

Fish and Ships

Fishery Dynamics with Bounded Rationality

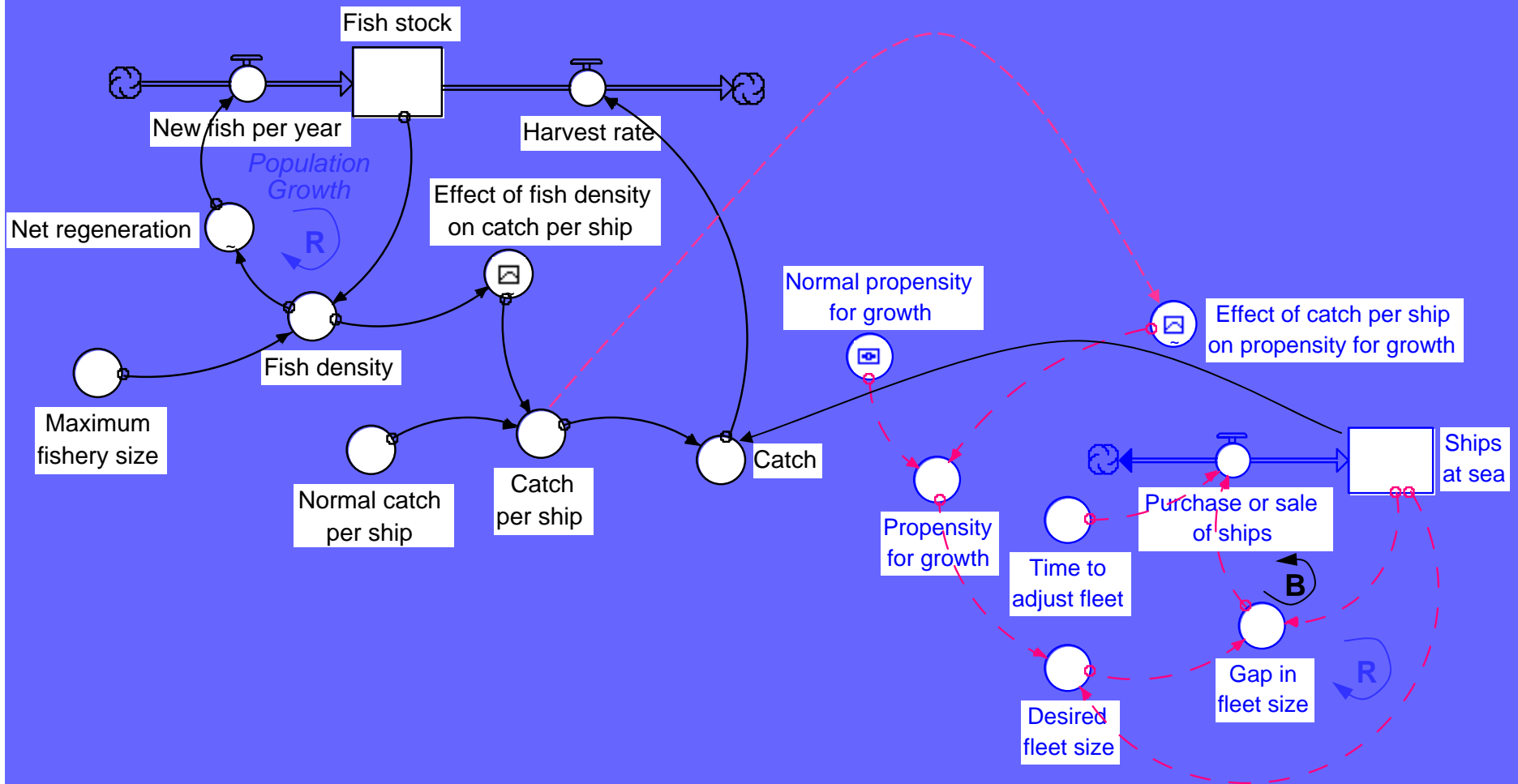
for a Poster Session at the 2007
International System Dynamics Conference
Boston MA

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Introduction

- The long-term sustainability of fisheries depends on maintaining the appropriate balance of fish and ships
- It sounds simple, but most of the world's fisheries are in danger of collapse within 40 years.
- In this poster session I explore the paradox of fisheries management with a small system dynamics model of a harvested fishery inspired by the well-known Fish Banks gaming-simulator.

