Overcoming challenges in conducting management strategy evaluation in a multi-species, multi-government fishery system, with application to bycatch harvest policies for Pacific halibut in the Bering Sea and Aleutian Islands

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Curry Cunningham[1], Dana Hanselman[1], Allan Hicks[3], Jim Ianelli[1], and Diana Stram[2]

(in alphabetical order)

National Oceanic and Atmospheric Administration[1], North Pacific Fishery Management Council[2], and International Pacific Halibut Commission[3]

Pollock

Pacific cod

Sablefi
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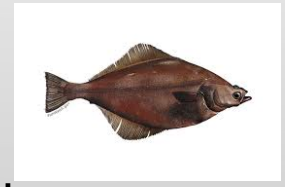
Yellowfin sole

N. rock sole

Flathead sole



Arrowtoot
h flounder

Greenland
turbot

Alaska
plaice

...

Pollock

Eastern Bering Sea Pollock 201

Catch Limit: 1.4 million t

Final Catch: 1.4 million t

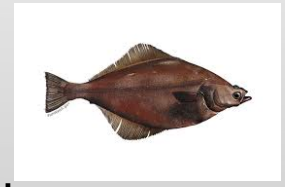
Pacific cod

Sablefish

Yellowfin sole

N. rock sole

Flathead sole



Arrowtooth flounder

Greenland turbot

Alaska plaice

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Pollock

Pacific cod

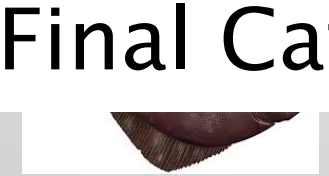
Northern Rock Sole 2018

Final Catch Limit: 47,100 t

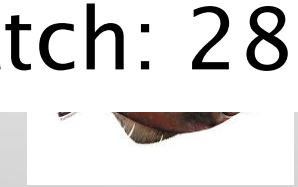
Final Catch: 28,000 t

Yellowfin sole

N. rock sole



Flathead sole



Arrowtooth flounder

Greenland turbot

Alaska plaice

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Why are catches < final catch limits for many species?

1. Need to avoid bycatch species and target species that are “choke” species for certain gear types (e.g. Pacific cod caught by trawl)
2. Economic decisions
3. ?

Pacific halibut is both a target and a bycatch species, depending on sector and gear

2018:

~Eastern Bering Sea and Aleutian Islands:

Final Catch Limit: 3,013 t (fish > 81cm)
Final Catch: 3,368 t (fish > 81 cm)

Bycatch limit: 3,515 t (all sizes)

The Pacific halibut fishery

Caught by longline only, in a sector just for halibut:

“the directed halibut fishery”

Pollock

Midwater trawl

Longline, bottom trawl, pot, and jig

Pacific cod

Longline

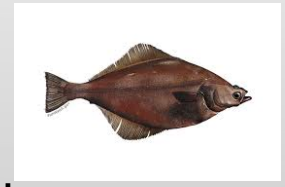
Sablefish

Bottom trawl, midwater trawl

Yellowfin sole

N. rock sole

Flathead sole



Arrowtooth flounder

Greenland turbot

Alaska plaice

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Pollock

AFA, CDQ

Longline, longline CDQ, AM80, TLAS, pot, and jig

Pacific cod

Sablefish

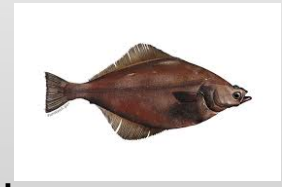
Longline, longline CDQ

AM80, TLAS, trawl CDQ

Yellowfin sole

N. rock sole

Flathead sole



Arrowtooth flounder

Greenland turbot

Alaska plaice

…

Pacific halibut is managed by the International Pacific Halibut Commission: treaty between the US and Canada (except for bycatch)

International Pacific Halibut Commission

↓

Coastwide survey + stock assessment

↓

U.S. and Canada Negotiate

↓

Coastwide catch limit (66 cm +)

