Intrinsic growth results

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2/27/2021

1. Scenarios

In this section, we test how grouping stocks by their intrinsic growth (r) affect the profits, biomass and effort allocation. We are considering 3 species/fish have a low growth (r=0.1), and 2 species/fish with high growth (r = 0.4) at time zero.

We considered 3 arrangement for the quota baskets:
- *Species with similar r:* we have a QB of low r and a group of high r.
- *The normal r species predominates in a basket:* we have a QB were the “low r” species predominates (2 low r and 1 high r), and the other basket has the remaining species (1 low r and 1 high r).
- *The high r species predominates in a basket:*we have a QB were the “high r” species predominates (1 low r and 2 high r), and the other basket has the remaining species (2 low r).

We are going to compare these arrangements in terms of biomass, efforts, ant total profits.

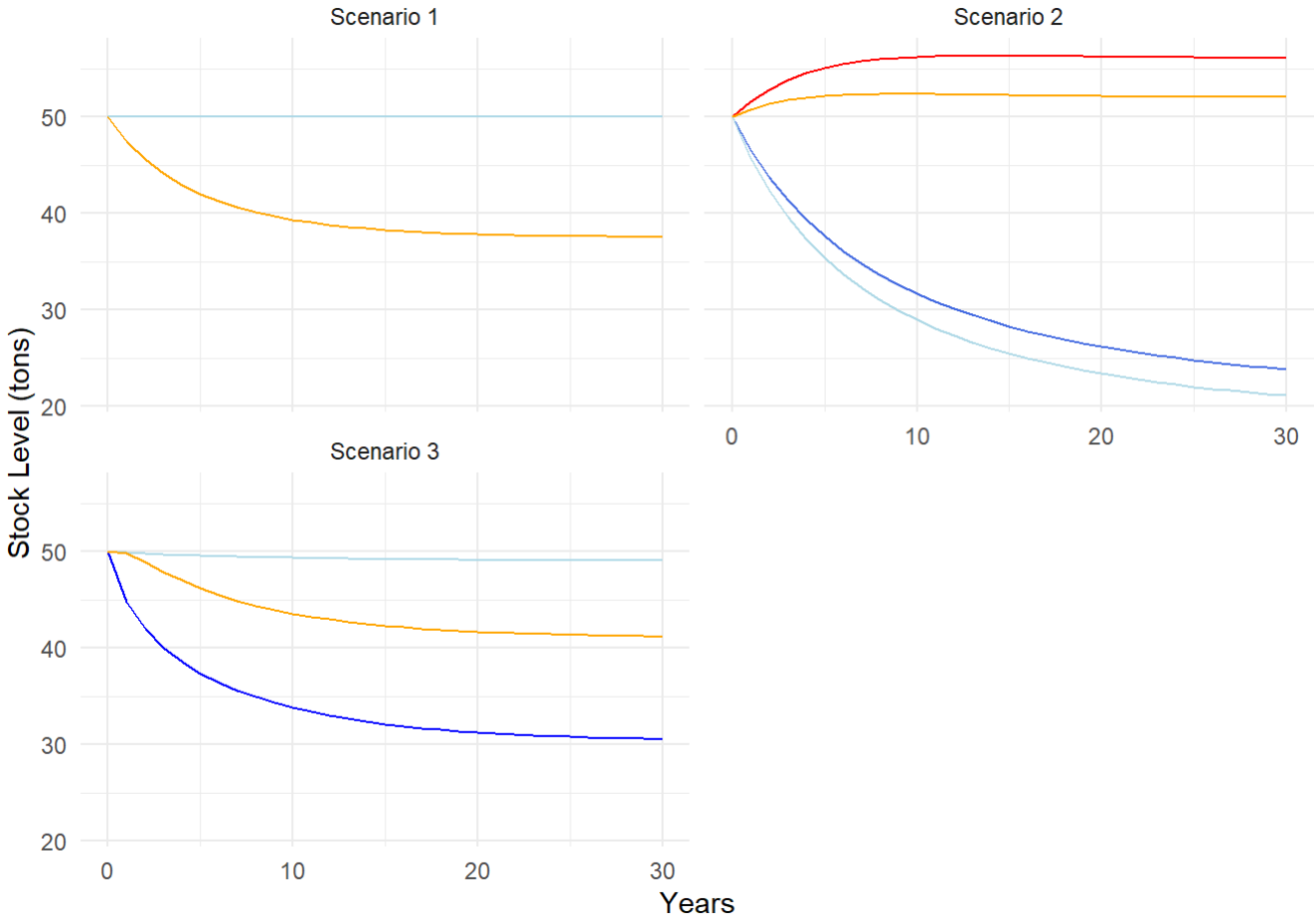
1.1 Parameters

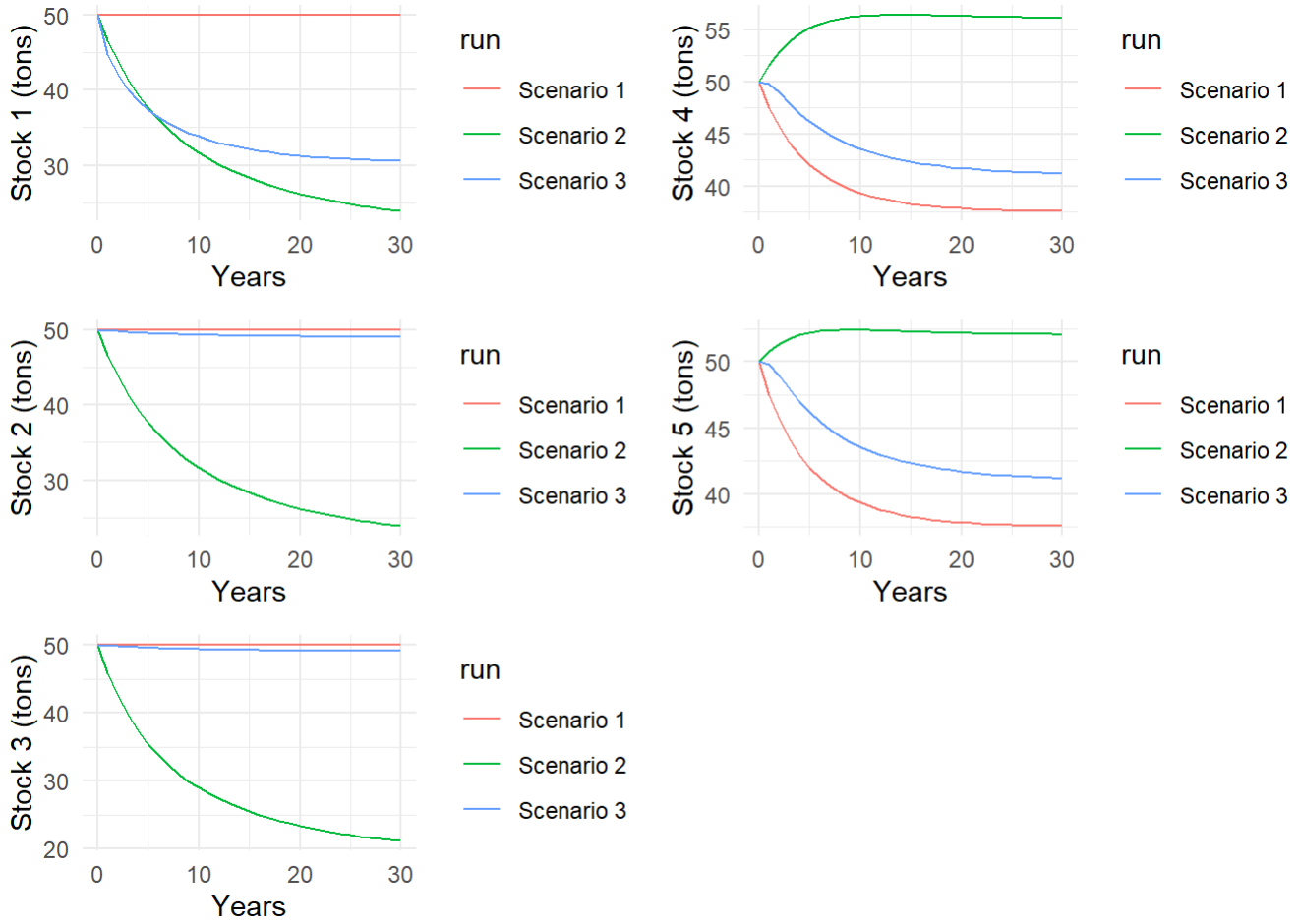
Species	r	K	Starting stock (X)	price
1	0.2	100	50	20
2	0.2	100	50	20
3	0.2	100	50	20
4	0.4	100	50	20
5	0.4	100	50	20