Fish and Ships: A Fisheries Model with Endogenous Investment



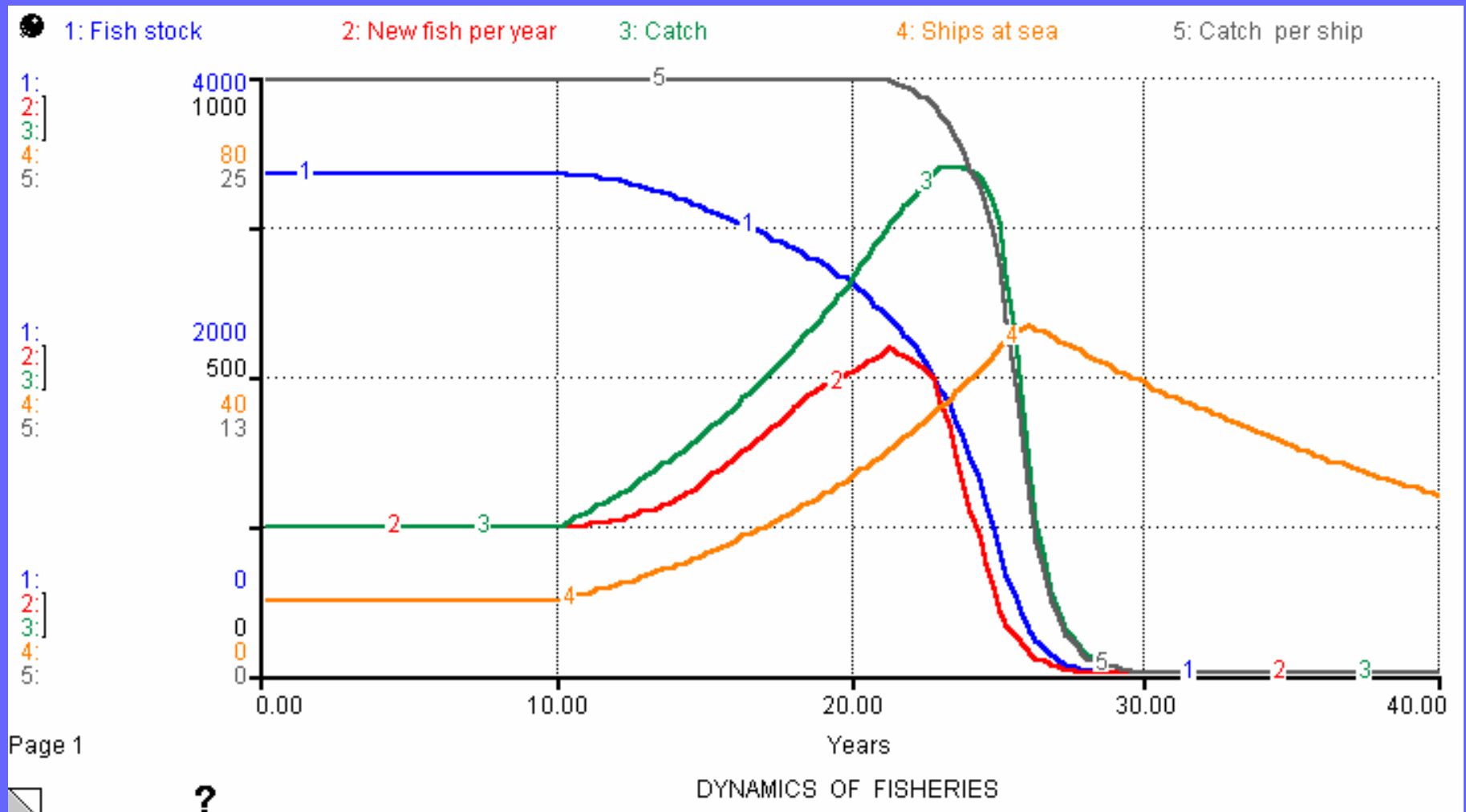
Notes on Fish Formulations

- The top left quadrant of 'Fish and Ships' represents a natural fishery, free from human intervention
- The regeneration of fish is a non-linear 'hump-shaped' function of fish density.
- Left alone this small yet dynamically complex system will reach a long-term equilibrium in which the fish stock equals the maximum fishery size. The sea is then full of fish.