West Coast

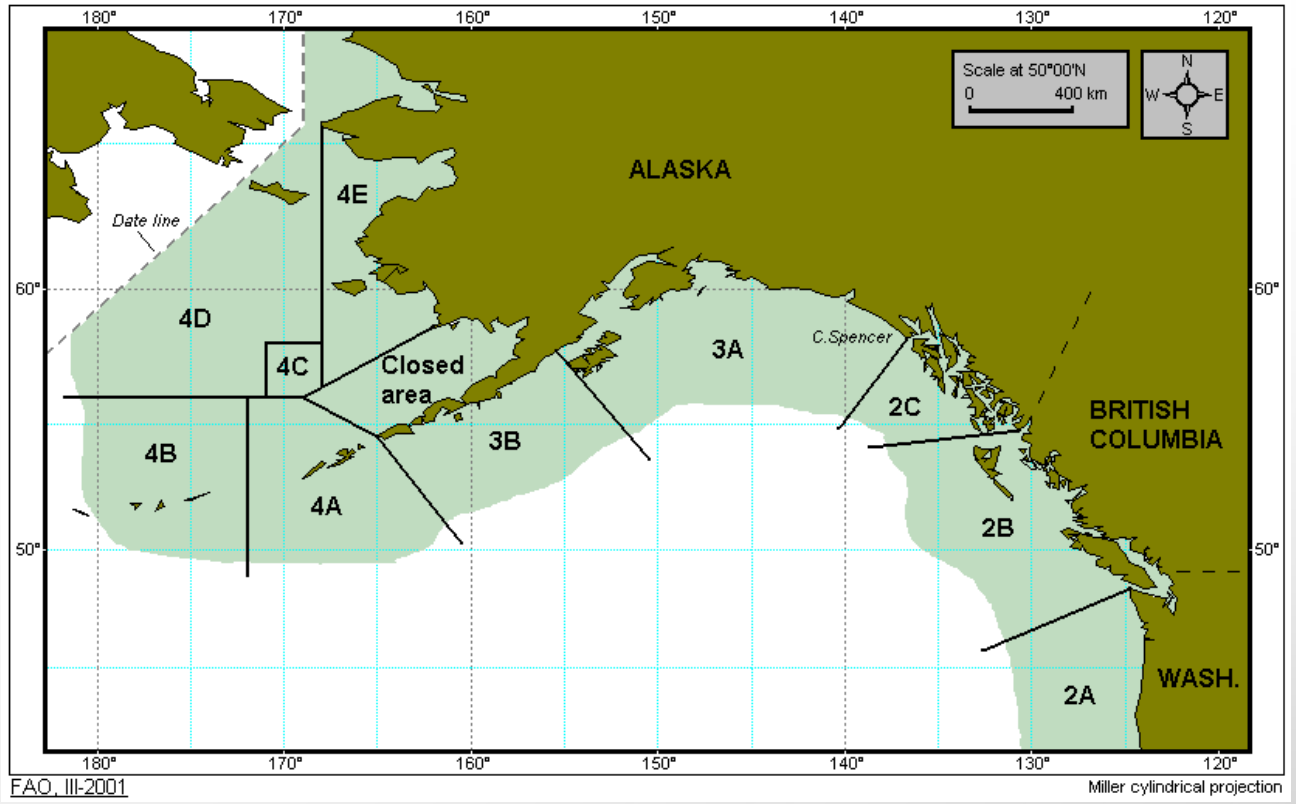
Canada

Areas in Southeast Alaska and Gulf of Alaska

Areas in Bering Sea and Aleutian Islands

↓

