FISHERIES PRODUCTION

SPINY LOBSTER

PEOPLE BENEFIT IN MANY WAYS FROM FISH

FOOD

TOURISM AND RECREATION

JOBS AND LIVELIHOODS

CULTURAL HERITAGE

InVEST FISHERIES MODEL

1. Estimate catch and revenue
2. Estimate changes in catch and revenue related to changes in habitat, fishing pressure, etc.

InVEST FISHERIES MODEL

LIBRARY OF SINGLE SPECIES MODELS

Caribbean spiny lobster
Belize

Dungeness Crab
Hood Canal, WA

White Shrimp
Galveston Bay, TX

Blue Crab
Galveston Bay, TX

InVEST FISHERIES MODEL

SPINY LOBSTER EXAMPLE

INPUTS

Life History
Recruitment
Age at maturity
Migration
Survival

Fishery Behavior
Fishing pressure
Market value

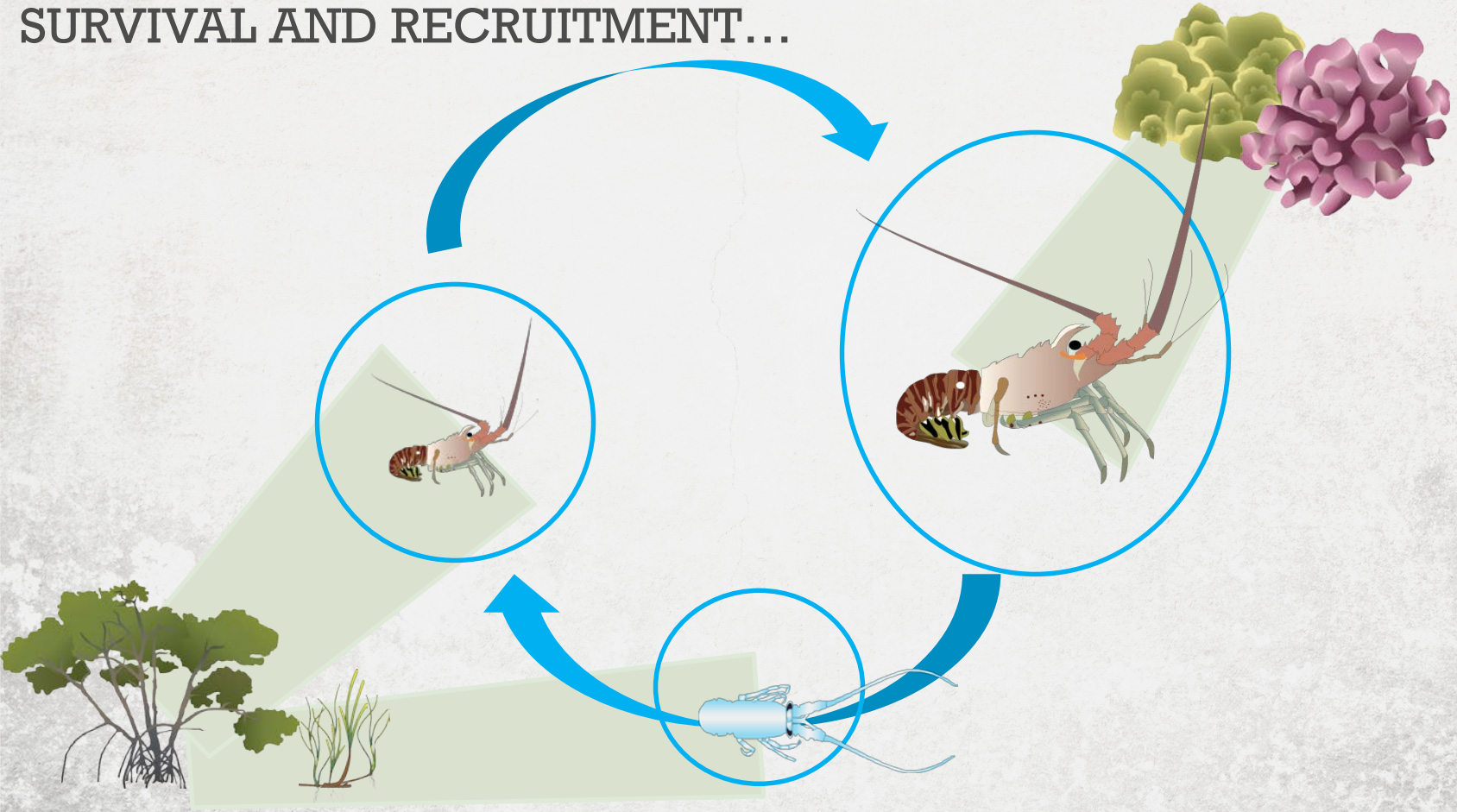
Habitat
Where?
How much?

