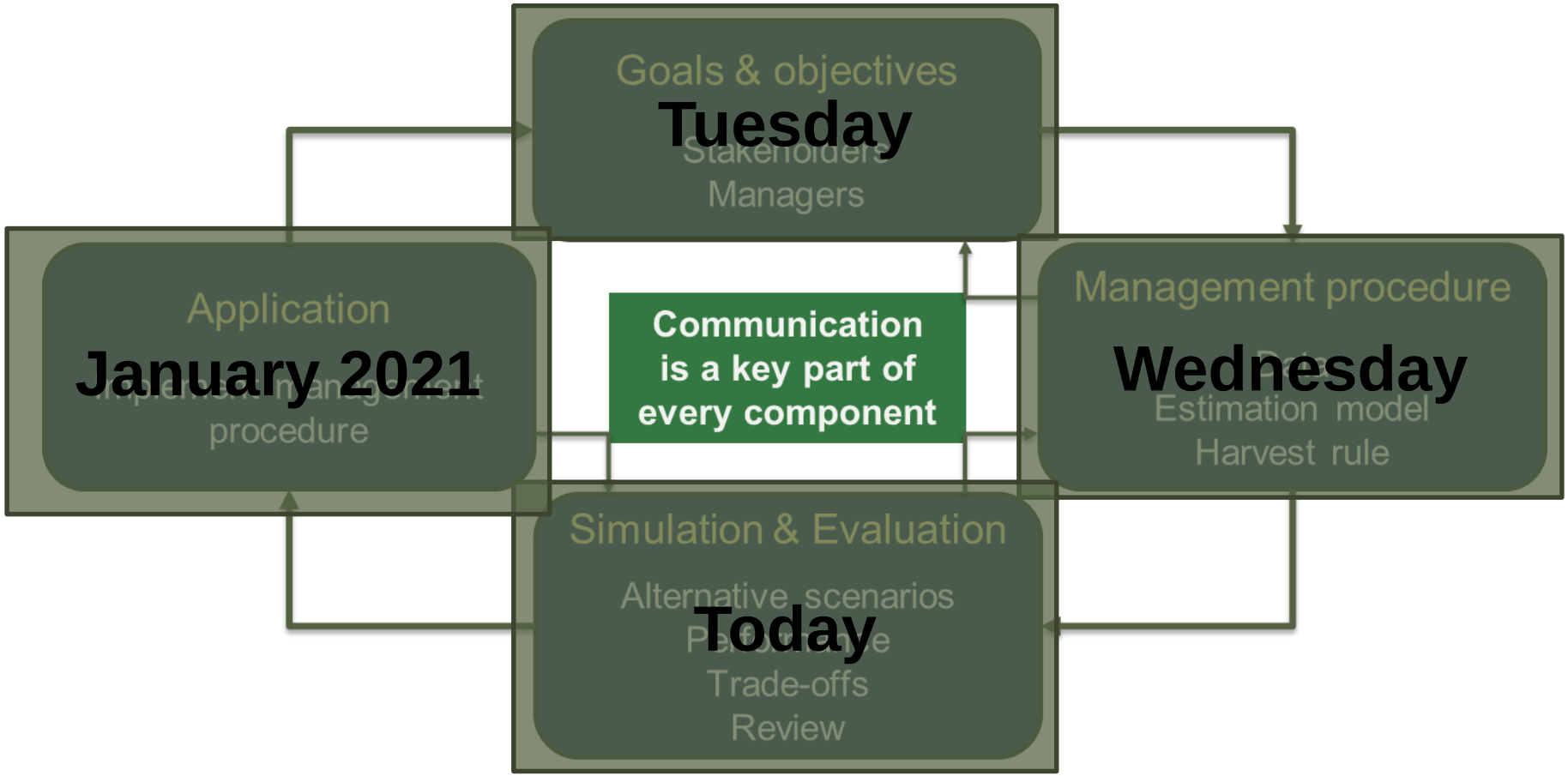
INTERNATIONAL PACIFIC HALIBUT COMMISSION

MSE Framework

Agenda Item 5

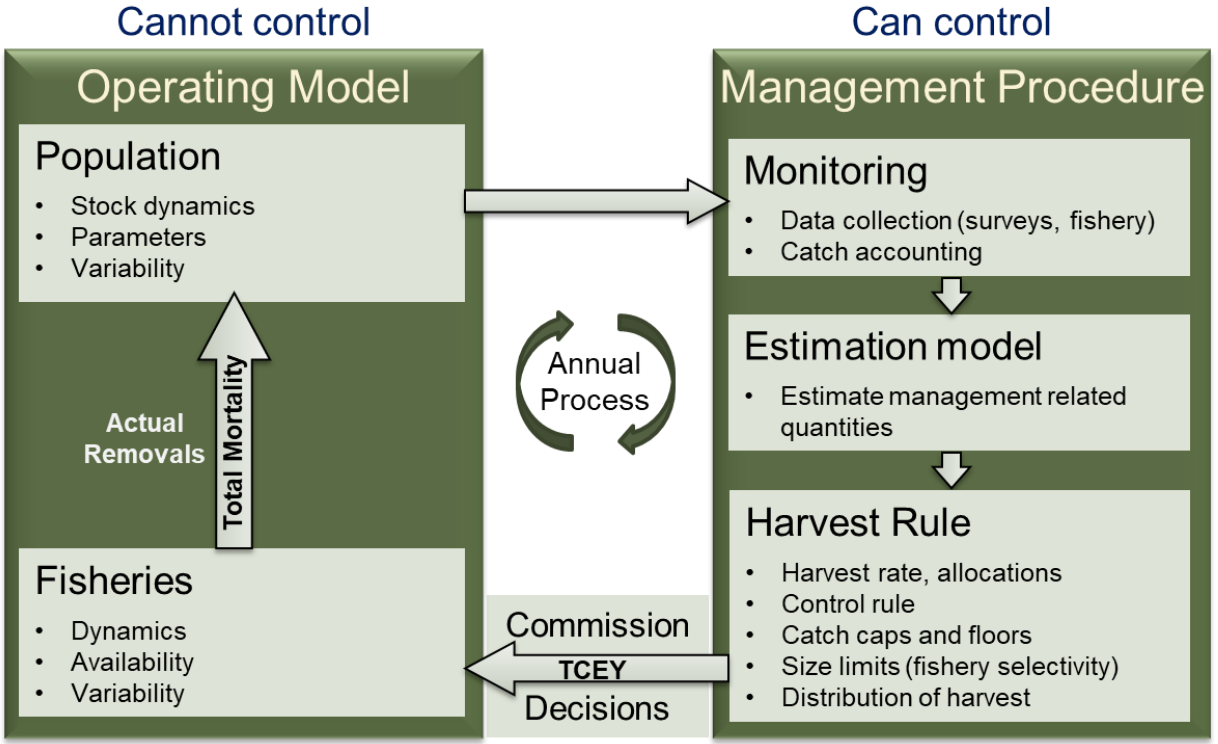
IPHC-2019-SRB015-08

MSE framework



MSE framework elements

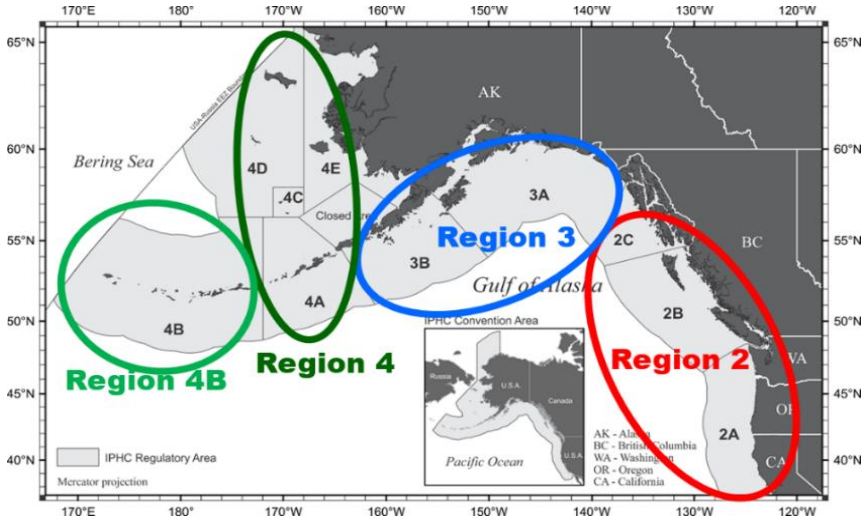
- Multi-area OM
  - Condition
  - Validate
  - Integrate MPs
  - Output MPs



IPHC-2019-MSAB014-INF01 is a living document containing some technical details

Halibut Operating Model

- Create initial ~stable population
- Condition using historical data to mimic stock “now”
- Forward-model stock biology & dynamics …
  - *For each age & sex class, in each Biological Region or IPHC Regulatory Area, per year:*
    - Recruitment (new halibut joining stock from previous year’s spawn)
    - Migration (patterns, dynamics,
    - Natural mortality (where & when)
    - Maturation (from numbers-at-age)
    - Spawning (mature-at-age x % spawning)
- … and Fishing Mortality
  - *By fishery sector, per active region:*
    - Unique selectivity
    - Fixed biomass (catch, set by MP)
    - Account for bycatch, discards