Tech	q1	q2	q3	q4	q5	cost
1	0.04	0.01	0.01	0.01	0.01	1
2	0.01	0.04	0.01	0.01	0.01	1
3	0.01	0.01	0.04	0.01	0.01	1
4	0.01	0.01	0.01	0.04	0.01	1
5	0.01	0.01	0.01	0.01	0.04	1

2. Biomass

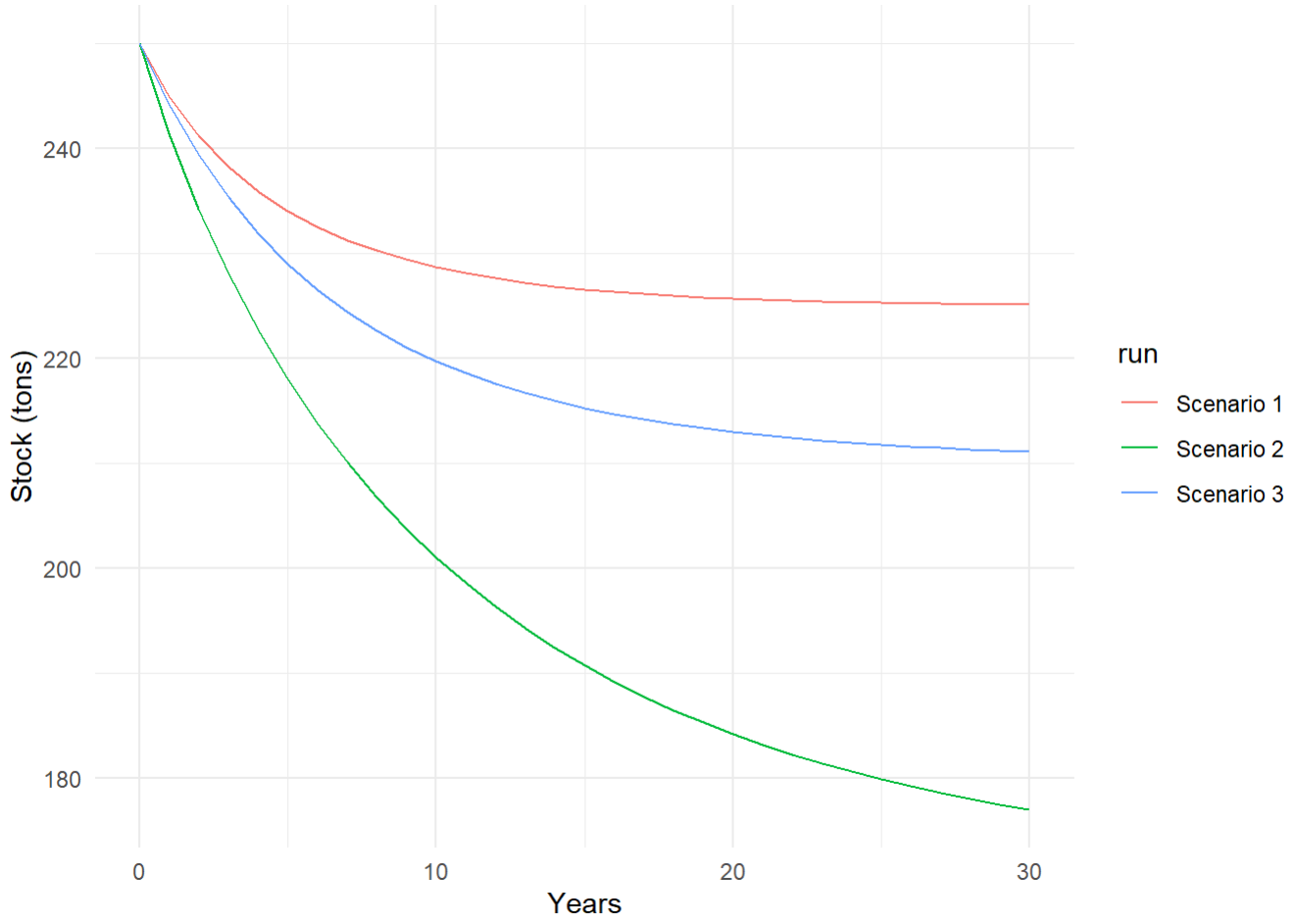
2.1 Biomass per species


Scenario 1
Scenario 2
Scenario 3
Stock Level (tons)
Years
50
40
30
20
0
10
20
30



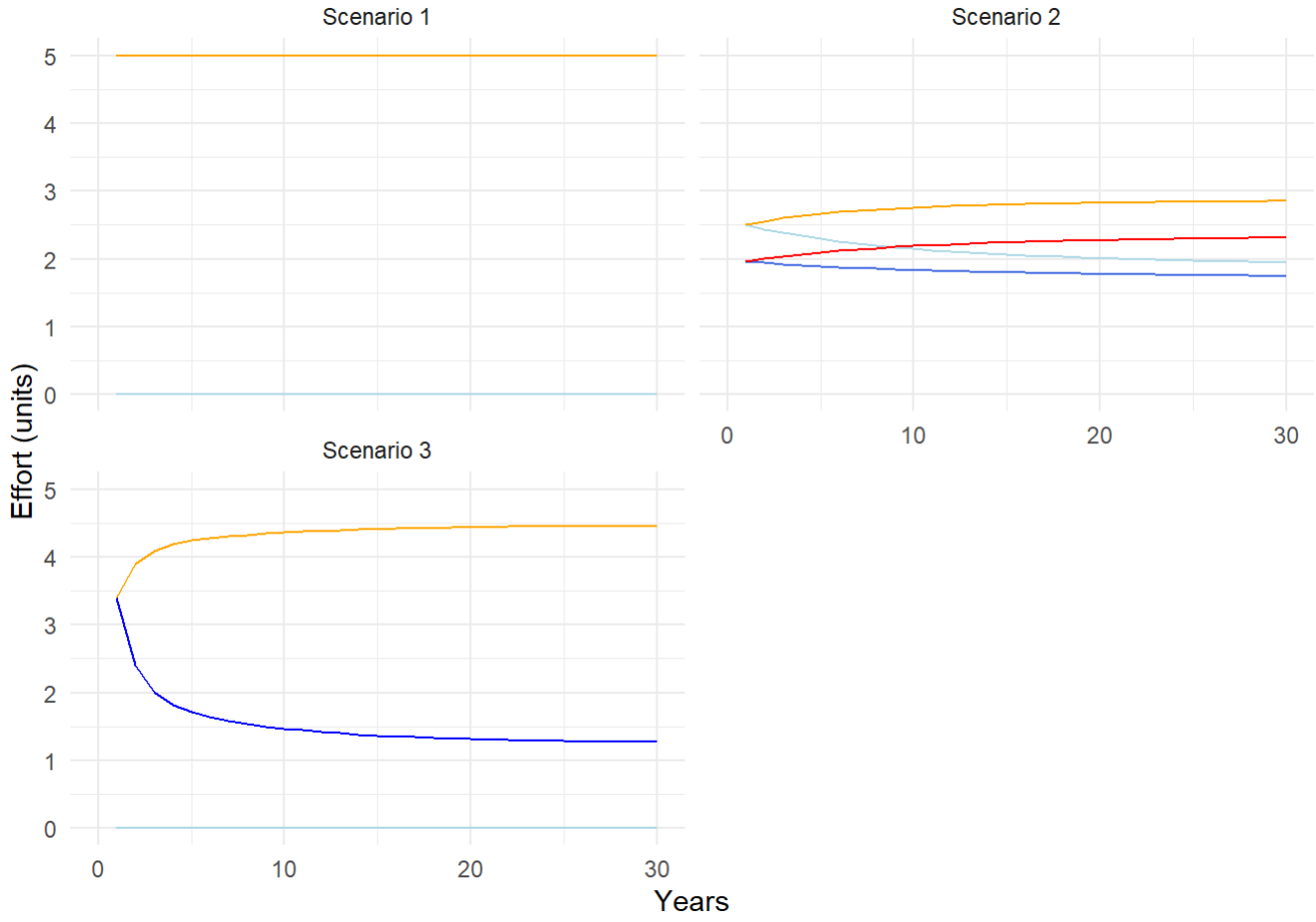
- The low r species display a stable stock when they are part of quota baskets without high r species.
- The high r species display a descending stock when they are part of quota baskets without low r species.
- The high r species have a more stable stock over time in basket dominated by low r species, however the stocks of the low r species are diminishing over time.

