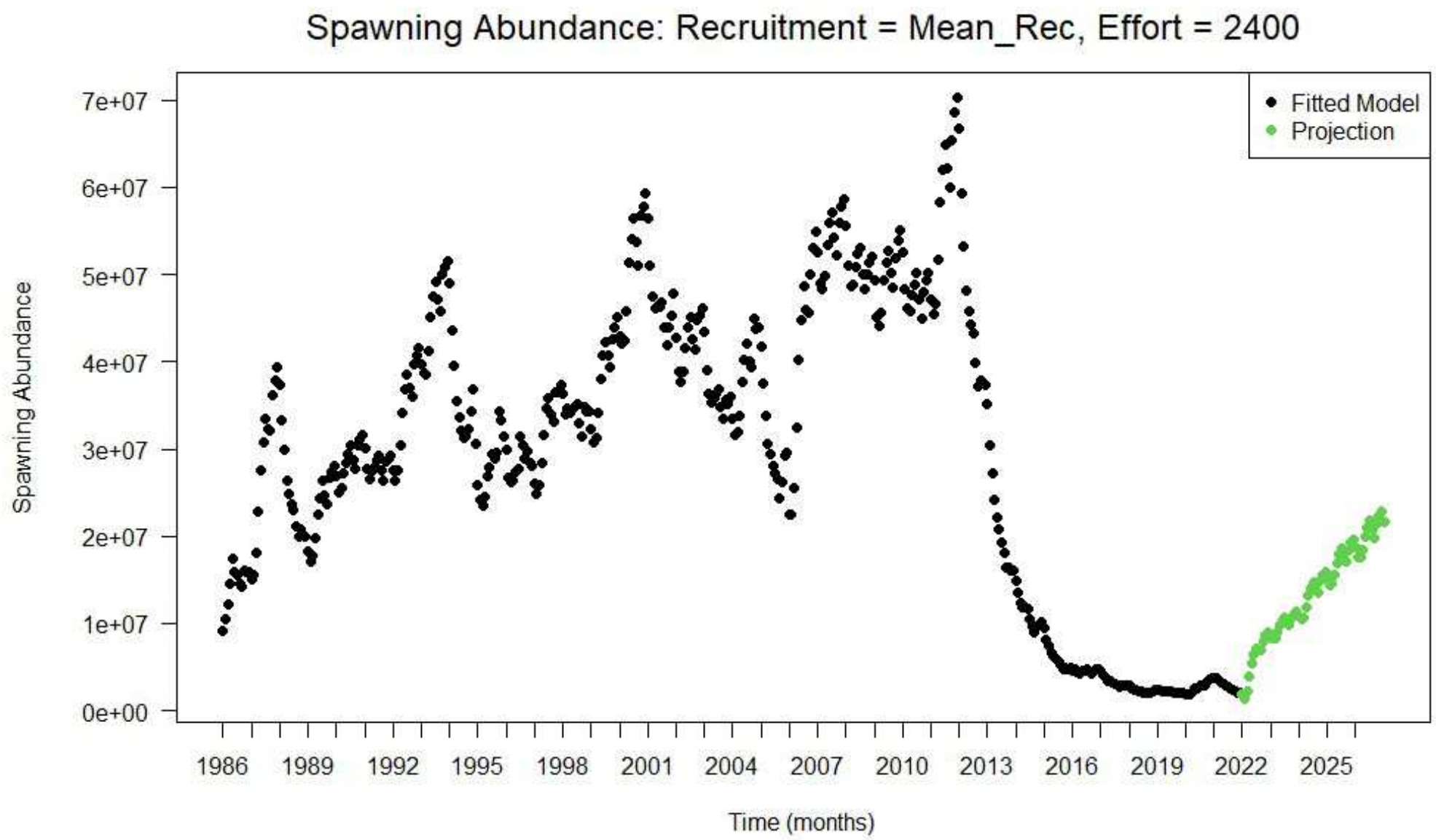

