

Supplementary Materials for

**Exploring AI Performance In Dynamic Decision-Making:  
Case Study on Fishery Management**

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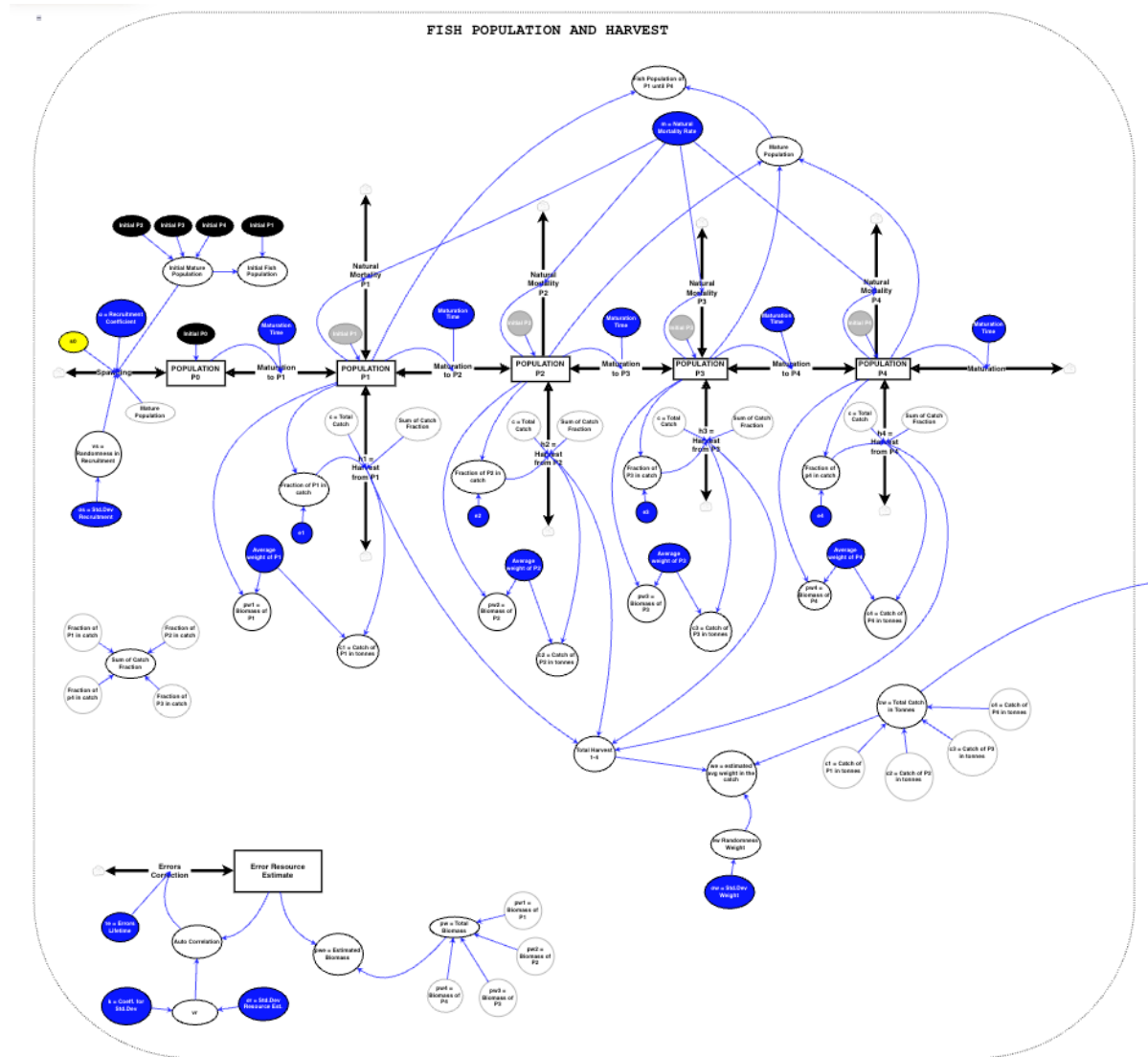
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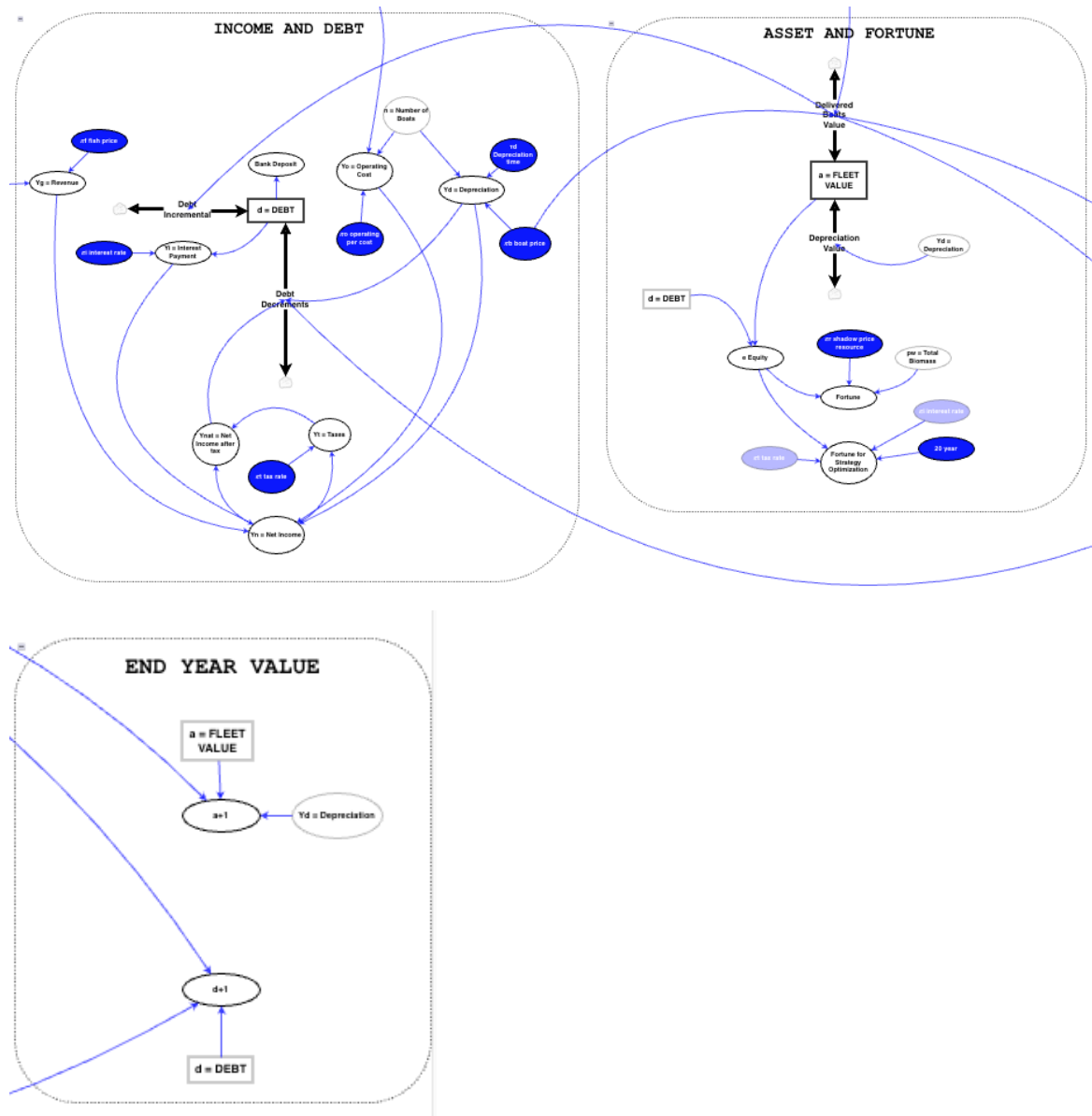
# 1. Stock-Flow Diagram