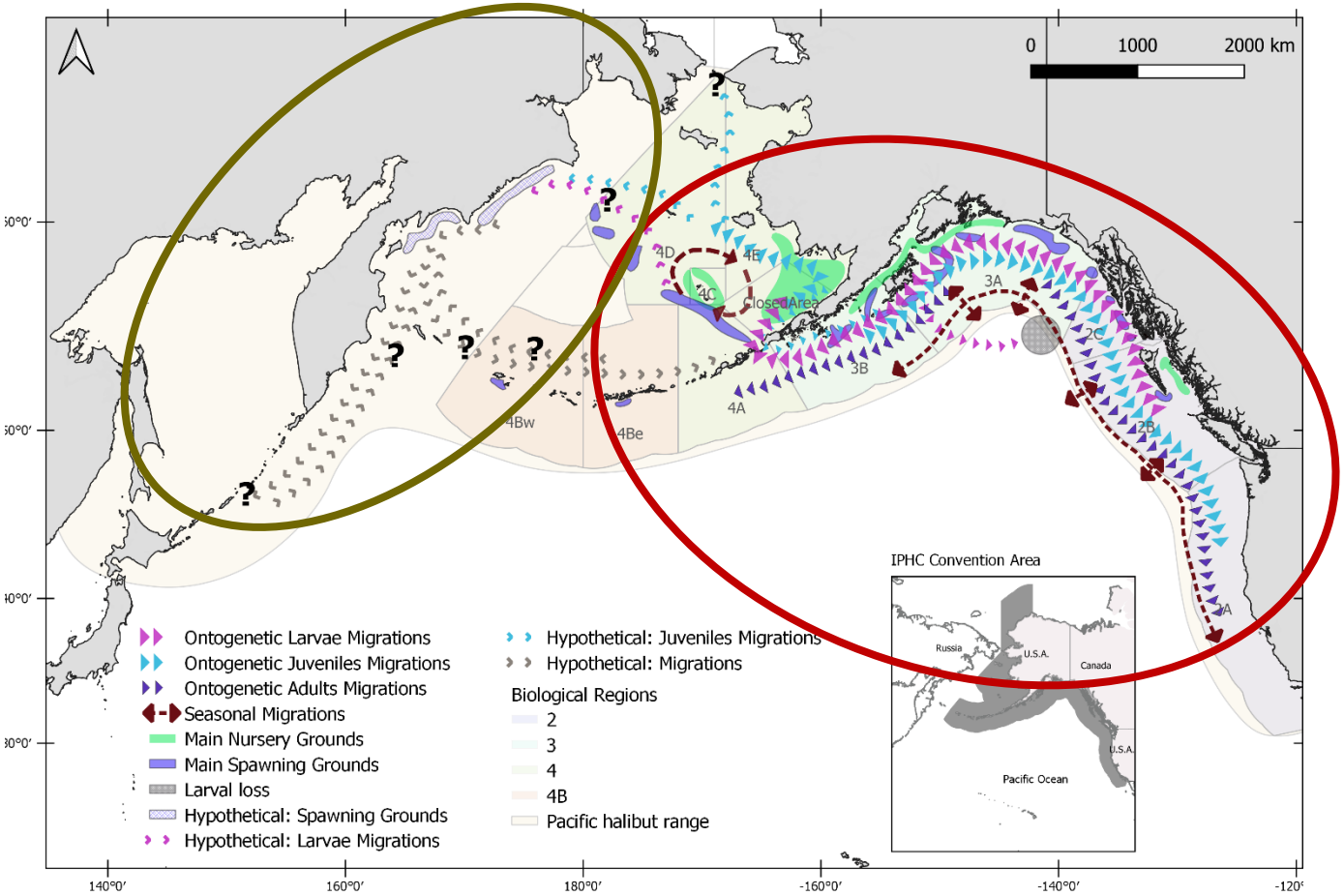


Technical Development Update

- Operating model (C++)
  - Initial model (prev slide) ***ongoing:***
    - More testing; validate against R, Stock Synthesis models
    - Improve initial population, conditioning tooling
    - Add ability to compare w/ stock assessment
    - Hooks for MPs
- Management Procedure (C++, R)
  - ***Ongoing:***
    - Templates for single, combined harvest controls, constraints
    - Complete “closed loop”
- ”Behind the scenes”
  - ***Ongoing:***
    - Improve large data set management, querying
    - Easy configuration & flexibility; job management