OUTPUTS

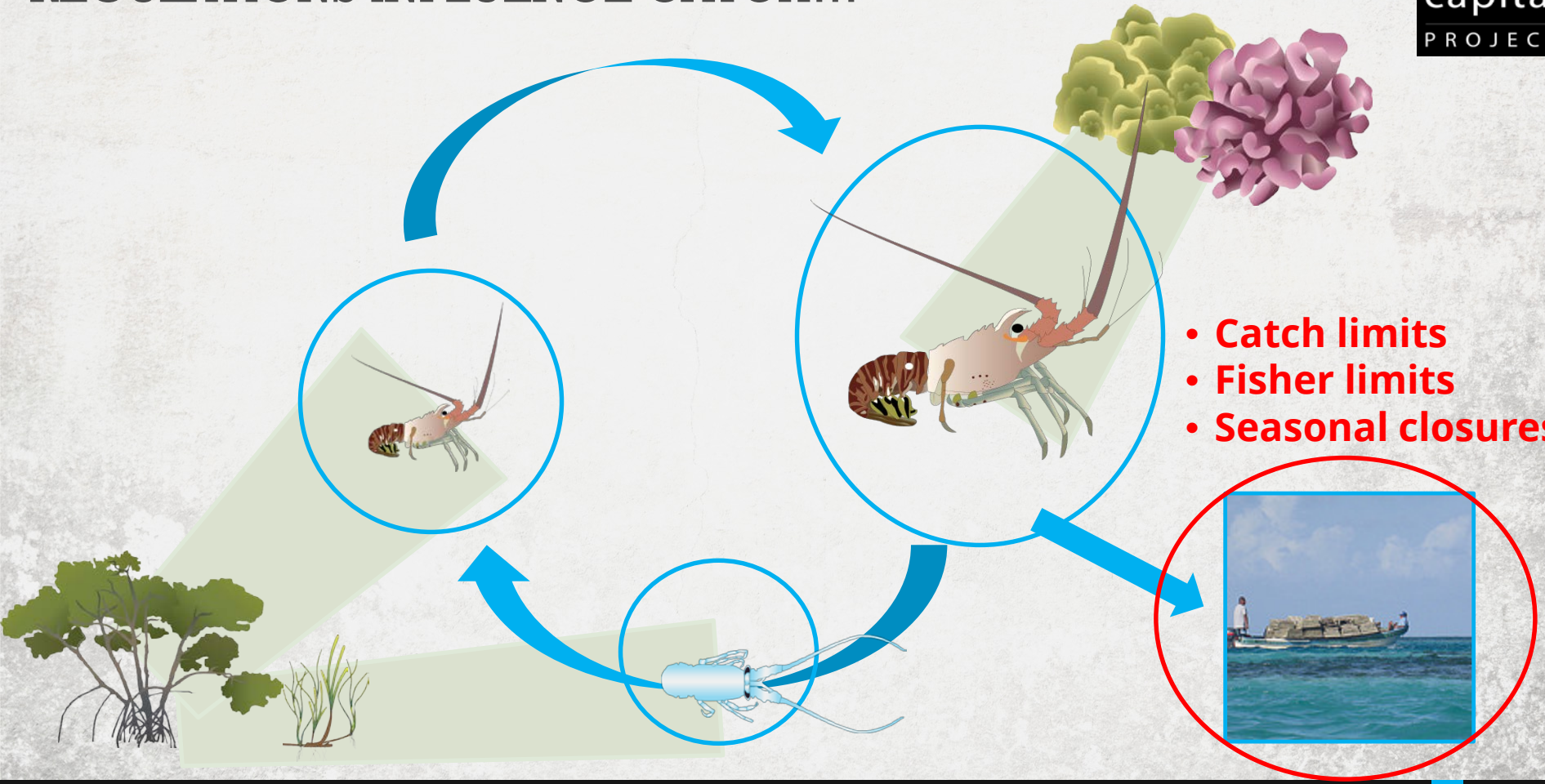
Catch of spiny lobster
(number/year)