## 1.1 Fish Population and Harvest





### 1.3 Financial Sector



## 2. Model Documentation

Simulation Settings	Time Start: 0 Time Length: 20 Time Step: 0.25 Time Units: Years
<b>Model Variables</b>	
20 year	Value: 20 Units: Years Note: Defines the total duration of the simulation, typically representing the modeled system's time horizon.
a+1	Value: $[a = \text{FLEET VALUE}] + ([\text{Delivered Boats Value}] - [\text{Yd} = \text{Depreciation}]) * \{1 \text{ year}\}$ Units: NOK Note: Represents the dynamic change in fleet value, incorporating delivered boats and other financial factors.
Auto Correlation	Value: $[\text{vr}] - [\text{Error Resource Estimate}]$ Units: Unitless Note: Auto correlation is the difference between the randomness in resource estimation and the error resource estimation.
Auto Correlation msy	Value: $[\text{vm}] - [\text{vm} = \text{Errors in msy estimation}]$ Units: Unitless Note: Auto correlation msy is the difference between the randomness in msy estimation and the error in msy estimation.
Average weight of P1	Value: 1.1 Units: tonnes/fish Note: Represents the average weight per fish for species P1, influencing stock assessments and harvesting decisions.
Average weight of P2	Value: 4.7 Units: tonnes/fish Note: Represents the average weight per fish for species P2, affecting biomass calculations and fishing quotas.
Average weight of P3	Value: 9.3 Units: tonnes/fish Note: Represents the average weight per fish for species P3, affecting biomass assessments and fishing limits.
Average weight of P4	Value: 13 Units: tonnes/fish Note: Represents the average weight per fish for species P4, influencing total stock calculations and quota settings.
b = Normal Catch per Boat	Value: 64 Units: fish/boat/year Note: The standard catch that a single fishing vessel can harvest under normal operating conditions.
Bank Deposit	Value: $\max(\{0 \text{ nok}\}, [\text{d} = \text{DEBT}] * -1)$

	<p>Units: NOK</p> <p>Note: Represents the financial reserves held by the fishing company, influencing investment and sustainability decisions.</p>
Boat Aging Time	<p>Value: 8</p> <p>Units: Years</p> <p>Note: The duration over which a boat experiences wear and tear before it requires replacement or refurbishment.</p>
Boat Construction Time	<p>Value: 1</p> <p>Units: Years</p> <p>Note: Time required to build and prepare a new boat before it is added to the active fleet.</p>
Boat Scrapping Time	<p>Value: 1</p> <p>Units: Years</p> <p>Note: The period after which a boat is considered obsolete and removed from the fleet due to aging or inefficiency.</p>
c = Total Catch	<p>Value: <math>[b = \text{Normal Catch per Boat}] * [n = \text{Number of Boats}] * (1 - [L = \text{Lay-ups}] / 100) * (1 - \text{Exp}(-([ \text{Relative Fish Population} ] / [\beta = \text{Efficiency Coeff}]))) / (1 - \text{Exp}(-1 / [\beta = \text{Efficiency Coeff}]))) * [vc = \text{Randomness in Catch}]</math></p> <p>Units: fish/year</p> <p>Note: Total catch depends on the normal catch per boat in numbers and the number of boat n (capacity), the lay-ups (L percent), the relative availability of the fish, and a randomness in catch.</p>
c1 = Catch of P1 in tonnes	<p>Value: <math>[h1 = \text{Harvest from P1}] * [\text{Average weight of P1}]</math></p> <p>Units: tonnes/year</p> <p>Note: Represents the total catch of species P1 in tonnes, impacting stock sustainability and economic returns.</p>
c2 = Catch of P2 in tonnes	<p>Value: <math>[h2 = \text{Harvest from P2}] * [\text{Average weight of P2}]</math></p> <p>Units: tonnes/year</p> <p>Note: Represents the total catch of species P2 in tonnes, impacting stock sustainability and economic returns.</p>
c3 = Catch of P3 in tonnes	<p>Value: <math>[h3 = \text{Harvest from P3}] * [\text{Average weight of P3}]</math></p> <p>Units: tonnes/year</p> <p>Note: Represents the total catch of species P3 in tonnes, impacting stock sustainability and economic returns..</p>
c4 = Catch of P4 in tonnes	<p>Value: <math>[h4 = \text{Harvest from P4}] * [\text{Average weight of P4}]</math></p> <p>Units: tonnes/year</p> <p>Note: Represents the total catch of species P4 in tonnes, impacting stock sustainability and economic returns.</p>
Current Catch per Boat	<p>Value: <math>[c = \text{Total Catch}] / [n = \text{Number of Boats}]</math></p> <p>Units: fish/boat/year</p> <p>Note: The actual amount of fish a single boat harvests per fishing trip or season.</p>
cw = Total Catch in Tonnes	<p>Value: <math>[c1 = \text{Catch of P1 in tonnes}] + [c2 = \text{Catch of P2 in tonnes}] + [c3 = \text{Catch of P3 in tonnes}] + [c4 = \text{Catch of P4 in tonnes}]</math></p> <p>Units: tonnes/year</p>

	Note: Represents the combined weight of all fish species harvested in the fishery.
d+1	Value: $[d = \text{DEBT}] + ([\text{Delivered Boats Value}] - [\text{Debt Decrements}]) * \{1 \text{ year}\}$ Units: NOK Note: Represents a calculated debt increment, reflecting financial obligations of the fishing operation.
e Equity	Value: $[a = \text{FLEET VALUE}] - [d = \text{DEBT}]$ Units: NOK Note: The total value of assets owned in the fishery operation, excluding liabilities such as debts.
e1	Value: 0.61 Units: 1/fish Note: a measure of the relative efficiency of the fishing gear applied to age class 1.
e2	Value: 1.11 Units: 1/fish Note: a measure of the relative efficiency of the fishing gear applied to age class 2.
e3	Value: 0.62 Units: 1/fish Note: a measure of the relative efficiency of the fishing gear applied to age class 3.
e4	Value: 0.48 Units: 1/fish Note: a measure of the relative efficiency of the fishing gear applied to age class 4.
Fish Population of P1 until P4	Value: $[\text{Mature Population}] + [\text{POPULATION P1}]$ Units: fish Note: Represents the total population of all fish species (P1 to P4) in the model.
Fortune	Value: $[e \text{ Equity}] + [\pi r \text{ shadow price resource}] * [pw = \text{Total Biomass}]$ Units: NOK Note: Fortune is the criterion to judge the result of the experiment. It is the sum of equity and the biomass pw times a price on the fish stock biomass.
Fortune for Strategy Optimization	Value: $[e \text{ Equity}] / (1 + (([\pi i \text{ interest rate}] * \{1 \text{ year}\}) * (1 - [\pi t \text{ tax rate}])))^{((\text{TIME} - [20 \text{ year}]) / \{1 \text{ year}\})}$ Units: NOK Note: This variable is used when we search for the optimal strategy.
Fraction of P1 in catch	Value: $[e1] * [\text{POPULATION P1}]$ Units: Unitless Note: The proportion of species P1 in the total catch, influencing biodiversity and stock balance.
Fraction of P2 in catch	Value: $[e2] * [\text{POPULATION P2}]$ Units: Unitless Note: The proportion of species P2 in the total catch, affecting ecosystem stability.
Fraction of P3 in catch	Value: $[e3] * [\text{POPULATION P3}]$ Units: Unitless