Movement

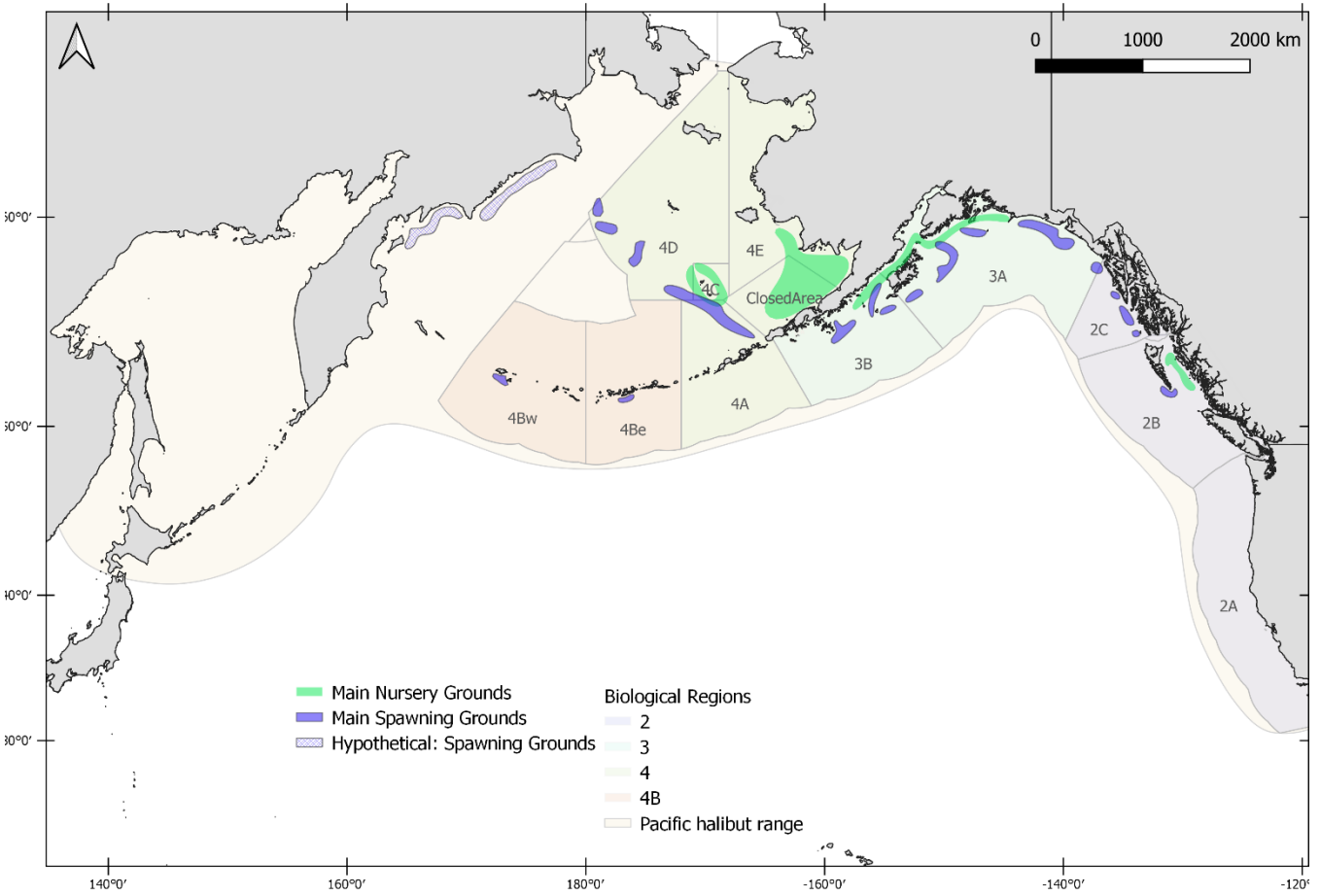
Conceptual model of main ontogenetic and seasonal migrations