Directed fishery limit = Area Total – Expected 66+cm bycatch



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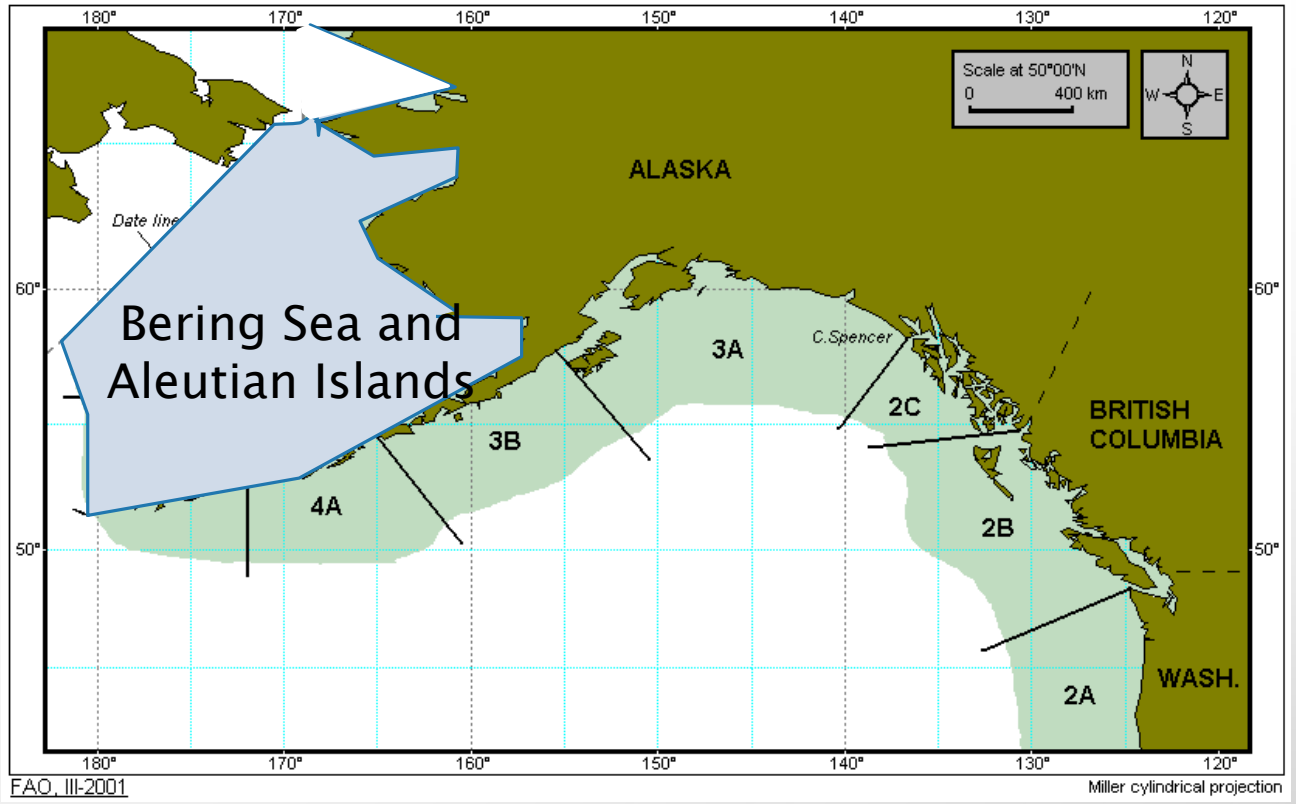