	Note: The proportion of species P3 in the total catch, impacting stock management and quotas.
Fraction of p4 in catch	Value: $[e4] \times [\text{POPULATION P4}]$ Units: Unitless Note: The proportion of species P4 in the total catch, impacting the mount of harvest from p4 stock.
Initial Fish Population	Value: $[\text{Initial P1}] + [\text{Initial Mature Population}]$ Units: fish Note: The baseline number of fish in the ecosystem before fishing activities begin.
Initial Mature Population	Value: $[\text{Initial P2}] + [\text{Initial P3}] + [\text{Initial P4}]$ Units: fish Note: The initial count of sexually mature fish available for reproduction in the fishery.
Initial P0	Value: 1946 Units: fish Note: Represents the starting population of pre-mature fish that will grow into adult stocks.
Initial P1	Value: 1218 Units: fish Note: Represents the initial number of fish in P1 at the start of the simulation.
Initial P2	Value: 759 Units: fish Note: Represents the initial number of fish in P2 at the start of the simulation.
Initial P3	Value: 476 Units: fish Note: Represents the initial number of fish in P3 at the start of the simulation.
Initial P4	Value: 297 Units: fish Note: Represents the initial number of fish in P4 at the start of the simulation.
k = Coeff. for Std.Dev	Value: 2.24 Units: Unitless Note: A coefficient used to determine standard deviation for model uncertainty calculations.
L = Lay-ups	Value: [Lay Up Data] Units: Unitless Note: Lay-ups is one of two decision variables in the experiment, aims to reduce or temporarily halt fishing operations by decommissioning part of their fishing fleet or equipment. This action is taken to cut costs and prevent overfishing when not profitable
m = Natural Mortality Rate	Value: 0.2  Units: 1/year Note: The proportion of fish that die from natural causes such as predation or disease.
Maturation Time	Value: 3 Units: Years Note: "Maturation Time" of fish population.
Maturation Time	Value: 3

	Units: Years Note: "Maturation Time" of fish population.
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Mature Population	Value: [POPULATION P2]+[POPULATION P3]+[POPULATION P4] Units: fish Note: The count of adult fish that catchable.
msy	Value: 934 Units: fish/year Note: Maximum Sustainable Yield (msy) is defined as the largest amount of fish that can be harvested from a population indefinitely without depleting the resources. It measures the maximum catch per year that does not have depletion of the resource as a long-term consequence.
msye	Value: [msy]*[vm = Errors in msy estimation] Units: fish/year Note: Estimated Maximum Sustainable Yield, adjusted based on stock assessment and environmental factors.
n = Number of Boats	Value: [NUMBER OF n1]+[NUMBER OF n2]+[NUMBER OF n3]+[NUMBER OF n4] Units: boat Note: The fleets that were available during the accounting year. Average lifetime of vessel is assumed 25 years, but some ships are scrapped before 20 years.
Number of Boats Next Year	Value: [n = Number of Boats]+(((O = Ordering of Boats)-[Boat Scrapping])*{1 year}) Units: boat Note: The available fleets after ordered ships arrive and ageing ships are scrapped.
pw = Total Biomass	Value: [pw1 = Biomass of P1]+[pw2 = Biomass of P2]+[pw3 = Biomass of P3]+[pw4 = Biomass of P4] Units: Tonnes Note: Represents the total weight of all fish in the ecosystem.
pw1 = Biomass of P1	Value: [POPULATION P1]*[Average weight of P1] Units: Tonnes Note: Total estimated biomass of stock p1 in tonnes.
pw2 = Biomass of P2	Value: [POPULATION P2]*[Average weight of P2] Units: Tonnes Note: Total estimated biomass of stock p2 in tonnes.
pw3 = Biomass of P3	Value: [POPULATION P3]*[Average weight of P3] Units: Tonnes Note: Total estimated biomass of stock p3 in tonnes.

pw4 = Biomass of P4	Value: [POPULATION P4]*[Average weight of P4] Units: Tonnes Note: Total estimated biomass of stock p1 in tonnes4
pwe = Estimated Biomass	Value: [pw = Total Biomass]*[Error Resource Estimate] Units: Tonnes Note: Estimated biomass calculates the total weight of the fishable stock by taking into account the Error Resource Estimate.
Relative Fish Population	Value: [Fish Population of P1 until P4]/[Initial Fish Population] Units: Unitless Note: Ratio comparing current fish stock levels to an initial or reference population.
s0	Value: 666 Units: fish/year Note: Assumption is currently used to define Spawning0 (or s0). According to the journal, in the initial equilibrium situation, spawning equals to s0. In this model, the value is assumed 666 to have at least stable fish population along 20 years simulation.
Sum of Catch Fraction	Value: [Fraction of P1 in catch]+[Fraction of P2 in catch]+[Fraction of P3 in catch]+[Fraction of p4 in catch] Units: Unitless Note: Total sum of catch fraction from p1, p2, p3, and p4.
Total Harvest 1-4	Value: [h1 = Harvest from P1]+[h2 = Harvest from P2]+[h3 = Harvest from P3]+[h4 = Harvest from P4] Units: fish/year Note: The cumulative fish harvest from P1 to P4 in a specific timeframe.
vc = Randomness in Catch	Value: RandNormal(1,[σc = Std.Dev Catch]) Units: Unitless Note: Randomness in catch is represented by vc = N(1,σc).
vm	Value: RandNormal(1,([σm = Std.Dev msy Est]*[k = Coeff. for Std.Dev])) Units: Unitless Note: Randomness in msy estimation
vr	Value: RANDnormal(1, [σr = Std.Dev Resource Est.]*[k = Coeff. for Std.Dev]) Units: Unitless Note: Errors associated with resource estimations, affecting quota setting and sustainability.
vs = Randomness in Recruitment	Value: RandNormal(1,[σs = Std.Dev Recruitment]) Units: Unitless Note: Randomness in recruitment is represented by vs = N(1,σs).
vw Randomness Weight	Value: randnormal(1,[σw = Std.Dev Weight]) Units: Unitless Note: Randomness in weight is represented by vw = N(1,σw).
we = estimated avg weight in the catch	Value: ([cw = Total Catch in Tonnes]/[Total Harvest 1-4])*[vw Randomness Weight] Units: tonnes/fish