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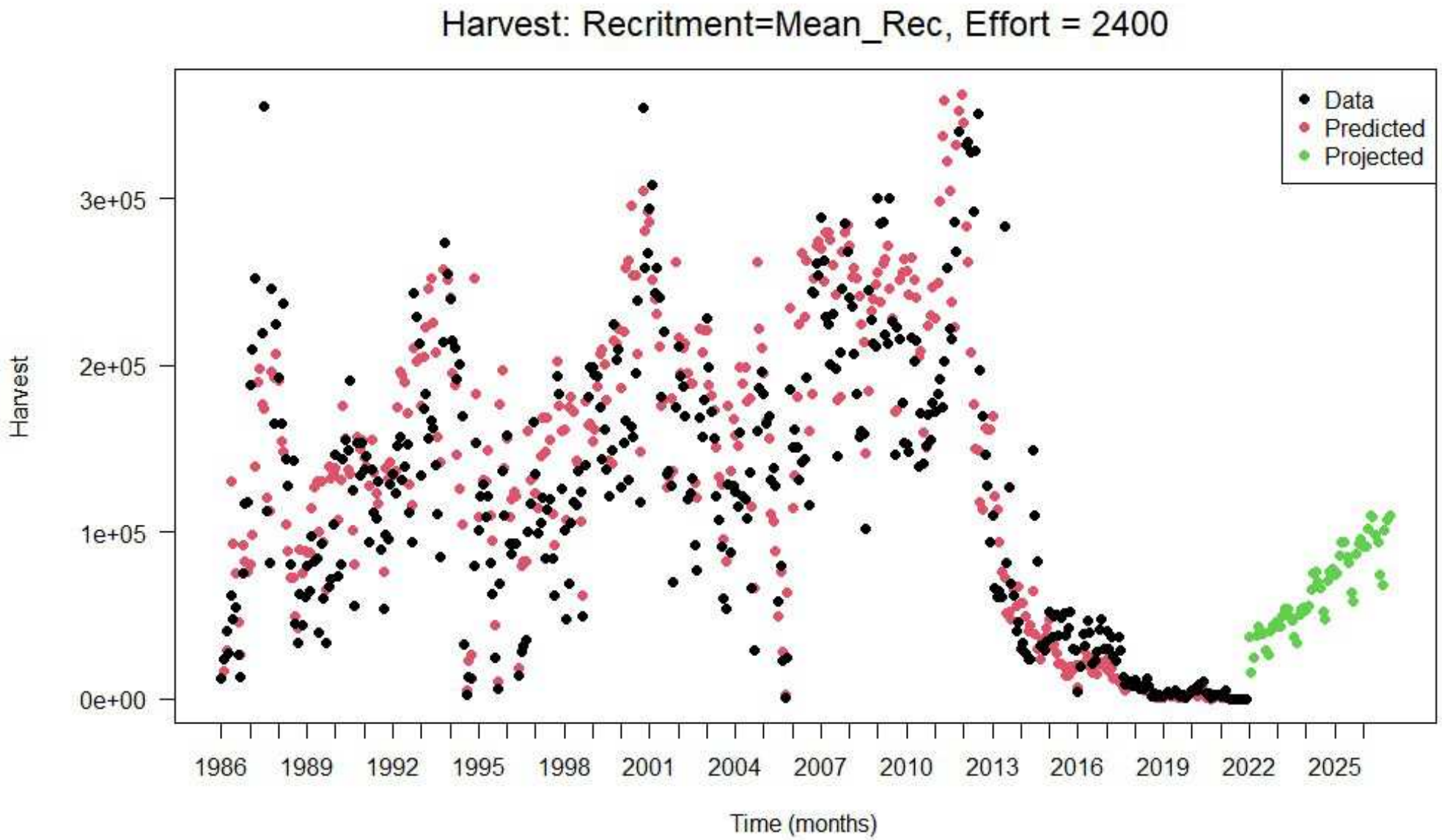