Notes on Investment Formulations

- The lower right quadrant of 'Fish and Ships' represents the fishing fleet with endogenous investment.
- Ship purchasing is a standard asset stock adjustment formulation with a floating goal.
- The desired fleet size (the floating goal) depends on the current number of ships at sea modified by a propensity for growth.

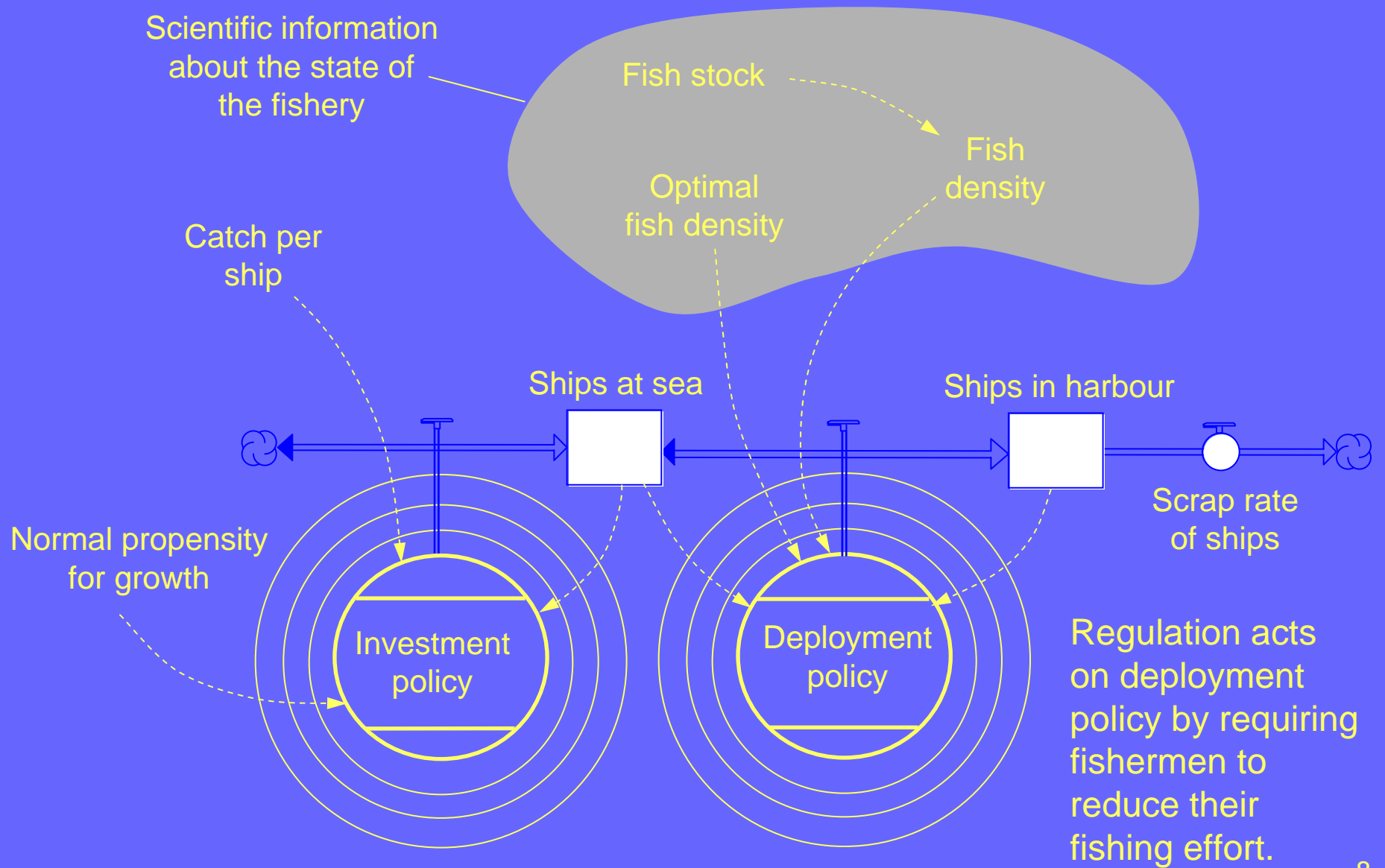
Dynamics of a Harvested Fishery



Regulatory Policy

- The model is extended to include regulatory policy.
- The fundamental purpose of regulatory policy is to ensure that scientific information about the state of the fishery limits fishing effort.