Y <sub>d</sub> = Depreciation	Note: It is estimated average weight in the age classes
	Value: $[n = \text{Number of Boats}] * [\pi_b \text{ boat price}] / [\tau_d \text{ Depreciation time}]$ Units: NOK/years Note: Depreciation (Y <sub>d</sub> ) is assumed to be linear.
Y <sub>g</sub> = Revenue	Value: $[\pi_f \text{ fish price}] * [c_w = \text{Total Catch in Tonnes}]$ Units: NOK/years Note: It is the product of total catch and a constant cod price of NOK 6000 per ton.
Y <sub>i</sub> = Interest Payment	Value: $[\pi_i \text{ interest rate}] * [d = \text{DEBT}]$ Units: NOK/years Note: Interest payment is given by debt (or bank deposits) and an interest rate of 5%/year.
Y <sub>n</sub> = Net Income	Value: $[Y_g = \text{Revenue}] - [Y_o = \text{Operating Cost}] - [Y_d = \text{Depreciation}] - [Y_i = \text{Interest Payment}]$ Units: NOK/years Note: This variable represents net income, which is derived by subtracting total costs from revenue.
Y <sub>nat</sub> = Net Income after tax	Value: $[Y_n = \text{Net Income}] - [Y_t = \text{Taxes}]$ Units: NOK/years Note: This variable represents earnings after tax (EAT), which is obtained by subtracting tax expenses from total earnings.
Y <sub>o</sub> = Operating Cost	Value: $[\pi_o \text{ operating per cost}] * [n = \text{Number of Boats}] * (1 - [L = \text{Lay-ups}] / 100)$ Units: NOK/years Note: It is influenced by 1200 NOK operating cost per boat per year, reduced proportionally with lay-ups.
Y <sub>t</sub> = Taxes	Value: $[\pi_t \text{ tax rate}] * \text{MAX}(\{0 \text{ NOK/years}\}, [Y_n = \text{Net Income}])$ Units: NOK/years Note: Taxes are given by a tax rate $\pi_t$ , and a max-function that inhibits negative tax payments.
$\alpha$ = Recruitment Coefficient	Value: 0.2 Units: Unitless Note: This parameter determines how quickly recruitment saturates.
$\beta$ = Efficiency Coeff	Value: 0.2 Units: Unitless Note: display how efficiently new investments or resources convert into productive capacity or improvements.
$\sigma_c$ = Std.Dev Catch	Value: 0 Units: Unitless Note: Represents the standard deviation in total catch, indicating the variability in fishing yields.
$\sigma_m$ = Std.Dev msy Est	Value: 0 Units: Unitless Note: Standard deviation in the estimated maximum sustainable yield (MSY), reflecting uncertainty in fishery assessments.
$\sigma_r$ = Std.Dev Resource Est.	Value: 0 Units: Unitless

Note: The standard deviation in resource estimation, measuring uncertainty in available fish stock calculations.

$\sigma_s$ = Std.Dev Recruitment	Value: 0 Units: Unitless Note: Represents the standard deviation in fish recruitment, showing the variability in the number of new fish entering the population.
$\sigma_w$ = Std.Dev Weight	Value: 0 Units: Unitless Note: Standard deviation of fish weight in catches, indicating variability in individual fish sizes.
$\tau_d$ Depreciation time	Value: 25 Units: years Note: The period over which fishing boats and equipment lose value due to wear and usage.
$\tau_e$ = Errors Lifetime	Value: 3 Units: Years Note: Time duration for errors in stock estimation to stabilize or be corrected in the model.
$\pi_b$ boat price	Value: 3000 Units: NOK/boat Note: Represents the cost of acquiring a new fishing vessel, influencing investment decisions.
$\pi_f$ fish price	Value: 6 Units: NOK/tonnes Note: Market price per unit of fish, determining revenue from fishing activities.
$\pi_i$ interest rate	Value: 0.05 Units: 1/year Note: Annual percentage rate applied to loans and debts within the fishery operation.
$\pi_o$ operating per cost	Value: 1200 Units: NOK/boat/year Note: Total operational cost per unit of fishing effort, including fuel, labor, and maintenance.
$\pi_r$ shadow price resource	Value: 1.09 Units: NOK/tonnes Note: The implied economic value of the fish resource, influencing conservation and exploitation decisions.
$\pi_t$ tax rate	Value: 0.2 Units: Unitless Note: Percentage of revenue deducted as tax obligations for the fishery business.

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#### Model Stocks

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$a$ = FLEET VALUE	Initial Value: 2880 Non-Negative: No Units: NOK Note: Fleet value increases by delivered boats $n_0/1$ , and is reduced by depreciation.
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d = DEBT	<p>Initial Value: 1576</p> <p>Non-Negative: No</p> <p>Units: NOK</p> <p>Note: Debt is only reported as debt as long as it is positive. When debt becomes negative, it appears/ understood as bank deposit.</p>
Error Resource Estimate	<p>Initial Value: 1</p> <p>Non-Negative: No</p> <p>Units: Unitless</p> <p>Note: Error Resource Estimate is assumed to have a certain lifetime <math>\tau_e</math>, which introduce auto correlation.</p>
NUMBER OF n1	<p>Initial Value: 1</p> <p>Non-Negative: No</p> <p>Units: boat</p> <p>Note: Represents the count of boats in category n1, used in fleet capacity calculations.</p>
NUMBER OF n2	<p>Initial Value: 0</p> <p>Non-Negative: No</p> <p>Units: boat</p> <p>Note: Represents the count of boats in category n2, influencing overall fleet management.</p>
NUMBER OF n3	<p>Initial Value: 0</p> <p>Non-Negative: No</p> <p>Units: boat</p> <p>Note: Represents the count of boats in category n3, determining catch distribution across vessels.</p>
NUMBER OF n4	<p>Initial Value: 0</p> <p>Non-Negative: No</p> <p>Units: boat</p> <p>Note: Represents the count of boats in category n4, contributing to fishing effort calculations.</p>
POPULATION P0	<p>Initial Value: [Initial P0]</p> <p>Non-Negative: No</p> <p>Units: fish</p> <p>Note: The earliest age group of cod fishes from 0 to 3 years and this group is not catchable.</p>
POPULATION P1	<p>Initial Value: [Initial P1]</p> <p>Non-Negative: No</p> <p>Units: fish</p> <p>Note: P represents the aging distribution of cod fishes. This group of fishes are catchable.</p>
POPULATION P2	<p>Initial Value: [Initial P2]</p> <p>Non-Negative: No</p> <p>Units: fish</p> <p>Note: P represents the aging distribution of cod fishes. This group of fishes are catchable.</p>
POPULATION P3	<p>Initial Value: [Initial P3]</p> <p>Non-Negative: No</p> <p>Units: fish</p>

	Note: P represents the aging distribution of cod fishes. This group of fishes are catchable.
POPULATION P4	Initial Value: [Initial P4] Non-Negative: No Units: fish Note: P represents the aging distribution of cod fishes. This group of fishes are catchable.
vm = Errors in msy estimation	Initial Value: 1  Non-Negative: No Units: Unitless Note: Error in msy Estimate is assumed to have a certain lifetime $\tau_e$ , which introduce auto correlation msy.
<b>Model Flows</b>	
Aging to n2	Rate: [NUMBER OF n1]/[Boat Aging Time] Alpha: NUMBER OF n1 Omega: NUMBER OF n2 Positive Only: No Units: boat/year Note: Represents the transition of boats from p1 to p2 as they age.
Aging to n3	Rate: [NUMBER OF n2]/[Boat Aging Time] Alpha: NUMBER OF n2 Omega: NUMBER OF n3 Positive Only: No Units: boat/year Note: Represents the transition of boats from p2 to p3 as they age.
Aging to n4	Rate: [NUMBER OF n3]/[Boat Aging Time] Alpha: NUMBER OF n3 Omega: NUMBER OF n4 Positive Only: No Units: boat/year Note: Represents the transition of boats from p3 to p4 as they age.
Boat Scrapping	Rate: $\text{FLOOR}([\text{NUMBER OF n4}] + \{0.1 \text{ boat}\}) / [\text{Boat Scrapping Time}]$ Alpha: NUMBER OF n4 Omega: None Positive Only: Yes Units: boat/year Note: The process of decommissioning and removing old boats from the fleet.
Debt Decrements	Rate: $[\text{Ynat} = \text{Net Income after tax}] + [\text{Yd} = \text{Depreciation}]$ Alpha: d = DEBT Omega: None Positive Only: No