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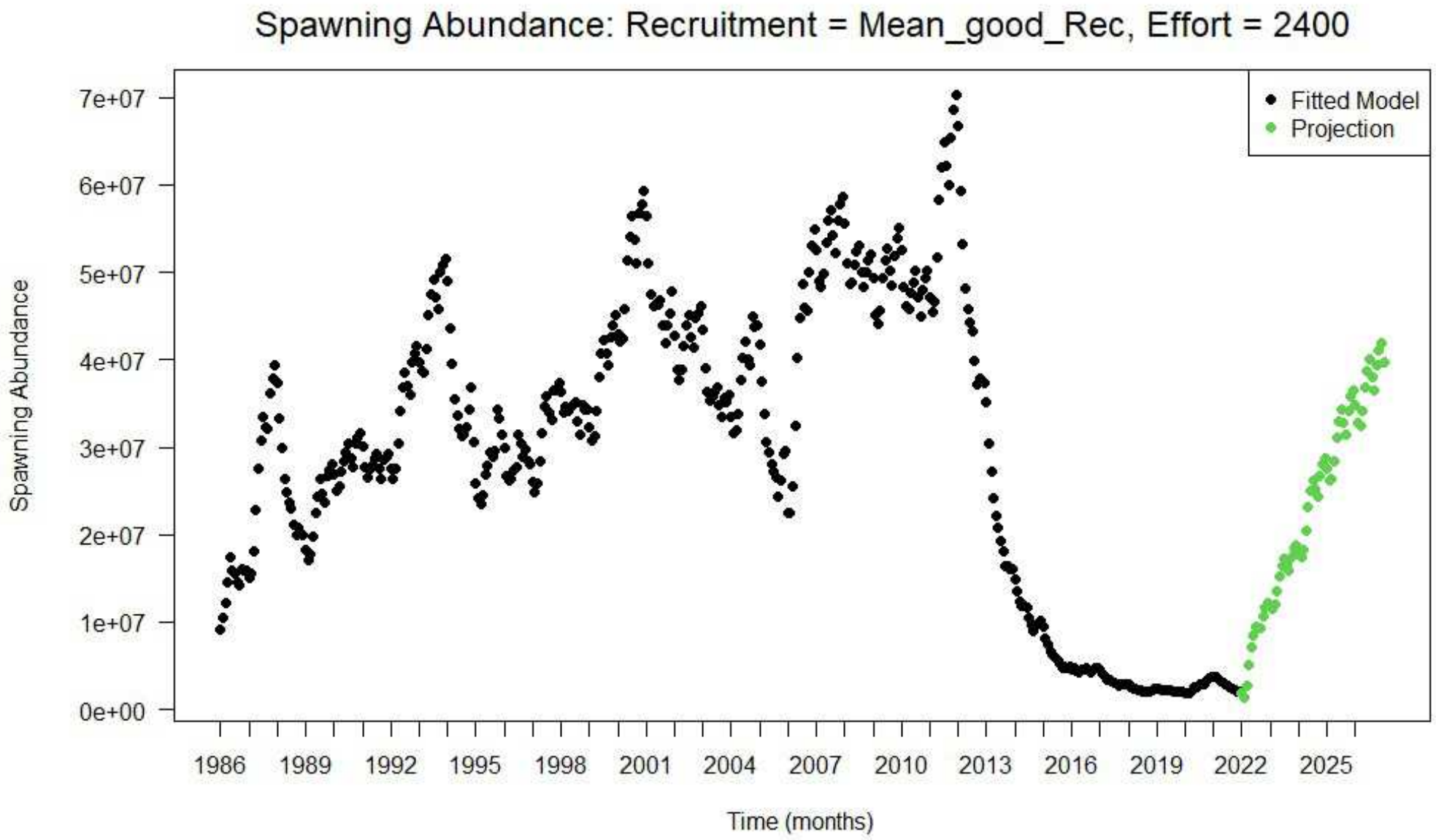