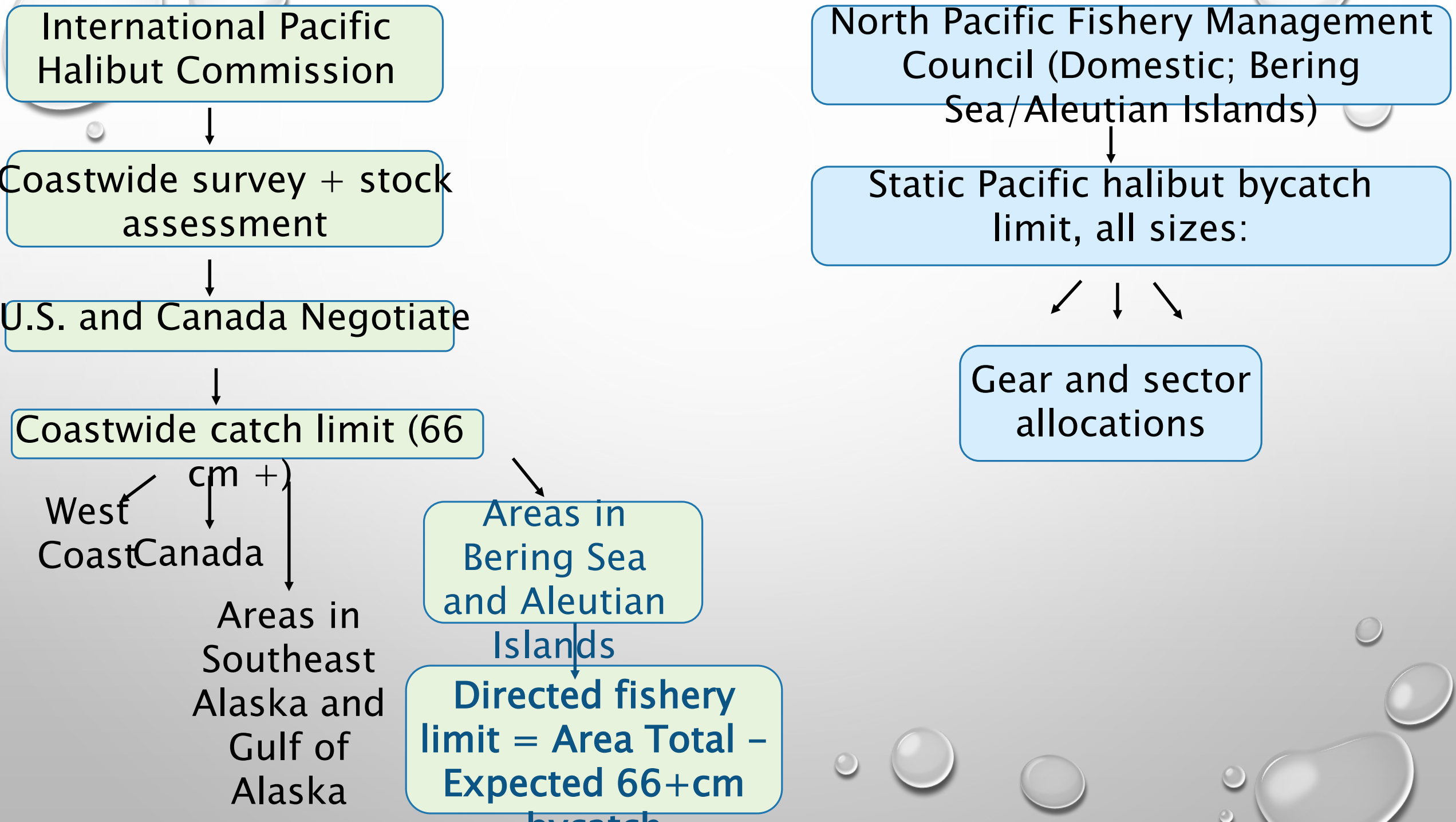
International Pacific Halibut Commission
Coastwide survey + stock assessment
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Coastwide catch limit (66 cm +)
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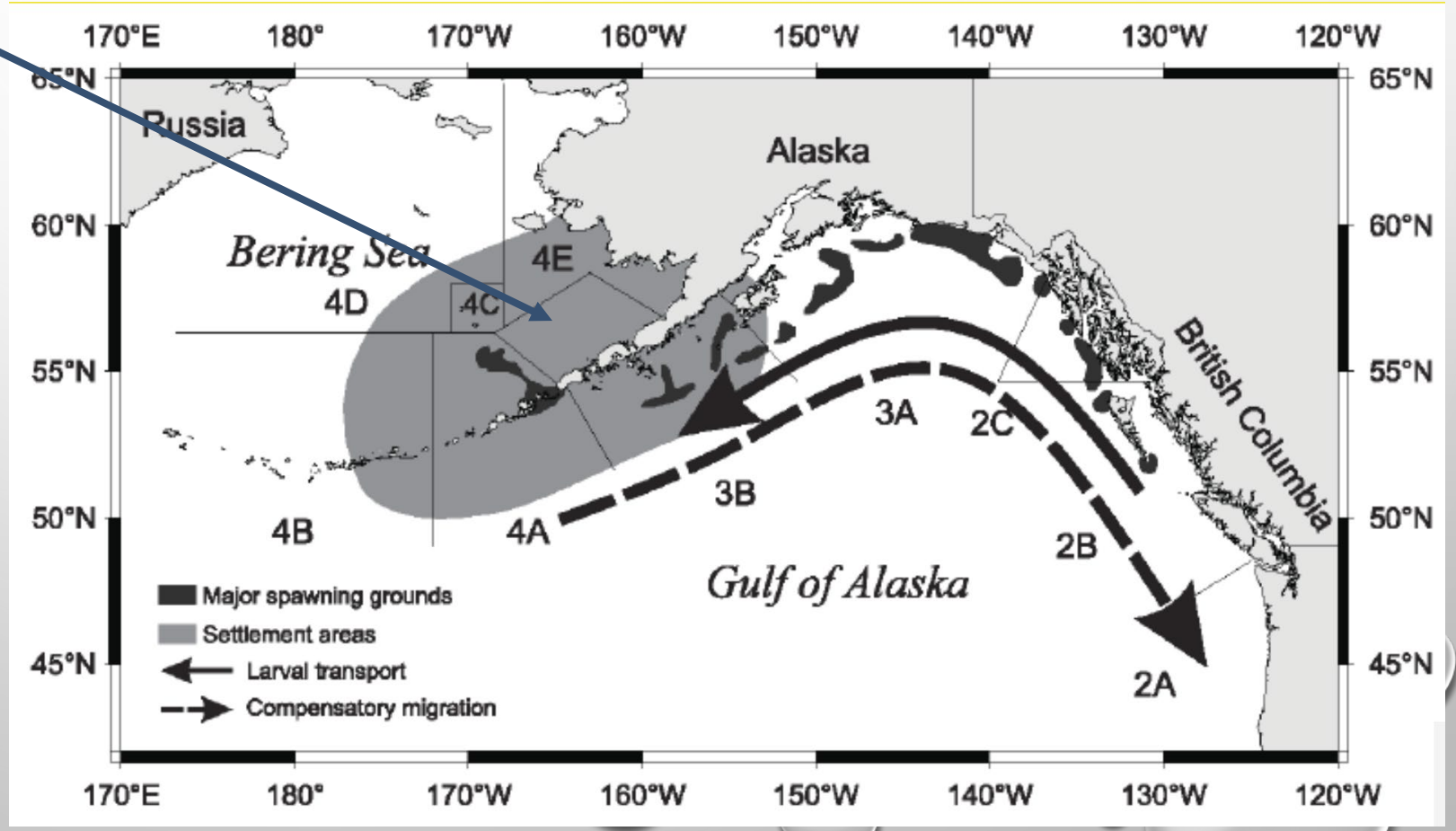
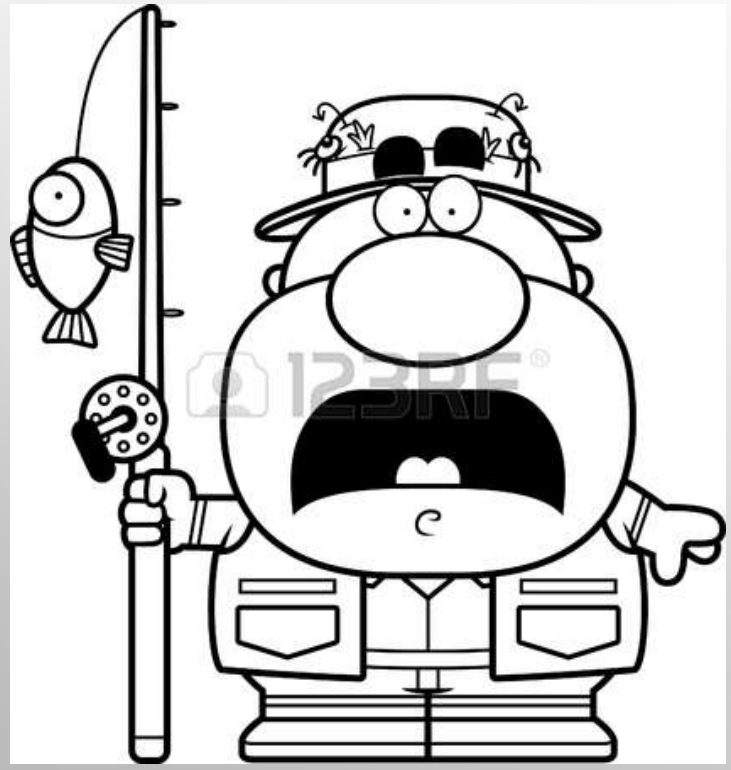
Canada
Areas in Southeast Alaska and Gulf of Alaska
Areas in Bering Sea and Aleutian Islands
Directed fishery limit = Area Total – Expected 66+cm
North Pacific Fishery Management Council (Domestic; Bering Sea/Aleutian Islands)
Static Pacific halibut bycatch limit, all sizes:
Gear and sector allocations