Movement

Spawning and Nursery grounds

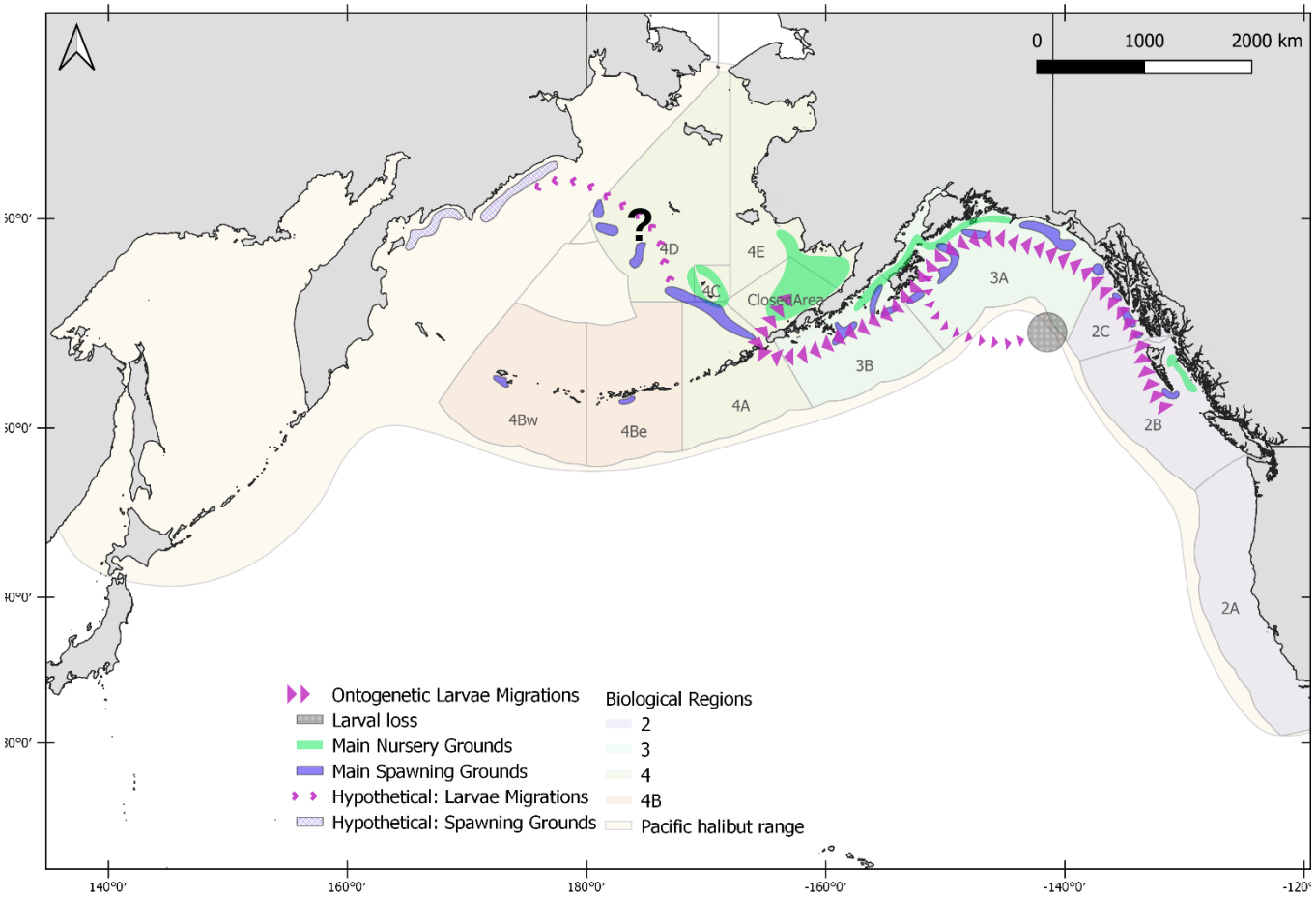
Nursery grounds: from settlement of larvae (6-7 months) to about 2 years of age.