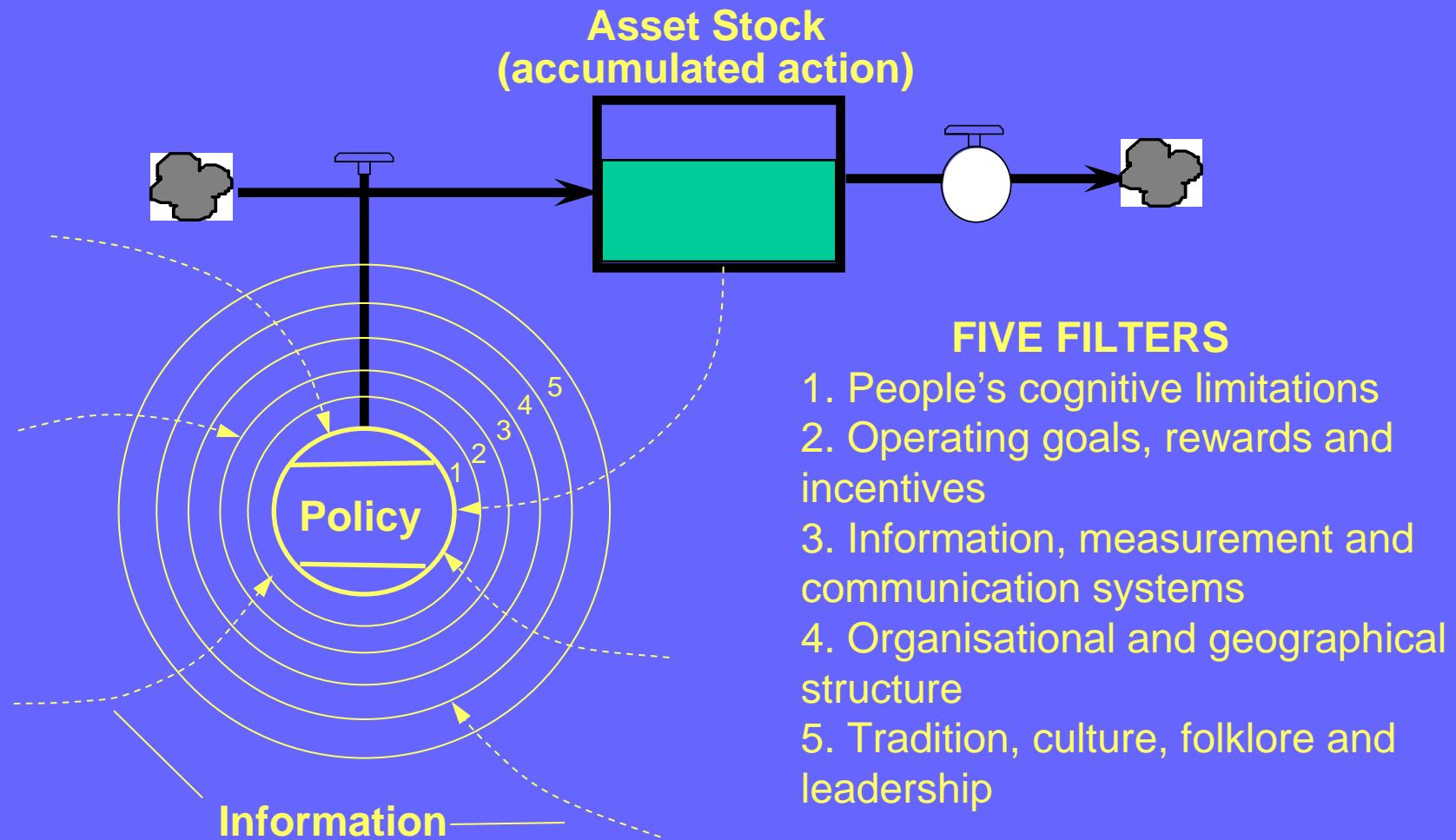
Policy Design in Fisheries



Notes on Policy and Information

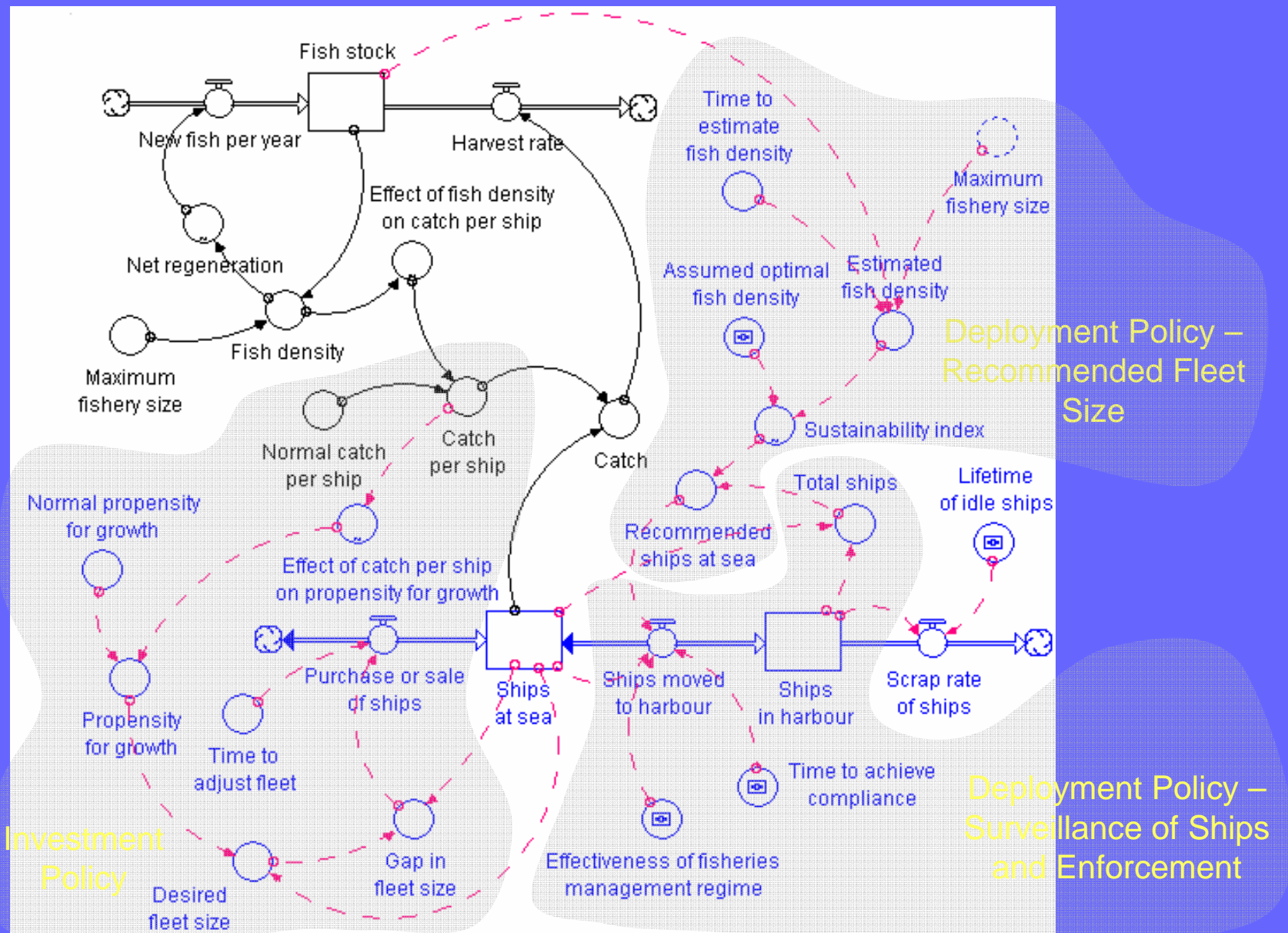
- Operating policy exists in an information jungle.
- There's far too much information.
- So managers (fleet operators or fishermen in this case) select information sources from those available – the assumption of bounded rationality