In some years the Pacific halibut bycatch in the Bering Sea and Aleutian Islands is greater than the directed fishery catch limit

Trawl catches smaller halibut than longline: Directed fishery concerned that bycatch users harvest small halibut that can't grow to recruit to directed fishery

Many small halibut h





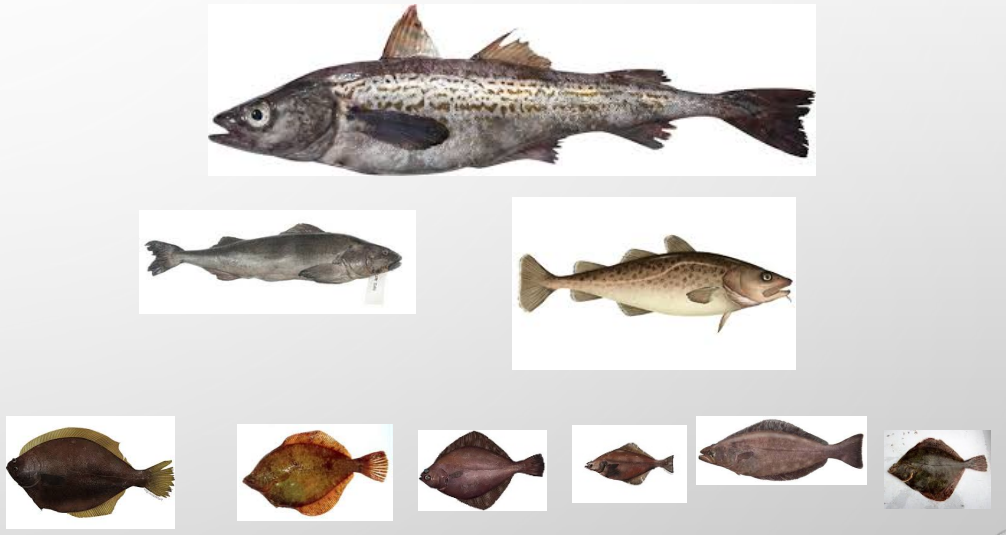
These concerns led to the North Pacific Fishery Management Council, “the Council,” to consider halibut bycatch limits that are based on halibut abundance in the Bering Sea and Aleutian Islands

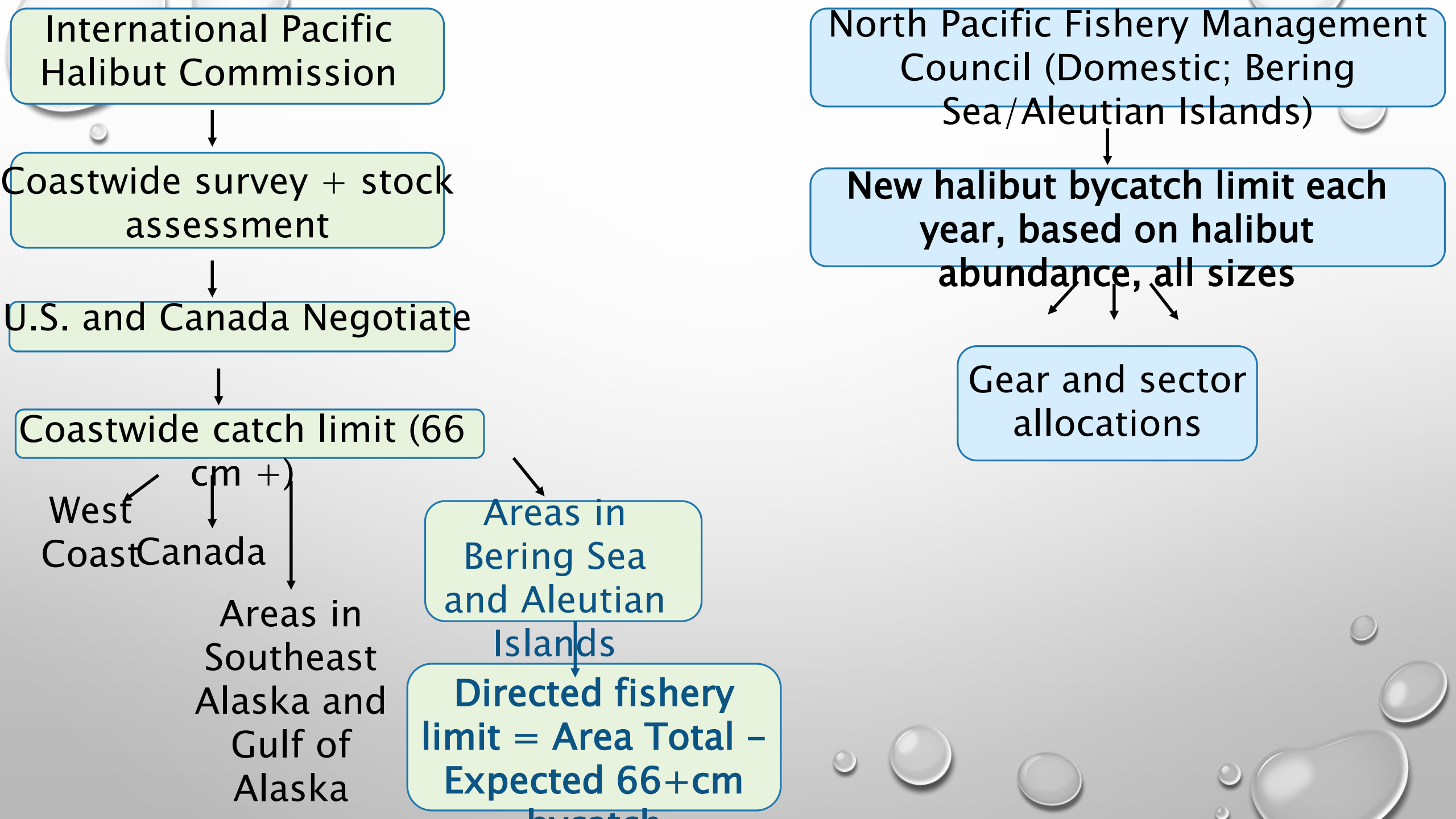
2017 Ex-Vessel Value of halibut vs. multi-species groundfish