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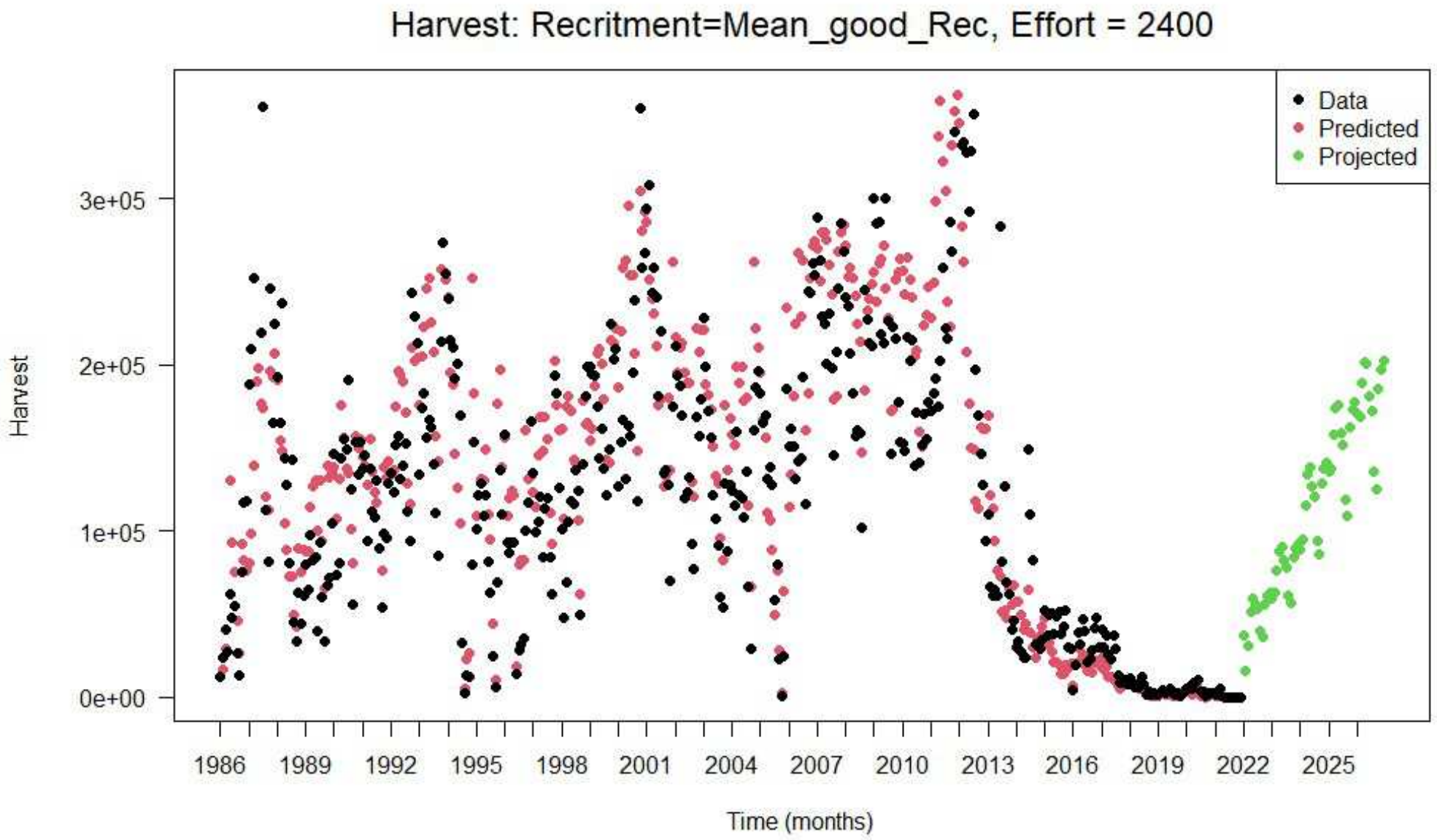