Bounded Rationality, Policy and Stock Accumulation

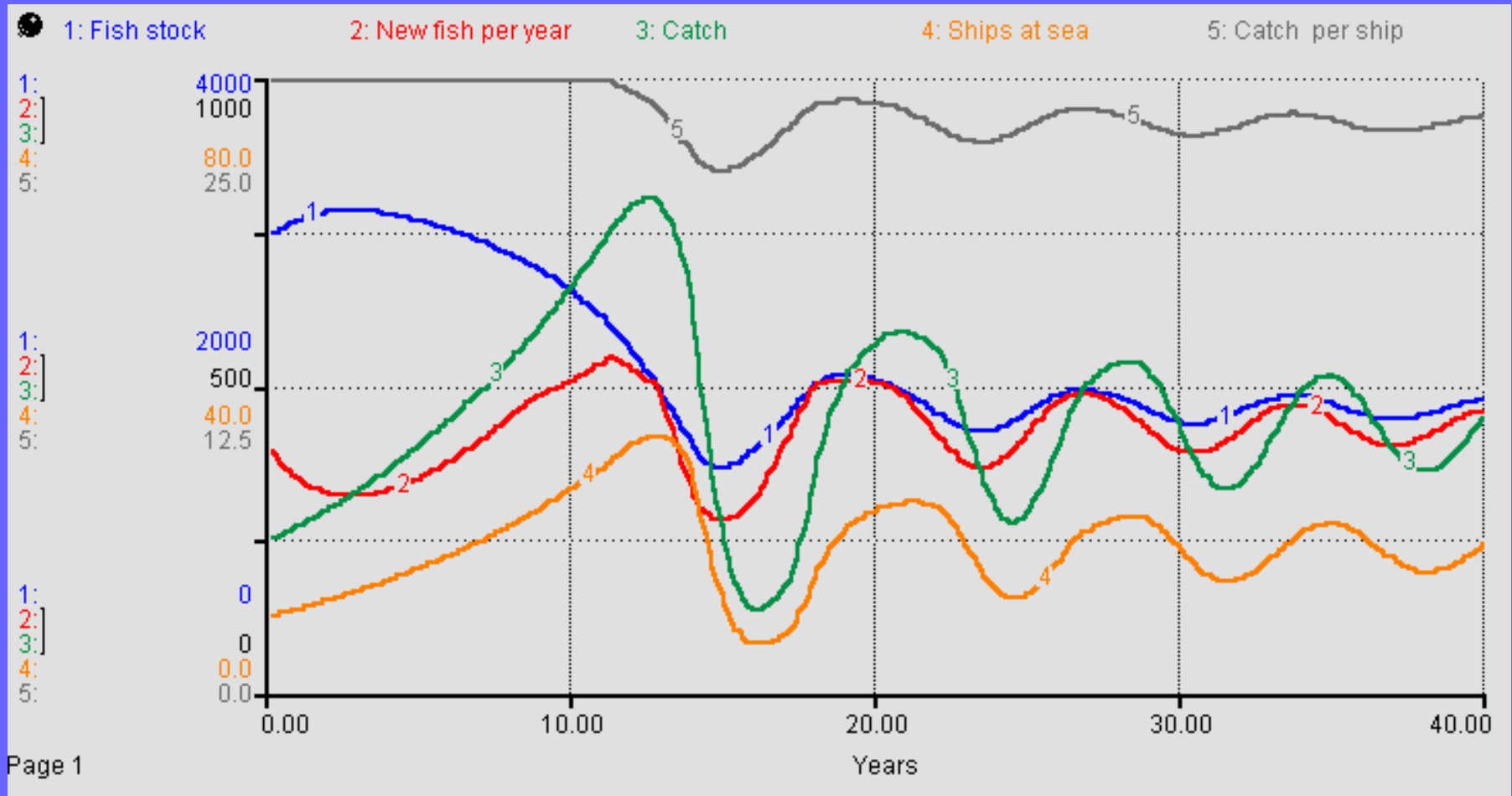


Only a few information sources penetrate the filters 10

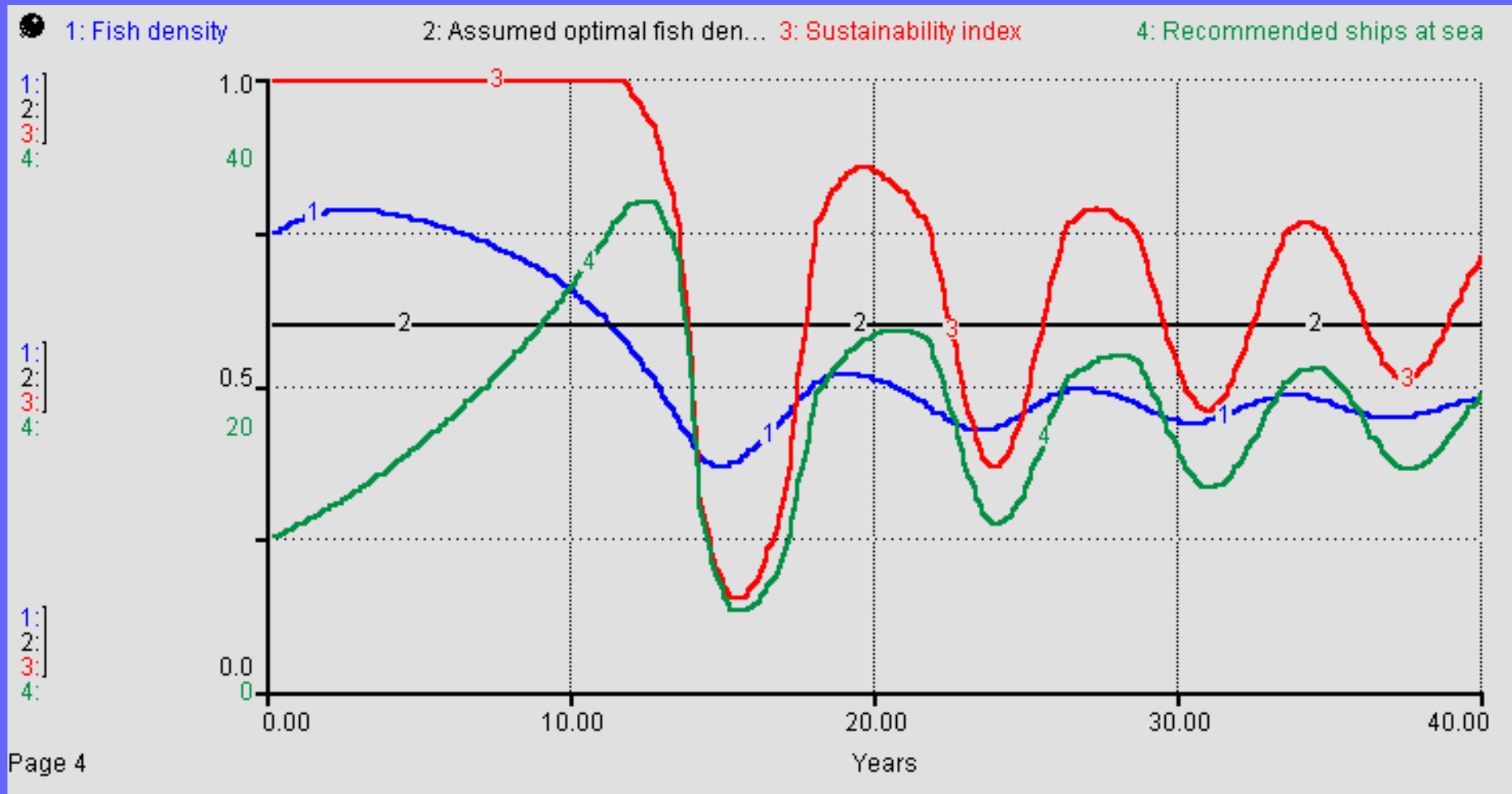
Overview of Fisheries Policy Model



Dynamics of a Regulated Fishery – Base Case



Trajectories Observed by the Regulator



More on Bounded Rationality and Dynamics



[www.wileyeurope.com/
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Strategic Modelling and Business Dynamics

A feedback systems approach



John Morecroft

Strategic Modelling and Business Dynamics

Chapter Titles

- Chapter 1 The Appeal and Power of Strategic Modelling
- Chapter 2 Introduction to Feedback Systems Thinking
- Chapter 3 Modelling Dynamic Systems
- Chapter 4 World of Showers
- Chapter 5 Cyclical Dynamics and the Process of Model Building



Strategic Modelling and Business Dynamics

Chapter Titles - Continued

Chapter 6 The Dynamics of Growth from Diffusion

Chapter 7 Managing Business Growth

Chapter 8 Industry Dynamics – Oil Price and the Global Oil Producers

Chapter 9 Public Sector Applications of Strategic Modelling

Chapter 10 Model Validity, Mental Models and Learning



Challenge – Run Your Own Fishery

- Go to the isee systems display area
- Ask to use the CD that accompanies *Strategic Modelling and Business Dynamics* (which is loaded on the demo computer)
- Try your hand at operating the Fisheries Gaming Simulator in the CD folder for Chapter 1