Aggregate market value of catch
($/fishing zone/year)

HABITAT INFLUENCES SURVIVAL AND RECRUITMENT…



REGULATIONS INFLUENCE CATCH…



- **Catch limits**
- **Fisher limits**
- **Seasonal closures**

AGE-STRUCTURED MODEL (8 CLASSES)

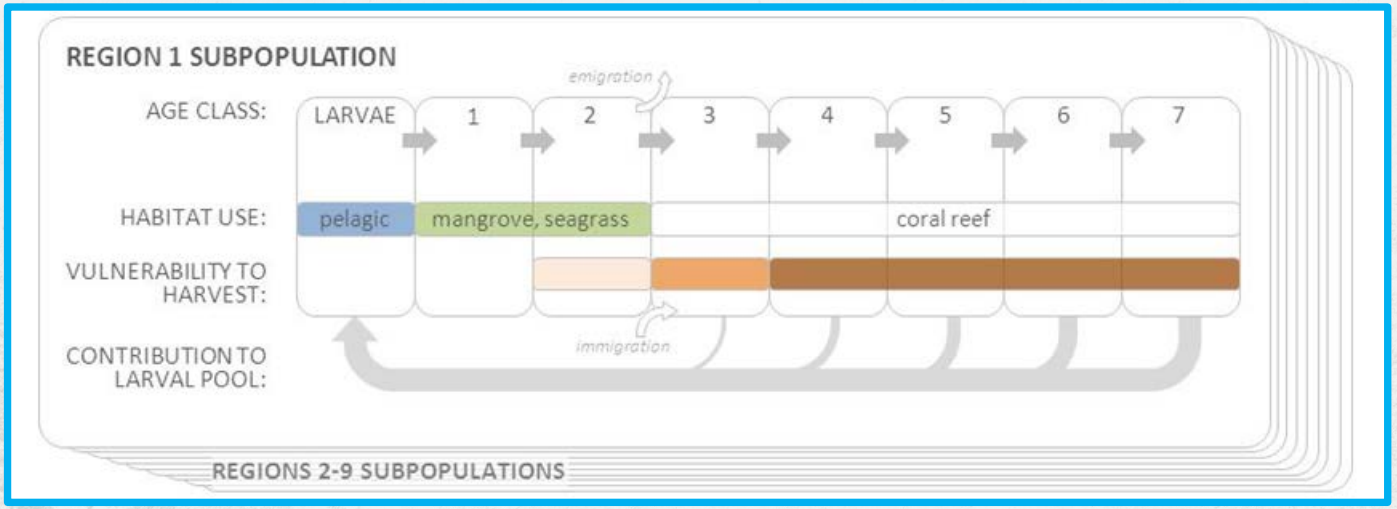
Recruitment function

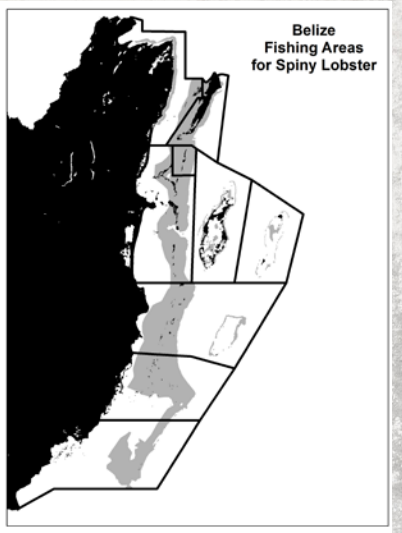
Habitats influence survivorship