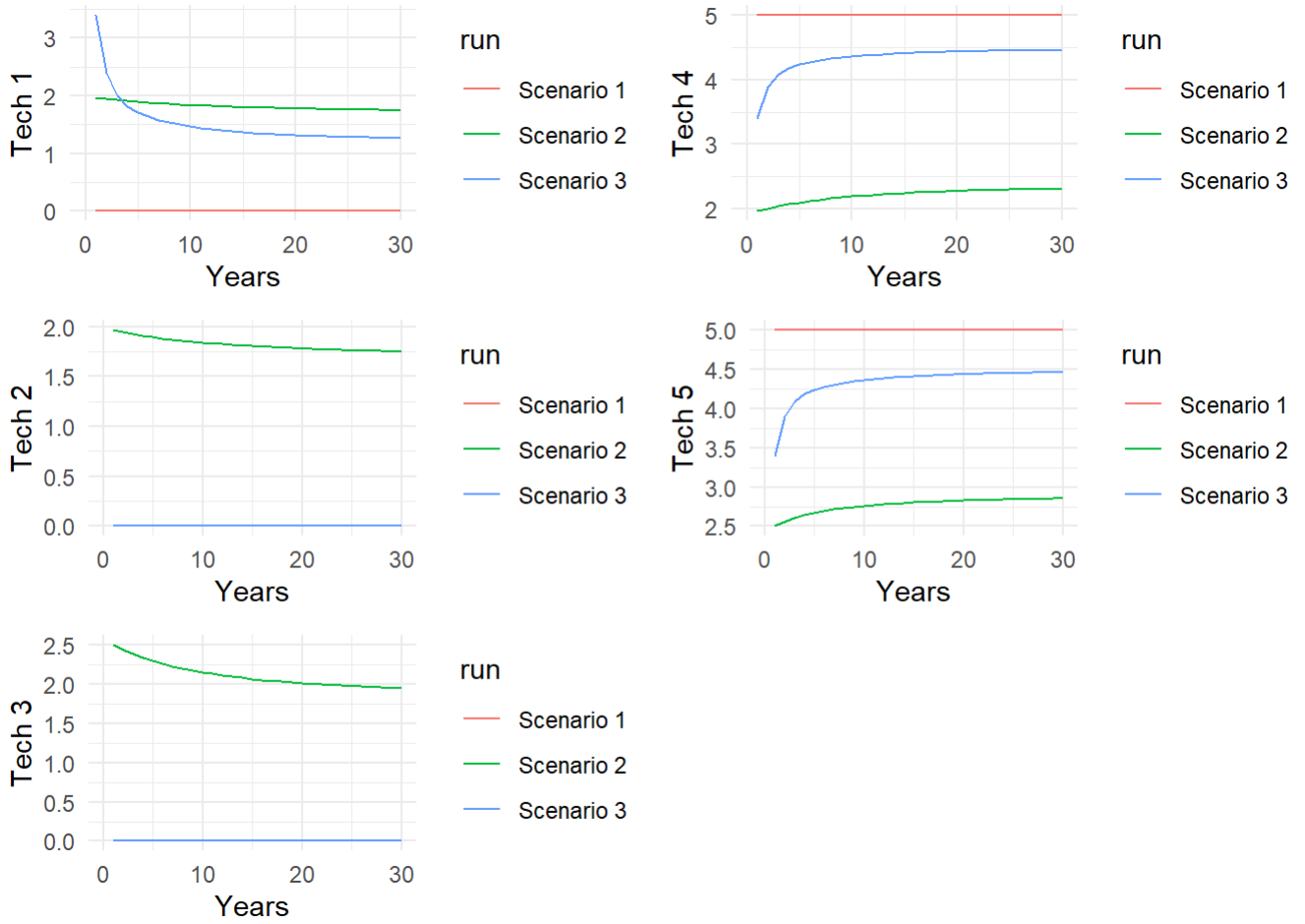
2.2 Total biomass in the ocean



- Despite the better results for high r species, scenario 2 provides the worst results in stock.
- Grouping species with similar r seems more reasonable to enjoy stable stocks over time.