Certainly unrealistic

Catch at Size Assessment model—Projections

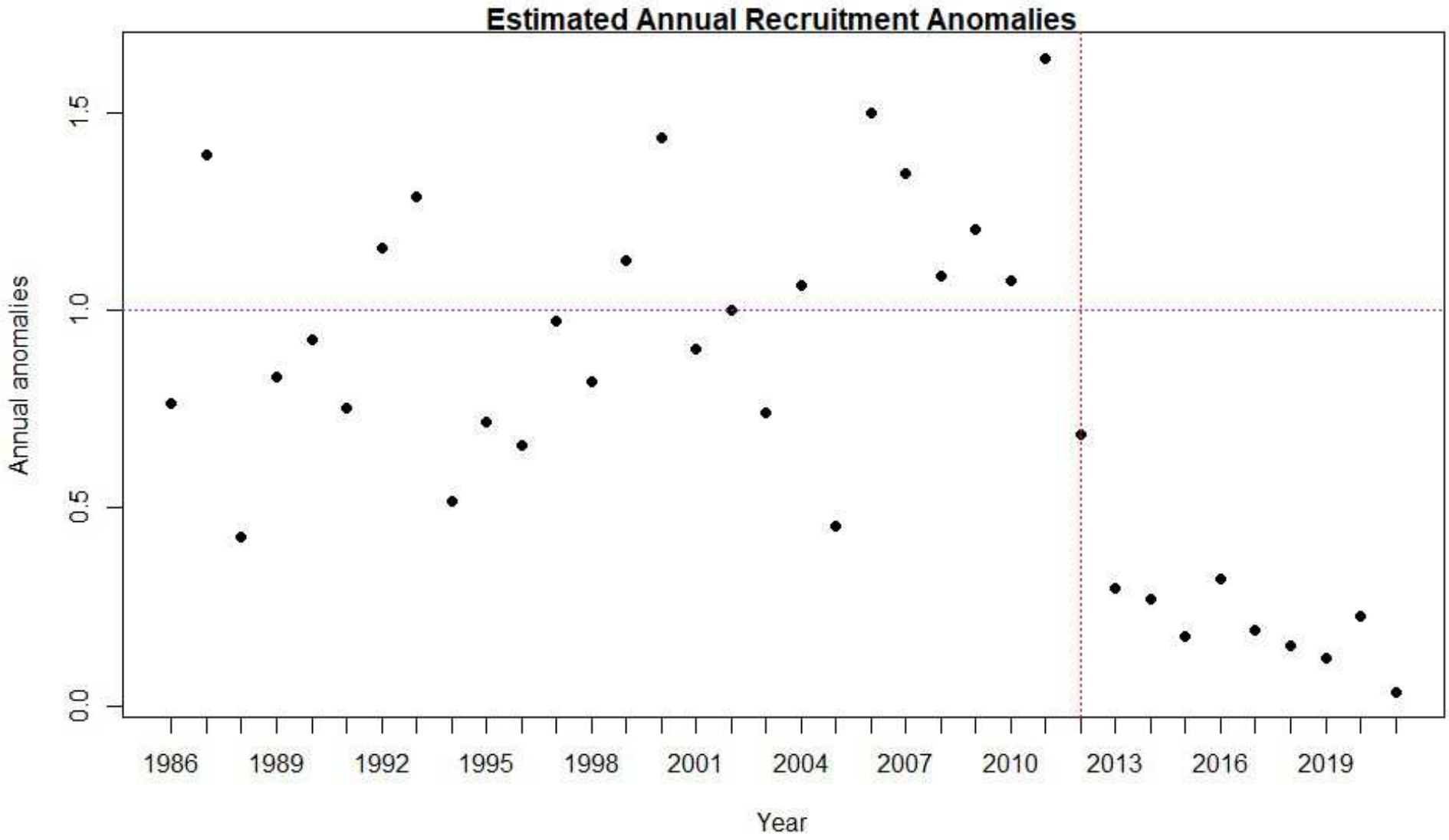
- If recruitment remains similar to how it's been, there is no recovery.
- If recruitment recovers to average levels, there will be a recovery and a meaningful fishery
- This is the same result as Pine et a. 2015 which was shown to (some of) you in 2013.
- Recruitment remained low, and the fishery and population collapsed further

Caveats and notes on these results

- Fisheries model, not explicitly accounting for shell dynamics.

- We have not yet succeeded with empirically estimating shell dynamics with these models. BUT there are some indications something concerning is going on with recruitment