	<p>Units: NOK/years</p> <p>Note: Reduction in total debt due to payments or adjustments in financial obligations.</p>
Debt Incremental	<p>Rate: [Delivered Boats Value]</p> <p>Alpha: None</p> <p>Omega: d = DEBT</p> <p>Positive Only: No</p> <p>Units: NOK/years</p> <p>Note: Increase in debt due to loan acquisitions or interest accumulation.</p>
Delivered Boats Value	<p>Rate: [<math>\pi b</math> boat price]*[O = Ordering of Boats]</p> <p>Alpha: None</p> <p>Omega: a = FLEET VALUE</p> <p>Positive Only: No</p> <p>Units: NOK/years</p> <p>Note: Total financial worth of newly delivered boats added to the fleet.</p>
Depreciation Value	<p>Rate: [Yd = Depreciation]</p> <p>Alpha: a = FLEET VALUE</p> <p>Omega: None</p> <p>Positive Only: No</p> <p>Units: NOK/years</p> <p>Note: Annual reduction in asset value for boats and equipment due to wear and usage.</p>
Errors Correction	<p>Rate: [Auto Correlation]/[<math>\tau e</math> = Errors Lifetime]</p> <p>Alpha: None</p> <p>Omega: Error Resource Estimate</p> <p>Positive Only: No</p> <p>Units: 1/year</p> <p>Note: This flow contains information delay of error resource estimation.</p>
Errors msy Correction	<p>Rate: [<math>\text{Auto Correlation msy}</math>]/[<math>\tau e</math> = Errors Lifetime]</p> <p>Alpha: None</p> <p>Omega: vm = Errors in msy estimation</p> <p>Positive Only: No</p> <p>Units: 1/year</p> <p>Note: This flow contains information delay of error in msy estimation.</p>
h1 = Harvest from P1	<p>Rate: [Fraction of P1 in catch]/[Sum of Catch Fraction]*[c = Total Catch]</p> <p>Alpha: POPULATION P1</p> <p>Omega: None</p> <p>Positive Only: No</p> <p>Units: fish/year</p>

	Note: This variable represents the amount of fish harvested annually from population class P1.
h2 = Harvest from P2	Rate: $[\text{Fraction of P2 in catch}]/[\text{Sum of Catch Fraction}]*[\text{c} = \text{Total Catch}]$ Alpha: POPULATION P2 Omega: None Positive Only: No Units: fish/year Note: This variable represents the amount of fish harvested annually from population class P2.
h3 = Harvest from P3	Rate: $[\text{Fraction of P3 in catch}]/[\text{Sum of Catch Fraction}]*[\text{c} = \text{Total Catch}]$ Alpha: POPULATION P3 Omega: None Positive Only: No Units: fish/year Note: This variable represents the amount of fish harvested annually from population class P3.
h4 = Harvest from P4	Rate: $[\text{Fraction of p4 in catch}]/[\text{Sum of Catch Fraction}]*[\text{c} = \text{Total Catch}]$ Alpha: POPULATION P4 Omega: None Positive Only: No Units: fish/year Note: This variable represents the amount of fish harvested annually from population class P4.
Maturation	Rate: $[\text{POPULATION P4}]/[\text{Maturation Time}]$ Alpha: POPULATION P4 Omega: None Positive Only: No Units: fish/year Note: Represents the process of juvenile fish reaching maturity and entering the reproductive population.
Maturation to P1	Rate: $[\text{POPULATION P0}]/[\text{Maturation Time}]$ Alpha: POPULATION P0 Omega: POPULATION P1 Positive Only: No Units: fish/year Note: The rate or number of fish transitioning into the P1 category due to maturation.
Maturation to P2	Rate: $[\text{POPULATION P1}]/[\text{Maturation Time}]$ Alpha: POPULATION P1 Omega: POPULATION P2 Positive Only: No Units: fish/year

	Note: The rate or number of fish maturing into species P2, influencing recruitment rates.
Maturation to P3	<p>Rate: <math>[\text{POPULATION P2}]/[\text{Maturation Time}]</math></p> <p>Alpha: POPULATION P2</p> <p>Omega: POPULATION P3</p> <p>Positive Only: No</p> <p>Units: fish/year</p> <p>Note: The rate at which juvenile fish transition into P3 category as part of stock dynamics.</p>
Maturation to P4	<p>Rate: <math>[\text{POPULATION P3}]/[\text{Maturation Time}]</math></p> <p>Alpha: POPULATION P3</p> <p>Omega: POPULATION P4</p> <p>Positive Only: No</p> <p>Units: fish/year</p> <p>Note: The process by which young fish become part of the P4 population, affecting biomass growth.</p>
Natural Mortality P1	<p>Rate: <math>[\text{POPULATION P1}] * [m = \text{Natural Mortality Rate}]</math></p> <p>Alpha: POPULATION P1</p> <p>Omega: None</p> <p>Positive Only: No</p> <p>Units: fish/year</p> <p>Note: The rate at which species P1 naturally die due to predation, disease, or environmental factors.</p>
Natural Mortality P2	<p>Rate: <math>[\text{POPULATION P2}] * [m = \text{Natural Mortality Rate}]</math></p> <p>Alpha: POPULATION P2</p> <p>Omega: None</p> <p>Positive Only: Yes</p> <p>Units: fish/year</p> <p>Note: The natural death rate for species P2, affecting sustainable harvest calculations.</p>
Natural Mortality P3	<p>Rate: <math>[\text{POPULATION P3}] * [m = \text{Natural Mortality Rate}]</math></p> <p>Alpha: POPULATION P3</p> <p>Omega: None</p> <p>Positive Only: No</p> <p>Units: fish/year</p> <p>Note: Represents natural losses in species P3 population due to ecological dynamics.</p>
Natural Mortality P4	<p>Rate: <math>[\text{POPULATION P4}] * [m = \text{Natural Mortality Rate}]</math></p> <p>Alpha: POPULATION P4</p> <p>Omega: None</p> <p>Positive Only: Yes</p> <p>Units: fish/year</p>

	Note: Represents non-fishing-related mortality for species P4, impacting biomass assessments.
O = Ordering of Boats	<p>Rate: [Ordering Data]/[Boat Construction Time]</p> <p>Alpha: None</p> <p>Omega: NUMBER OF n1</p> <p>Positive Only: No</p> <p>Units: boat/year</p> <p>Note: Ordering of Boats is one of two decision variables in the experiment, aims to add fishing boats to gain more fish, ideally when it is profitable or the stock of fish still high.</p>
Spawning	<p>Rate: <math>[s0] * (1 - \text{EXP}(-([Mature Population]/[Initial Mature Population]) / [\alpha = \text{Recruitment Coefficient}])) / (1 - \text{EXP}(-1 / [\alpha = \text{Recruitment Coefficient}])) * (\text{MAX}(0, [vs = \text{Randomness in Recruitment}])))</math></p> <p>Alpha: None</p> <p>Omega: POPULATION P0</p> <p>Positive Only: No</p> <p>Units: fish/year</p> <p>Note: Spawning depends on the mature stock or population (age group 2-4).</p>
<b>Model Converters</b>	
Boat value data	<p>Data: 0,2880; 1,2760; 2,2640; 3,2520; 4,2400; 5,2280; 6,5280; 7,5040; 8,4800; 9,4560; 10,7320; 11,6960; 12,9600; 13,12120; 14,11520; 15,10920; 16,10320; 17,9720; 18,9120; 19,8520; 20,7920</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Historical records and projections of boat values over time.</p>
Catch data	<p>Data: 0,300; 1,300; 2,299; 3,297; 4,294; 5,293; 6,583; 7,581; 8,576; 9,570; 10,848; 11,840; 12,1106; 13,1359; 14,1324; 15,1279; 16,1236; 17,1201; 18,1174; 19,1154; 20,1154</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Recorded figures of fish catches categorized by species and time periods.</p>
Debt data	<p>Data: 0,1576; 1,1135; 2,684; 3,224; 4,73; 5,-245; 6,2276; 7,1441; 8,583; 9,-286; 10,1837; 11,649; 12,2450; 13,3986; 14,2303; 15,722; 16,-707; 17,-1987; 18,-3152; 19,-4235; 20,-5263</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Financial records detailing accumulated debt, payments, and outstanding liabilities.</p>
Depreciation data	<p>Data: 1,120; 2,120; 3,120; 4,120; 5,120; 6,240; 7,240; 8,240; 9,240; 10,360; 11,360; 12,480; 13,600; 14,600; 15,600; 16,600; 17,600; 18,600; 19,600; 20,600</p>