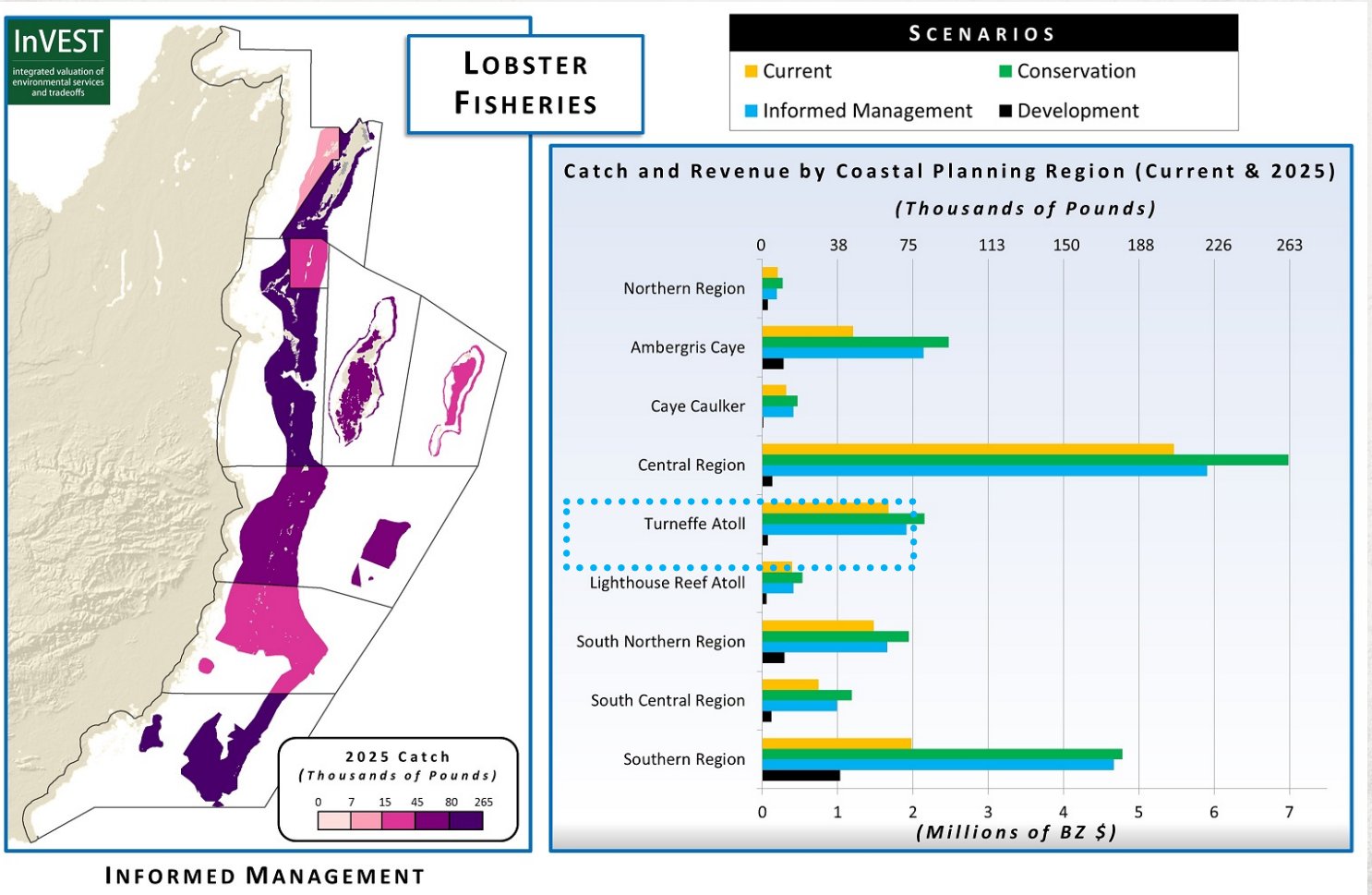
$$N_{a,x,y+1} = \begin{cases} \frac{\sum_x SB_{x,y}}{SB_0}\left(\alpha + \beta \frac{\sum_x SB_{x,y}}{SB_0}\right)^{-1} \frac{H_{h,x,SCEN}}{\sum_x H_{h,x,SCEN}} S_{a,x} & \text{if } a = 0 \\ (N_{a-1,x,y} - C_{a-1,x,y}) S_{a,x} & \text{if } 1 \leq a \leq A-1 \\ (N_{A-1,x,y} - C_{A-1,x,y}) S_{A,x} + (N_{A,x,y} - C_{A,x,y}) S_{A,x} & \text{if } a = A \end{cases}$$