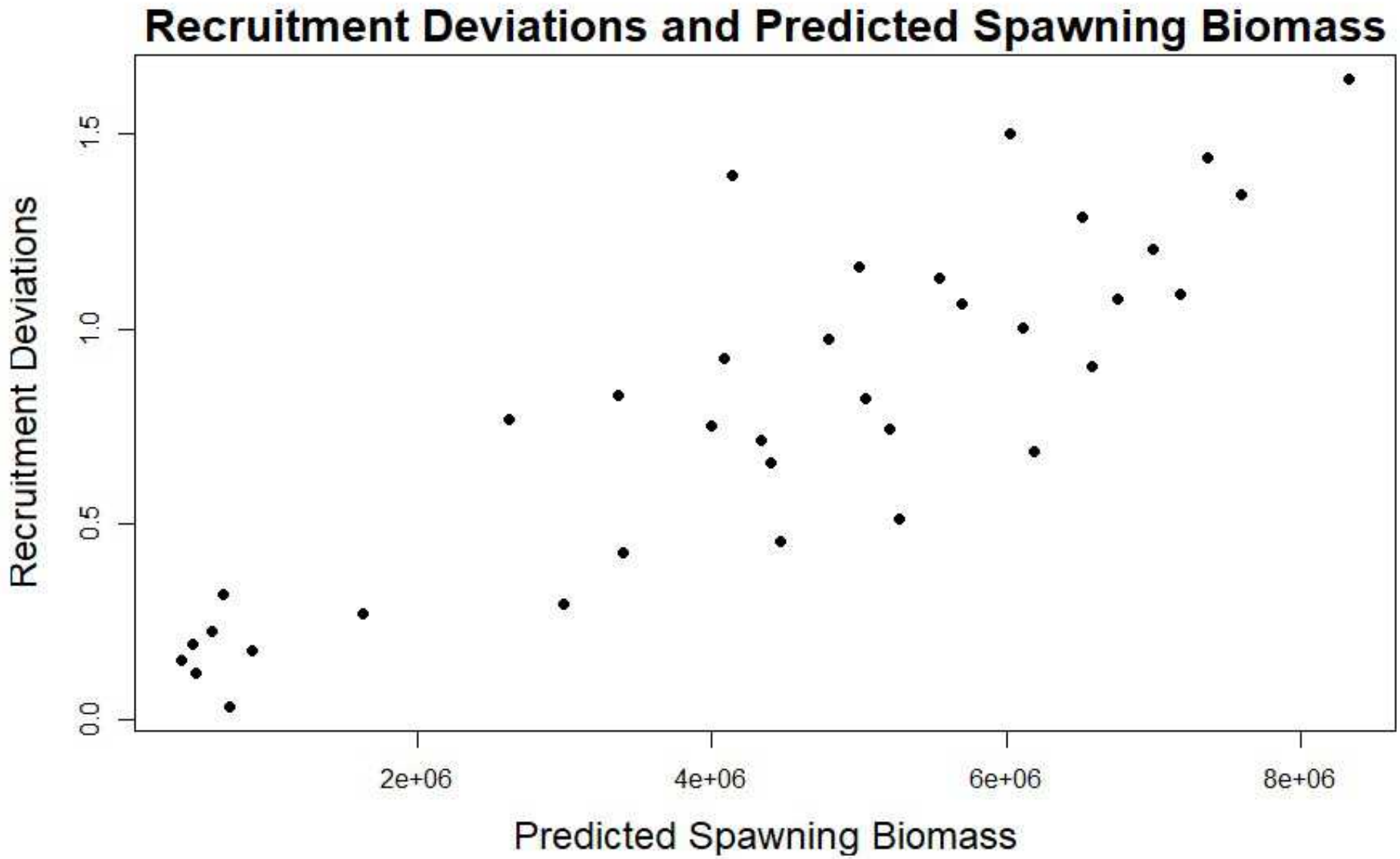
Caveats and notes on these results



Usually recruitment deviations are expected to be random.

Post-2012 deviations do not ***appear*** to be random.

Caveats and notes on these results



This is a disturbing pattern…

Caveats and notes on these results

- Evidence is at least compatible with…
  - Decrease in survival of young oysters
  - Loss of recruitment habitat?
  - Change in ecosystem (pred/prey)?
  - Shift in way oyster system functions
- We do not know for sure.

Implications for CAB work

- I think low recruitment is much more likely because it is what we are seeing
- Assuming low recruitment will not make interesting explorations of mgmt. strategies (no oysters = no fishery)
- Assuming greater recruitment probably unrealistic, but it will afford us more interesting conversations about mgmt. strategies.

Discussion on this

- How do we move forward to assess different mgmt. options without further raising unrealistic expectations?


Questions and concerns
edvcamp@ufl.edu