	<p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Data related to the reduction in asset values due to depreciation calculations.</p>
Equity data	<p>Data: 1,1625; 2,1956; 3,2296; 4,2645; 5,3004; 6,3599; 7,4217; 8,4846; 9,5483; 10,6311; 11,7150; 12,8134; 13,9217; 14,10198; 15,11027; 16,11707; 17,12272; 18,12755; 19,13183; 20,13574</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Financial records tracking the net worth and asset holdings of the fishery business.</p>
Income after tax data	<p>Data: 0,304; 1,321; 2,331; 3,340; 4,349; 5,359; 6,595; 7,617; 8,629; 9,637; 10,828; 11,839; 12,984; 13,1083; 14,981; 15,829; 16,680; 17,564; 18,483; 19,429; 20,390</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Reports showing net income after all tax obligations are deducted.</p>
Lay Up Data	<p>Data: 0.25,0; 0.5,0; 0.75,0; 1,0; 1.25,0; 1.5,0; 1.75,0; 2,0; 2.25,0; 2.5,0; 2.75,0; 3,0; 3.25,0; 3.5,0; 3.75,0; 4,0; 4.25,0; 4.5,0; 4.75,0; 5,0; 5.25,0; 5.5,0; 5.75,0; 6,0; 6.25,0; 6.5,0; 6.75,0; 7,0; 7.25,0; 7.5,0; 7.75,0; 8,0; 8.25,0; 8.5,0; 8.75,0; 9,0; 9.25,0; 9.5,0; 9.75,0; 10,0; 10.25,0; 10.5,0; 10.75,0; 11,0; 11.25,0; 11.5,0; 11.75,0; 12,0; 12.25,0; 12.5,0; 12.75,0; 13,0; 13.25,0; 13.5,0; 13.75,0; 14,0; 14.25,0; 14.5,0; 14.75,0; 15,0; 15.25,0; 15.5,0; 15.75,0; 16,0; 16.25,0; 16.5,0; 16.75,0; 17,0; 17.25,0; 17.5,0; 17.75,0; 18,0; 18.25,0; 18.5,0; 18.75,0; 19,0; 19.25,0; 19.5,0; 19.75,0; 20,0</p> <p>Source: Time</p> <p>Interpolation: None</p> <p>Units: Unitless</p> <p>Note: Historical records of fleet lay-ups, showing inactive boats in different periods.</p>
No of Boat data	<p>Data: 0,1; 1,1; 2,1; 3,1; 4,1; 5,1; 6,2; 7,2; 8,2; 9,2; 10,3; 11,3; 12,4; 13,5; 14,5; 15,5; 16,5; 17,5; 18,5; 19,5; 20,5</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Statistics on the number of operational boats available over time.</p>

Ordering Data	<p>Data: 0.25,0; 0.5,0; 0.75,0; 1,0; 1.25,0; 1.5,0; 1.75,0; 2,0; 2.25,0; 2.5,0; 2.75,0; 3,0; 3.25,0; 3.5,0; 3.75,0; 4,0; 4.25,0; 4.5,0; 4.75,0; 5,1; 5.25,1; 5.5,1; 5.75,1; 6,0; 6.25,0; 6.5,0; 6.75,0; 7,0; 7.25,0; 7.5,0; 7.75,0; 8,0; 8.25,0; 8.5,0; 8.75,0; 9,1; 9.25,1; 9.5,1; 9.75,1; 10,0; 10.25,0; 10.5,0; 10.75,0; 11,1; 11.25,1; 11.5,1; 11.75,1; 12,1; 12.25,1; 12.5,1; 12.75,1; 13,0; 13.25,0; 13.5,0; 13.75,0; 14,0; 14.25,0; 14.5,0; 14.75,0; 15,0; 15.25,0; 15.5,0; 15.75,0; 16,0; 16.25,0; 16.5,0; 16.75,0; 17,0; 17.25,0; 17.5,0; 17.75,0; 18,0; 18.25,0; 18.5,0; 18.75,0; 19,0; 19.25,0; 19.5,0; 19.75,0; 20,0</p> <p>Source: Time</p> <p>Interpolation: None</p> <p>Units: boat</p> <p>Note: Records of all boat purchases and orders, tracking fleet expansion trends.</p>
Resource estimate data	<p>Data: 1,13133; 2,12829; 3,12548; 4,12311; 5,12126; 6,11989; 7,11601; 8,11238; 9,10919; 10,10657; 11,10172; 12,9737; 13,9089; 14,8241; 15,7493; 16,6882; 17,6411; 18,6053; 19,5774; 20,5774</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Historical records of estimated fish stock levels used for decision-making.</p>
Revenue data	<p>Data: 0,1800; 1,1800; 2,1791; 3,1779; 4,1767; 5,1757; 6,3498; 7,3484; 8,3455; 9,3422; 10,5087; 11,5041; 12,6633; 13,8153; 14,7941; 15,7672; 16,7415; 17,7206; 18,7046; 19,6924; 20,6825</p> <p>Source: Time</p> <p>Interpolation: Linear</p> <p>Units: Unitless</p> <p>Note: Financial reports detailing revenue from fishing operations over different time periods.</p>

### 3. GPT-4o Response Transcript

EXPERIMENT COORDINATOR:

You are a fishing fleet manager. You have a fleet of boats, and each year you decide how many boats to order (if any) and what percentage of the fleet to lay up (0 - 100%). For example, 10 would mean 10% of the fleet is laid up.

Your goal is to maximize the weighted sum of equity (fleet value minus debt) and fish biomass (total biomass) at the end of 20 years.

You should respond with JSON in the following format:

```
{
  "analysis": "Based on XYZ, I think I should ABC...",
  "BOATS_ORDERED": 1,
  "LAY_UPS_PERCENT": 0
}
```

EXPERIMENT COORDINATOR:

Initially we have:

Year: 0 Fleet Value: 2880 Debt: 1576 Bank Deposits: 0 Equity: 1304 Revenue: 1779  
Operating Costs: 1200 Depreciation: 120 Interest: 79 Net Income: 381 Taxes: 76 Net Income  
after Tax: 304 Number of Boats this Year: 1 Total Catch (tonnes/year): 64 Catch/Boat  
(tonnes/year): 64 Avg. Fish Weight in Catch (kg): 4.6 Total Resource Biomass (tonnes):  
13195

Please provide your first decision as JSON.