3. Effort

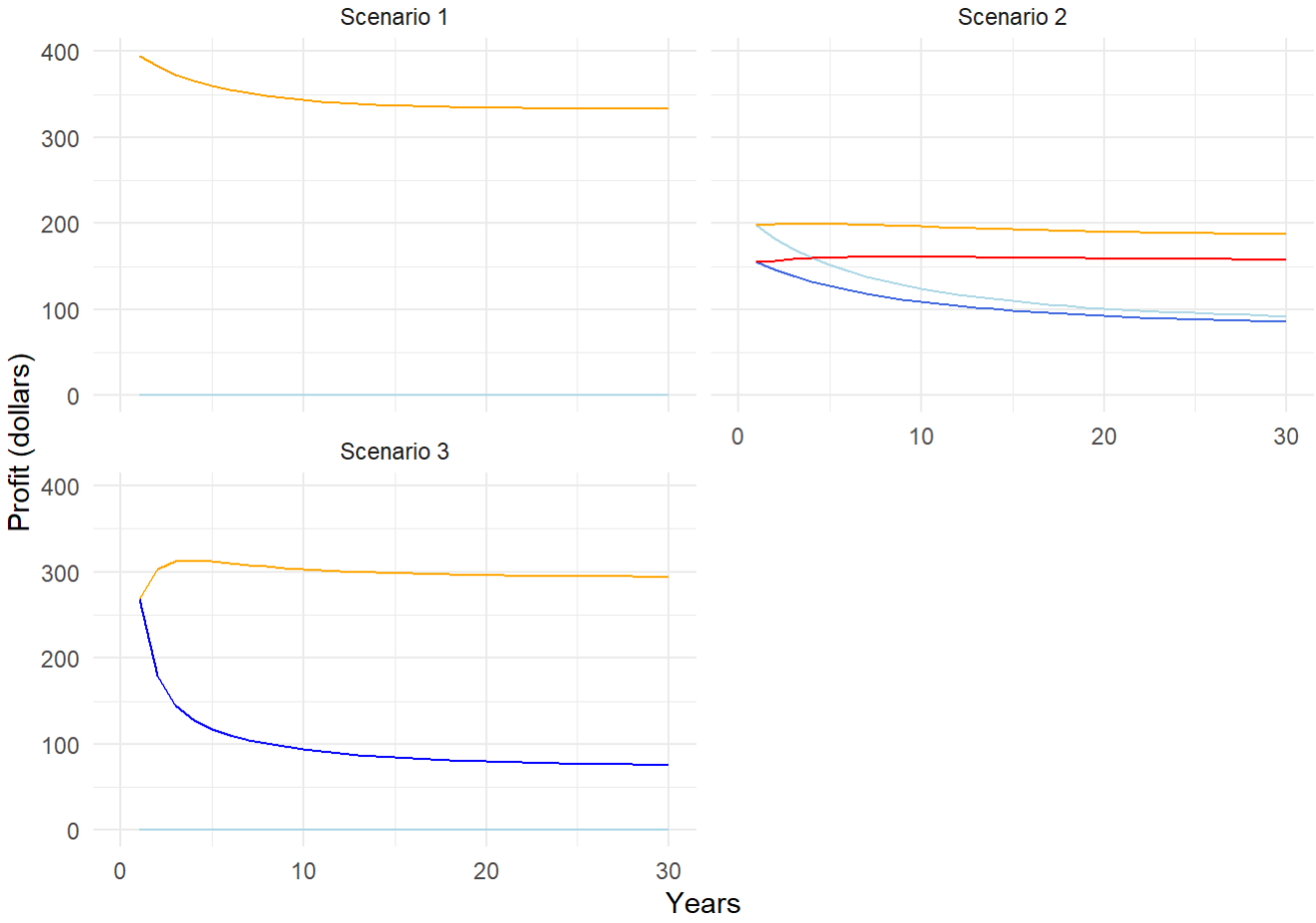

Scenario 1
Scenario 2
Scenario 3
Effort (units)
Years
0
10
20
30
0
1
2
3
4
5

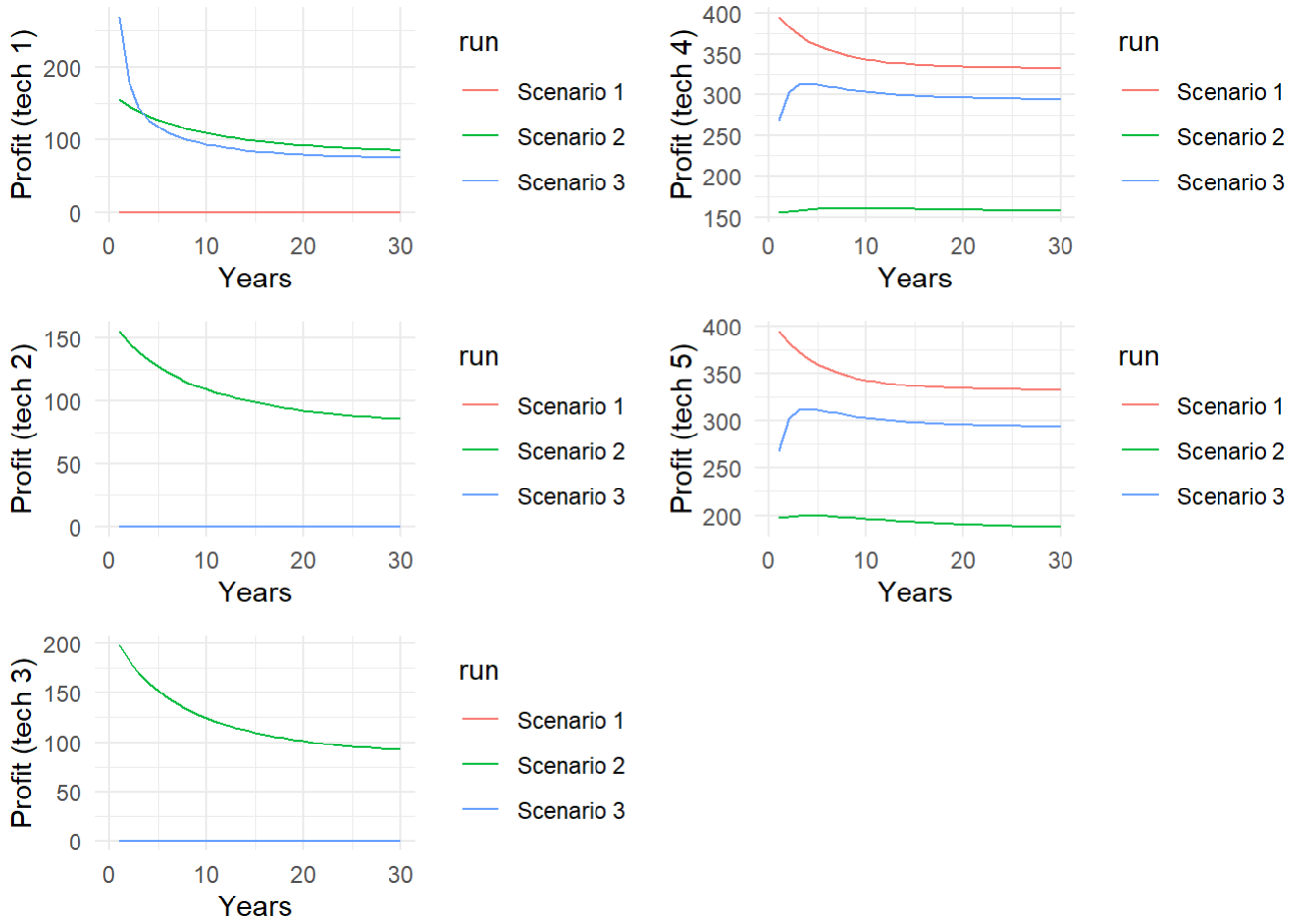

Tech 1
Tech 2
Tech 3
Tech 4
Tech 5
Years
run
Scenario 1
Scenario 2
Scenario 3

- In all the scenarios, the allocation favor the technologies that excel at harvesting high r species. The baskets dominated by high r species present **high mortality** (0.9).
- Baskets with only low r species display low allocations (0 in many years) on the technologies that are good at catching them.