Movement

Ontogenetic eggs and larvae Migrations

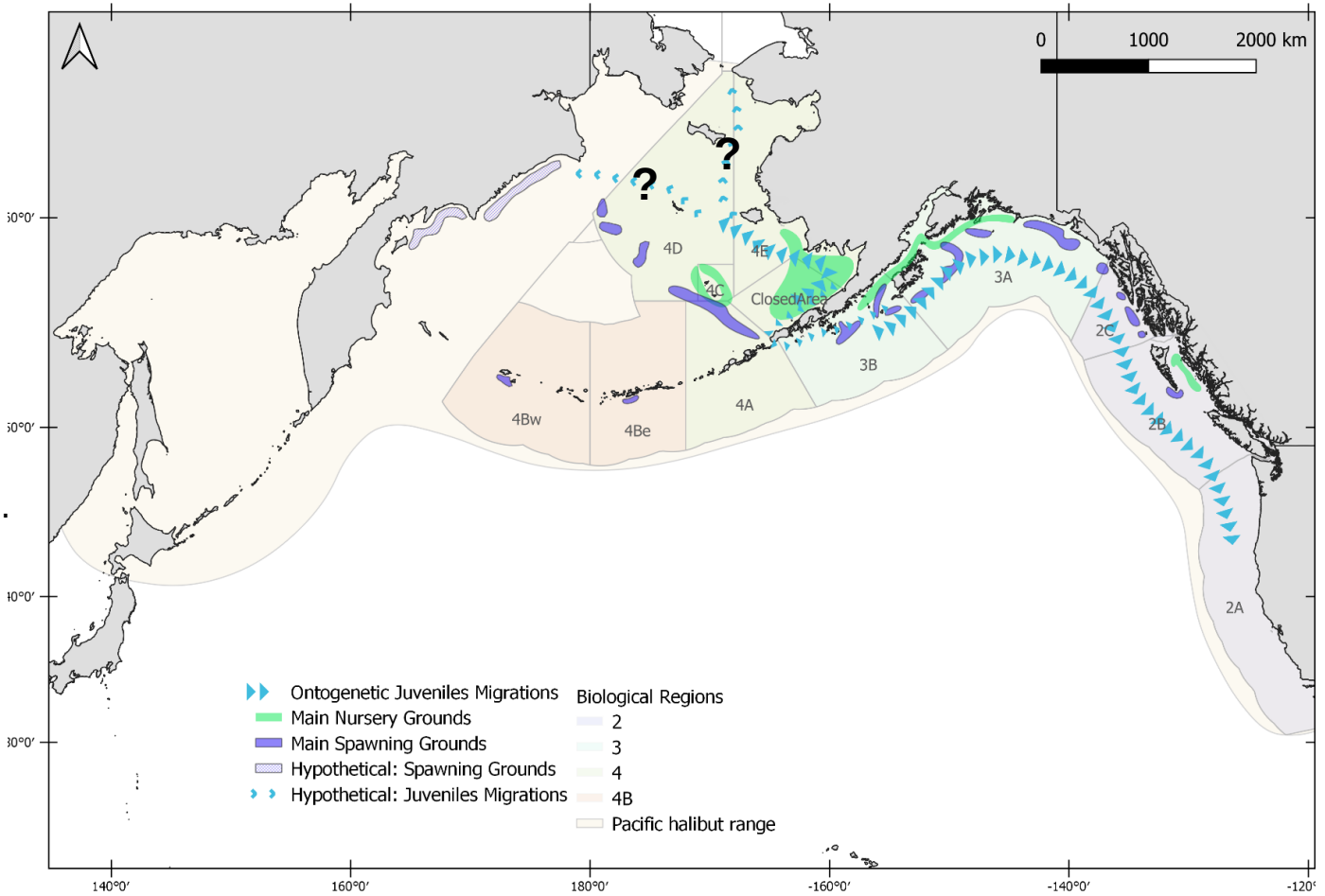
Natant stage till 6-7 months of age.



Movement

Ontogenetic Juveniles Migrations