Regulations influence catch

MULTIPLE SUB-REGIONS






InVEST
integrated valuation of environmental services and tradeoffs
LOBSTER FISHERIES
SCENARIOS
Current
Conservation
Informed Management
Development
Catch and Revenue by Coastal Planning Region (Current & 2025)
(Thousands of Pounds)
0
38
75
113
150
188
226
263
Northern Region
Ambergris Caye
Caye Caulker
Central Region
Turneffe Atoll
Lighthouse Reef Atoll
South Northern Region
South Central Region
Southern Region
0
1
2
3
4
5
6
7
(Millions of BZ $)
2025 Catch
(Thousands of Pounds)
0
7
15
45
80
265
INFORMED MANAGEMENT

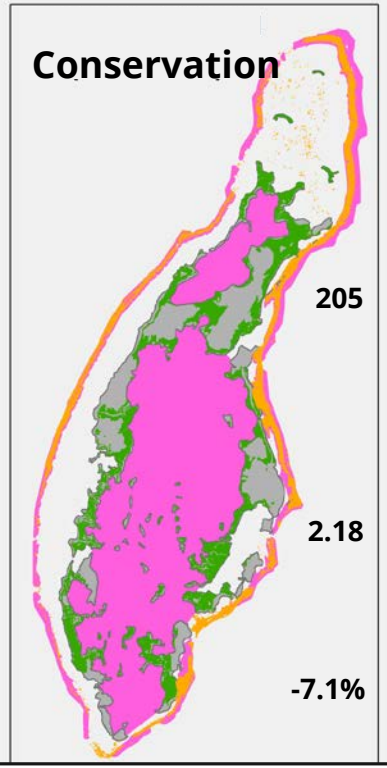
TURNEFFE ATOLL

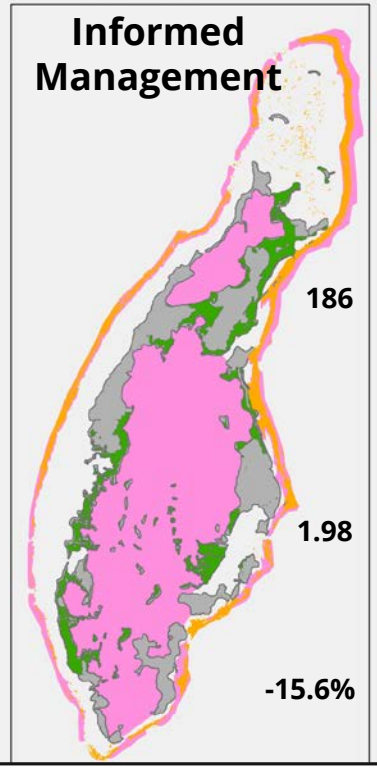