$19 million

<

$738 million

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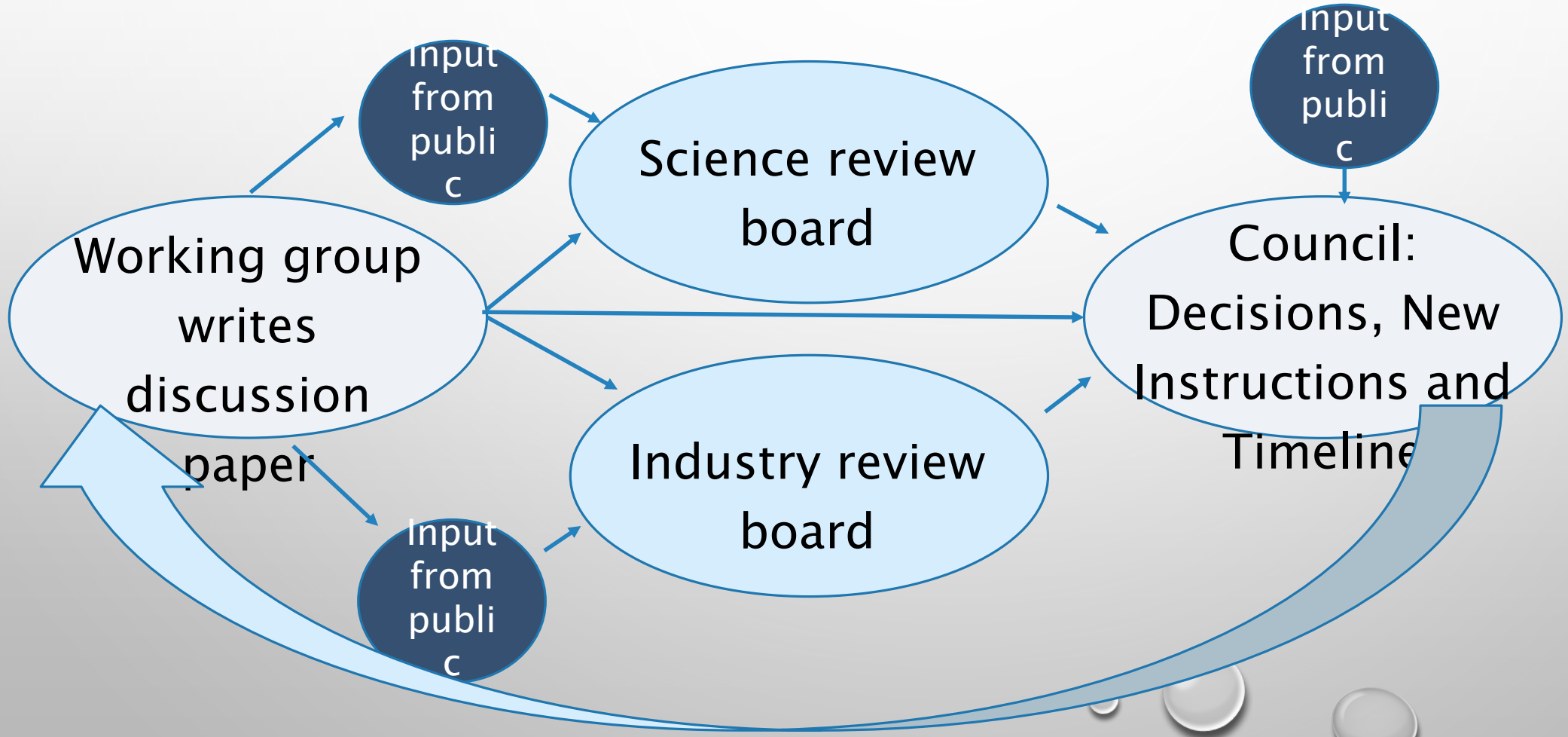
Directed fishery limit = Area Total – Expected 66+cm
North Pacific Fishery Management Council (Domestic; Bering Sea/Aleutian Islands)
New halibut bycatch limit each year, based on halibut abundance, all sizes
Gear and sector allocations