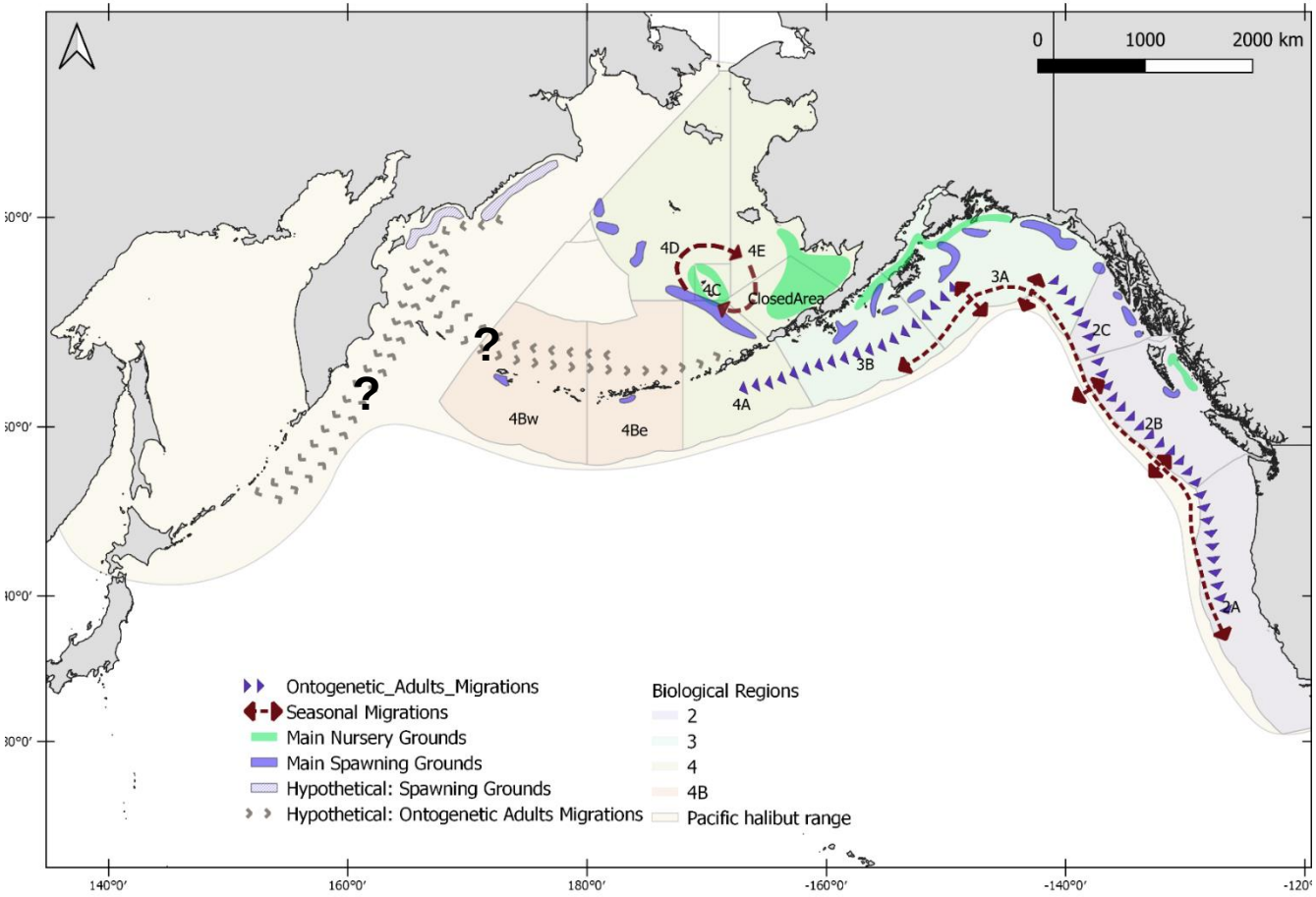
Early juveniles: 7months to 2 years old.
Juveniles: 2-8 years old.
Late juveniles: 8-12 years old.