Year: 2025

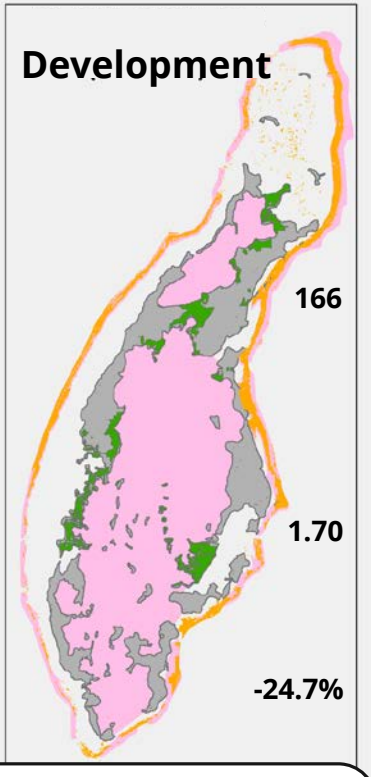
Annual catch (thsd of pounds)

Total revenue (mill of BZ $)

% change in revenue from current



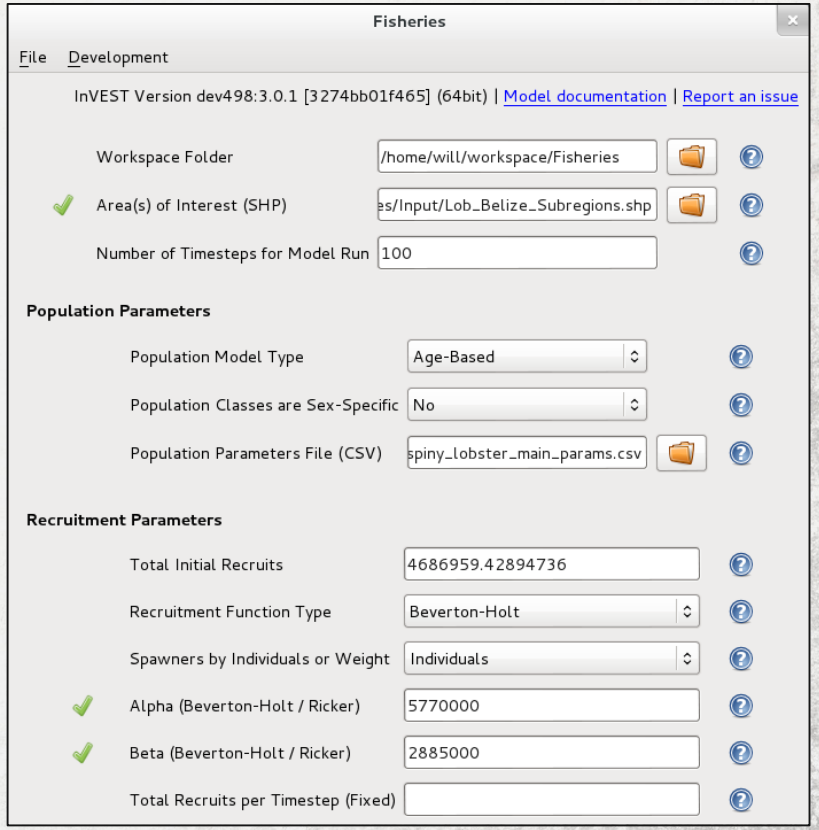




MODEL LIMITATIONS

- Equilibrium model = good for scenarios, not for predicting next year's catch.
- Habitat dependencies are obligatory (i.e. habitat substitutability is not explicitly represented).
- Harvest rates are assumed to be constant (not responsive to abundance).
- Model must be adapted for each species/region.

InVEST Fisheries Model

Find out more…

- It's in InVEST!
- How it works
- Case study: Belize
- On the horizon: new approaches