AI:

Given the current financial state and the strong revenue with low operating costs, there seems to be a good room for growth. With a healthy equity and fish biomass, investing in another boat could increase capacity and future revenue. Maintaining full operational capacity (laying up 0% of the fleet) will maximize the utilization of existing resources.

Decision: 1 boats ordered, 0% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 1 Fleet Value: 5760 Debt: 4152 Bank Deposits: 0 Equity: 1608 Revenue: 3557  
Operating Costs: 2400 Depreciation: 240 Interest: 208 Net Income: 710 Taxes: 142 Net  
Income after Tax: 568 Number of Boats this Year: 2 Total Catch (tonnes/year): 128  
Catch/Boat (tonnes/year): 64 Avg. Fish Weight in Catch (kg): 4.6 Total Resource Biomass  
(tonnes): 12898

Please provide your next decision as JSON.

AI:

The fleet has grown with an additional boat, doubling the total catch while maintaining constant catch per boat, indicating efficient use of capacity. The resource biomass has slightly decreased, suggesting a more cautious approach to avoid overfishing. Financially, revenue and net income have improved, though debt has increased proportionally with the fleet's growth, leading to higher interest costs. To build on equity while ensuring sustainable fish stocks, I recommend not ordering new boats this year and maintaining the current fleet operations by laying up 0% of the fleet.

Decision: 0 boats ordered, 0% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 2 Fleet Value: 8520 Debt: 6344 Bank Deposits: 0 Equity: 2176 Revenue: 3533  
Operating Costs: 2400 Depreciation: 240 Interest: 317 Net Income: 576 Taxes: 115 Net  
Income after Tax: 461 Number of Boats this Year: 2 Total Catch (tonnes/year): 128  
Catch/Boat (tonnes/year): 64 Avg. Fish Weight in Catch (kg): 4.6 Total Resource Biomass  
(tonnes): 12309

Please provide your next decision as JSON.

AI:

The financial situation remains stable, with a consistent revenue stream and controlled operating costs. However, the increase in debt and interest expenses is notable, and the biomass has continued to decrease slightly. Given these factors, it's important to focus on debt management and sustainability of fish stocks. To stabilize the debt while ensuring sustainability, I recommend not ordering any new boats and continuing operations without laying up any boats, allowing for debt reduction strategies and biomass recovery.

Decision: 0 boats ordered, 0% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 3 Fleet Value: 8280 Debt: 5643 Bank Deposits: 0 Equity: 2637 Revenue: 3484  
Operating Costs: 2400 Depreciation: 240 Interest: 282 Net Income: 562 Taxes: 112 Net  
Income after Tax: 450 Number of Boats this Year: 2 Total Catch (tonnes/year): 127  
Catch/Boat (tonnes/year): 64 Avg. Fish Weight in Catch (kg): 4.6 Total Resource Biomass  
(tonnes): 11754

Please provide your next decision as JSON.

AI:

Although equity has improved, the total resource biomass has decreased further, which is concerning for long-term sustainability. Revenue is steady, but the declining biomass suggests we might be overfishing the current stock levels. Debt has decreased slightly, which is positive, but ensuring resource sustainability is a priority to secure future revenue streams. To address this, I recommend not ordering new boats and laying up 10% of the fleet to give the fish biomass a chance to recover, thereby promoting sustainable fishing practices.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 4 Fleet Value: 8040 Debt: 4761 Bank Deposits: 0 Equity: 3279 Revenue: 3088  
Operating Costs: 2160 Depreciation: 240 Interest: 238 Net Income: 450 Taxes: 90 Net  
Income after Tax: 360 Number of Boats this Year: 2 Total Catch (tonnes/year): 115  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.5 Total Resource Biomass  
(tonnes): 11341

Please provide your next decision as JSON.

AI:

The lay-up strategy helped reduce operating costs and contributed to lower interest expenses and debt. However, the total resource biomass is still declining, albeit at a slower rate, which remains a concern for future sustainability. Revenue has decreased due to the reduced catch, which indicates pressure on fish stocks. The priority now should be to help the biomass recover further. I'll continue focusing on sustainability by maintaining the lay-up and avoiding further fleet expansion.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 5 Fleet Value: 7800 Debt: 4161 Bank Deposits: 0 Equity: 3639 Revenue: 3051  
Operating Costs: 2160 Depreciation: 240 Interest: 208 Net Income: 443 Taxes: 89 Net  
Income after Tax: 354 Number of Boats this Year: 2 Total Catch (tonnes/year): 115  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 11034

Please provide your next decision as JSON.

AI:

The positive trend of increased equity and reduced debt is a sign that financial health is improving. However, the decreasing biomass still signals potential sustainability issues. With stable finances, the priority should still be on resource conservation. I'll continue with the strategy of maintaining the current fleet size and lay-up rate to allow the biomass to recover, which is crucial for the long-term viability of the fleet and its profitability.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 6 Fleet Value: 7560 Debt: 3567 Bank Deposits: 0 Equity: 3993 Revenue: 3025  
Operating Costs: 2160 Depreciation: 240 Interest: 178 Net Income: 447 Taxes: 89 Net  
Income after Tax: 358 Number of Boats this Year: 2 Total Catch (tonnes/year): 115  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10827

Please provide your next decision as JSON.

AI:

The financial situation is stable with increasing equity and manageable debt. However, the biomass is still declining, though at a slower rate. This indicates that the current lay-up strategy is beginning to help, but more time is needed for significant recovery. The focus should still remain on supporting the fish stocks to stabilize and boost their numbers. Therefore, no new boats should be ordered, and the lay-up percentage should remain at 10% to aid in further biomass recovery.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 7 Fleet Value: 7320 Debt: 2969 Bank Deposits: 0 Equity: 4351 Revenue: 3009  
Operating Costs: 2160 Depreciation: 240 Interest: 148 Net Income: 460 Taxes: 92 Net  
Income after Tax: 368 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10693

Please provide your next decision as JSON.

AI:

Equity continues to improve, and debt is decreasing, which reflects a stable financial situation. The biomass, however, is still slowly declining. Continuing with prudent management of the fleet while focusing on promoting biomass recovery is imperative for long-term sustainability. Keeping the current number of boats and lay-up strategy seems appropriate as it balances financial health and resource conservation. I recommend maintaining the same approach to support biomass stabilization and future growth opportunities.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 8 Fleet Value: 7080 Debt: 2361 Bank Deposits: 0 Equity: 4719 Revenue: 2999  
Operating Costs: 2160 Depreciation: 240 Interest: 118 Net Income: 481 Taxes: 96 Net  
Income after Tax: 385 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10610

Please provide your next decision as JSON.

AI:

Equity and financial health are continually improving while debt decreases. However, the biomass is still showing a decrease, albeit less sharp. To allow fish stocks more time to recover, it's essential to maintain current operations without expanding the fleet. The continued focus should be on conserving the biomass while maintaining profitability. Therefore, the sensible approach is to maintain 10% lay-up of the fleet and not order any new boats.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 9 Fleet Value: 6840 Debt: 1736 Bank Deposits: 0 Equity: 5104 Revenue: 2993  
Operating Costs: 2160 Depreciation: 240 Interest: 87 Net Income: 507 Taxes: 101 Net  
Income after Tax: 405 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10559

Please provide your next decision as JSON.