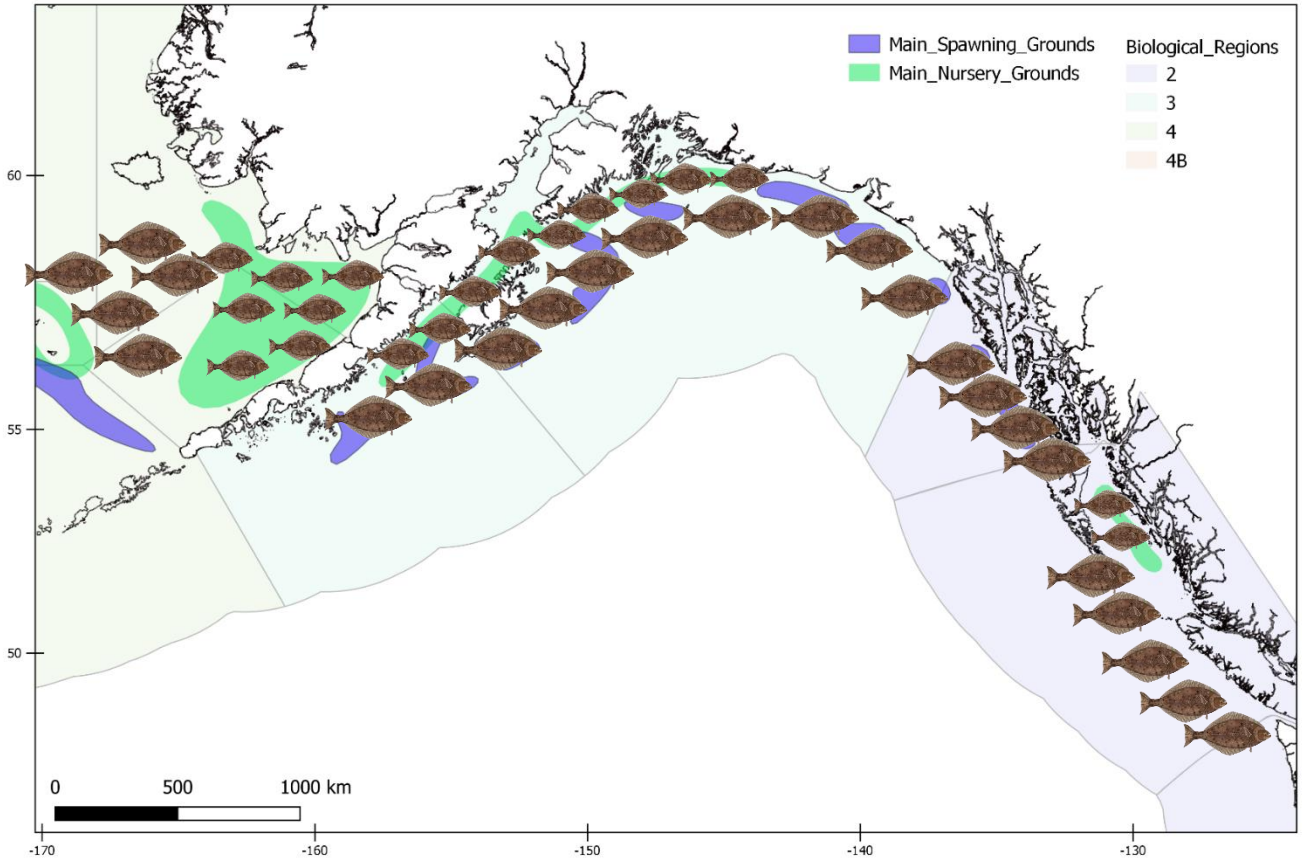
Movement

Ontogenetic and seasonal Adults Migrations + hypothetical migrations in the Western Bering Sea

From age 12+



Modelling movements in the OM

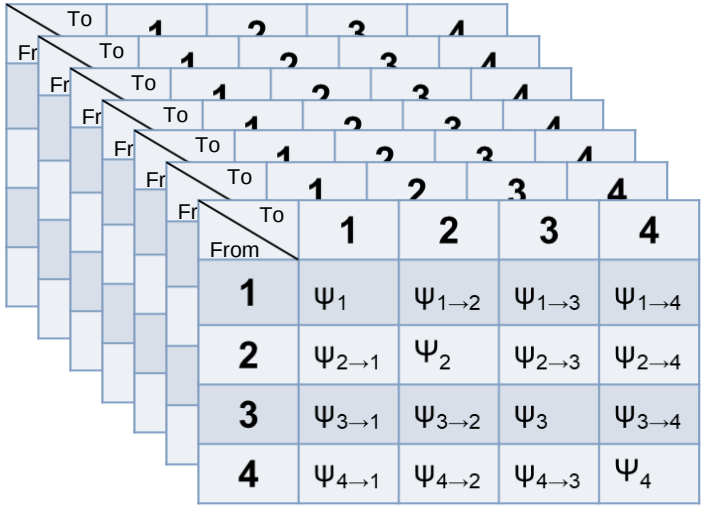


Modelling movement in practice

Transition Matrix:

From \ To	1	2	3	4
1	Ψ_1	$\Psi_{1\to2}$	$\Psi_{1\to3}$	$\Psi_{1\to4}$
2	$\Psi_{2\to1}$	Ψ_2	$\Psi_{2\to3}$	$\Psi_{2\to4}$
3	$\Psi_{3\to1}$	$\Psi_{3\to2}$	Ψ_3	$\Psi_{3\to4}$
4	$\Psi_{4\to1}$	$\Psi_{4\to2}$	$\Psi_{4\to3}$	Ψ_4

- 30 age groups
- 2 sex



Metrics by IPHC Regulatory Area

- Various metrics may need to be calculated at the IPHC Regulatory Area level
  - e.g., survey index, fishery CPUE
- Approximate by assigning proportion in each IPHC Regulatory Area
  - Conditioning and a closer look at data provide information and will identify how much variability from year to year

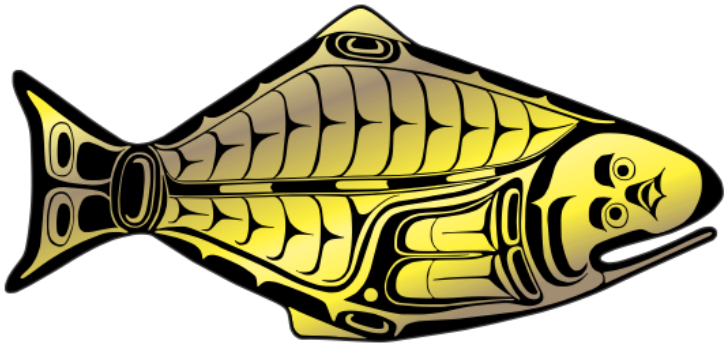
Sectors

- Multiple fisheries in each IPHC Regulatory Area
  - The MP will distribute mortality to these according to current practice
    - With implementation variability when appropriate

Summary

Coastwide	Regions	IPHC Reg Areas
Spawning Biomass	Movement	Fisheries
Recruitment	Age-0 distribution	Survey
Fisheries	*Fisheries*	
Survey	*Survey*	

INTERNATIONAL PACIFIC



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