4. Profit

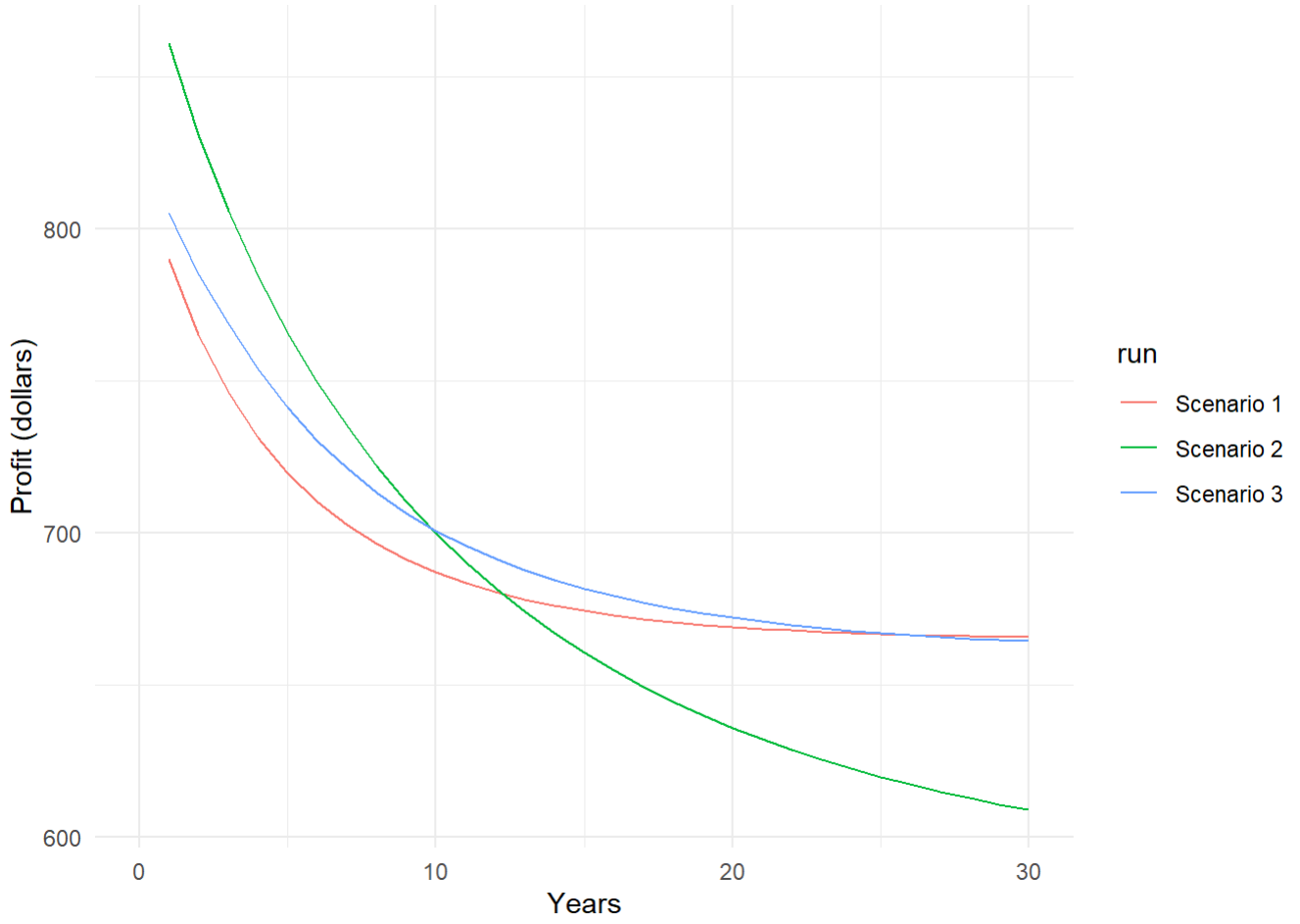
4.1 Profit per technology





- The low or zero efforts allocated in baskets with only low r species have null(or almost zero) profits in their best technologies.
- Profits are positive for the technologies good at catching high r species in all scenarios. The best results are for baskets dominated by high r species.

4.2 Total profit per scenario



- Over time, the baskets dominated by high r species provide better total profits results in the period of analysis.

5. Summary

Stocks

- The low r species display a stable stock when they are part of quota baskets without high r species.
- The high r species display a descending stock when they are part of quota baskets without low r species.
- The high r species have a more stable stock over time in basket dominated by low r species, however the stocks of the low r species are diminishing over time.
- Despite the better results for high r species, scenario 2 provides the worst results in stock.
- Grouping species with similar r seems more reasonable to enjoy stable stocks over time.

Effort

- In all the scenarios, the allocation favor the technologies that excel at harvesting high r species. The baskets dominated by high r species present **high mortality** (0.9).
- Baskets with only low r species display low allocations (0 in many years) on the technologies that are good at catching them.

Profit

- The low or zero efforts allocated in baskets with only low r species have null(or almost zero) profits in their best technologies.
- Profits are positive for the technologies good at catching high r species in all scenarios. The best results are for baskets dominated by high r species.
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