AI:

The financial position is robust, with equity continuing to increase and debt reducing significantly. The biomass decrease is now very gradual, suggesting that measures are starting to yield results. Given this, the most prudent course of action remains to not order new boats and maintain the 10% lay-up, allowing further opportunity for fish stocks to stabilize or grow slightly, while ensuring we continue operating profitably and sustainably.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 10 Fleet Value: 6600 Debt: 1091 Bank Deposits: 0 Equity: 5509 Revenue: 2990  
Operating Costs: 2160 Depreciation: 240 Interest: 55 Net Income: 535 Taxes: 107 Net  
Income after Tax: 428 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10525

Please provide your next decision as JSON.

AI:

The financial indicators look strong with rising equity, reduced debt, and stable post-tax income. The biomass level has shown signs of stabilization. To encourage further recovery of fish stocks and ensure long-term sustainability, the strategy of keeping a 10% lay-up should continue, helping to maintain this balance while allowing more room for biomass growth. There's no immediate need to order new boats as the current strategy is proving effective.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 11 Fleet Value: 6360 Debt: 422 Bank Deposits: 0 Equity: 5938 Revenue: 2988  
Operating Costs: 2160 Depreciation: 240 Interest: 21 Net Income: 567 Taxes: 113 Net  
Income after Tax: 453 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10502

Please provide your next decision as JSON.

AI:

The fleet's financial status continues to strengthen, with near elimination of debt and stable equity growth. The biomass level appears stable, indicating that previous measures are effective in preventing further decline. Continuing the current strategy will ensure the biomass remains healthy and financial benefits are maximized. Therefore, maintaining the lay-up rate at 10% while avoiding new boat orders is advisable, keeping operations profitable and fish stocks sustainable.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 12 Fleet Value: 6120 Debt: 0 Bank Deposits: 271 Equity: 6391 Revenue: 2986  
Operating Costs: 2160 Depreciation: 240 Interest: -14 Net Income: 600 Taxes: 120 Net  
Income after Tax: 480 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.4 Total Resource Biomass  
(tonnes): 10485

Please provide your next decision as JSON.

AI:

With debt fully eliminated and equity continuing to improve, the financial position is very strong. The slight increase in biomass stabilization signifies that the current strategy is effective. At this stage, the prudent choice is to maintain the current operating strategy with a 10% lay-up to continue supporting biomass recovery, while not expanding the fleet to ensure the sustainability of fish stocks and financial stability.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 13 Fleet Value: 5880 Debt: 0 Bank Deposits: 991 Equity: 6871 Revenue: 2985  
Operating Costs: 2160 Depreciation: 240 Interest: -50 Net Income: 635 Taxes: 127 Net  
Income after Tax: 508 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10473

Please provide your next decision as JSON.

AI:

The financial health of the fleet is excellent, with no debt and a growing equity position. The stabilization of fish biomass, albeit with a slight decrease, calls for continued cautious approach to ensure sustainable resource management. Given the sound financial status, it is prudent to maintain the current fleet size and lay-up percentage to promote further biomass recovery while capitalizing on the profitability of operations.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 14 Fleet Value: 5640 Debt: 0 Bank Deposits: 1739 Equity: 7379 Revenue: 2984  
Operating Costs: 2160 Depreciation: 240 Interest: -87 Net Income: 671 Taxes: 134 Net  
Income after Tax: 537 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10462

Please provide your next decision as JSON.

AI:

The financial status remains robust with increasing equity and no debt, which is excellent for continued operations. The total resource biomass is stable, showing that the current strategy is effective. Given the balance achieved between maintaining financial health and sustaining biomass, it becomes crucial to continue with this prudent approach. Therefore, I recommend maintaining the same fleet size and lay-up percentage to continue fostering a sustainable and profitable future.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 15 Fleet Value: 5400 Debt: 0 Bank Deposits: 2516 Equity: 7916 Revenue: 2984  
Operating Costs: 2160 Depreciation: 240 Interest: -126 Net Income: 710 Taxes: 142 Net  
Income after Tax: 568 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10454

Please provide your next decision as JSON.

AI:

The financial performance continues to be strong with rising equity and substantial bank deposits. The biomass remains stable, indicating that the sustainable practices are effective. Given this trend, and with ample financial reserves, it's sensible to maintain the current strategy of a 10% lay-up to continue supporting the biomass while capitalizing on operations. This approach will safeguard long-term profitability and resource sustainability.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 16 Fleet Value: 5160 Debt: 0 Bank Deposits: 3324 Equity: 8484 Revenue: 2983  
Operating Costs: 2160 Depreciation: 240 Interest: -166 Net Income: 749 Taxes: 150 Net  
Income after Tax: 600 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10448

Please provide your next decision as JSON.

AI:

The fleet is in a very strong financial position with no debt and increasing bank deposits, allowing for flexibility in future strategic decisions. The biomass remains stable with the current sustainable catch strategy. To maintain this balance between operational profitability and resource sustainability, continuing with a 10% lay-up while refraining from ordering new boats is advisable. This will help ensure stable fish stocks and sustained financial performance moving forward.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 17 Fleet Value: 4920 Debt: 0 Bank Deposits: 4163 Equity: 9083 Revenue: 2983  
Operating Costs: 2160 Depreciation: 240 Interest: -208 Net Income: 791 Taxes: 158 Net  
Income after Tax: 633 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10442

Please provide your next decision as JSON.

AI:

The continued growth in equity and bank deposits highlights a strong financial foundation, while the biomass is stable, reflecting effective resource management. As the strategy has proven successful, maintaining the lay-up percentage at 10% ensures sustainability and profitability. Avoiding fleet expansion remains prudent to sustain fish stocks at healthy levels, protecting long-term revenue potential.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 18 Fleet Value: 4680 Debt: 0 Bank Deposits: 5036 Equity: 9716 Revenue: 2982  
Operating Costs: 2160 Depreciation: 240 Interest: -252 Net Income: 834 Taxes: 167 Net  
Income after Tax: 667 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10438

Please provide your next decision as JSON.

AI:

The financial strength continues to build with substantial bank deposits and zero debt, and stable biomass indicates sustainable operations. Keeping the current course is beneficial in achieving long-term objectives of maximizing equity and ensuring sustainable fishing practices. Therefore, I will maintain the 10% lay-up strategy without ordering new boats to continue supporting a stable fish biomass and financial health.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 19 Fleet Value: 4440 Debt: 0 Bank Deposits: 5944 Equity: 10384 Revenue: 2982  
Operating Costs: 2160 Depreciation: 240 Interest: -297 Net Income: 879 Taxes: 176 Net

Income after Tax: 703 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10435

Please provide your next decision as JSON.

AI:

The fleet is in excellent financial shape with substantial equity and bank deposits. The biomass remains stable, demonstrating that the ongoing strategy is both financially and environmentally sustainable. As we are approaching the 20-year term, keeping operations steady ensures protection of both the financial assets and fish stocks. Therefore, I will continue with the current strategy of maintaining a 10% lay-up without purchasing new boats.

Decision: 0 boats ordered, 10% lay up

EXPERIMENT COORDINATOR:

After simulating a year, we see the following results:

Year: 20 Fleet Value: 4200 Debt: 0 Bank Deposits: 6887 Equity: 11087 Revenue: 2982  
Operating Costs: 2160 Depreciation: 240 Interest: -344 Net Income: 926 Taxes: 185 Net  
Income after Tax: 741 Number of Boats this Year: 2 Total Catch (tonnes/year): 114  
Catch/Boat (tonnes/year): 57 Avg. Fish Weight in Catch (kg): 4.3 Total Resource Biomass  
(tonnes): 10432