The Council Process
Iterative "pre-analysis" to guide stakeholders and the Council towards defining objectives and management procedures



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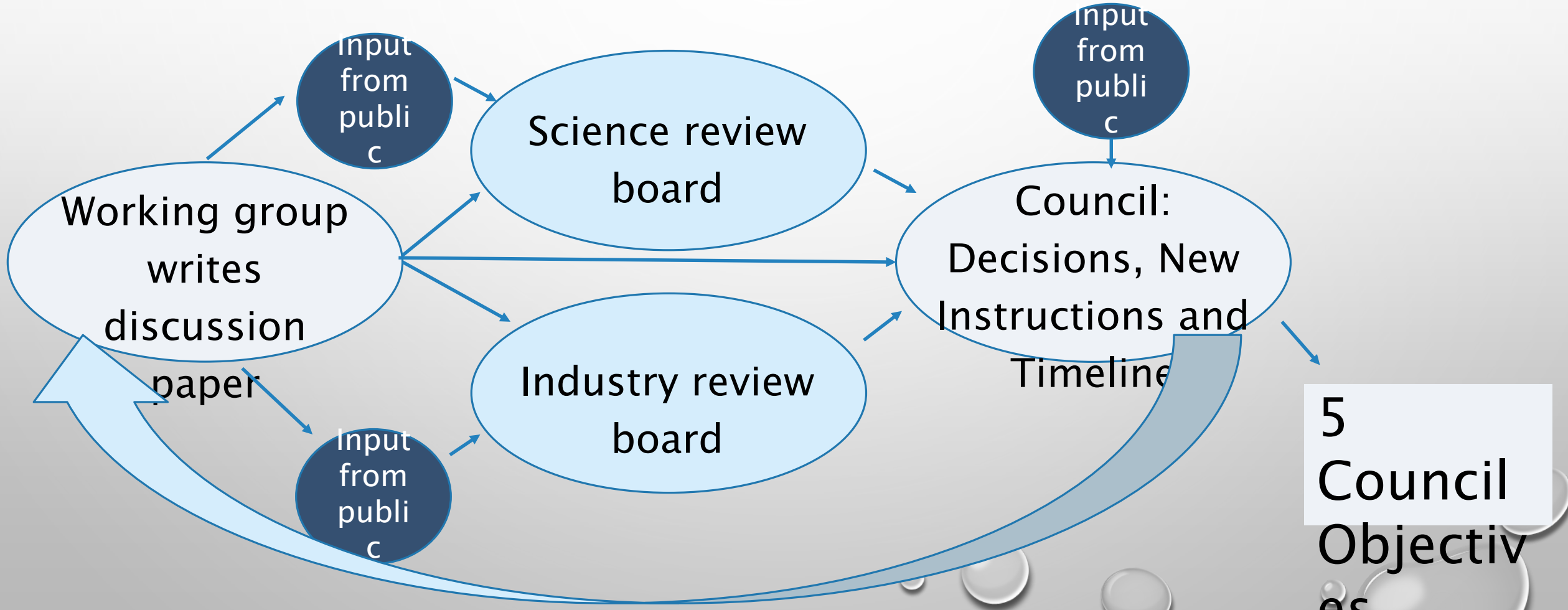
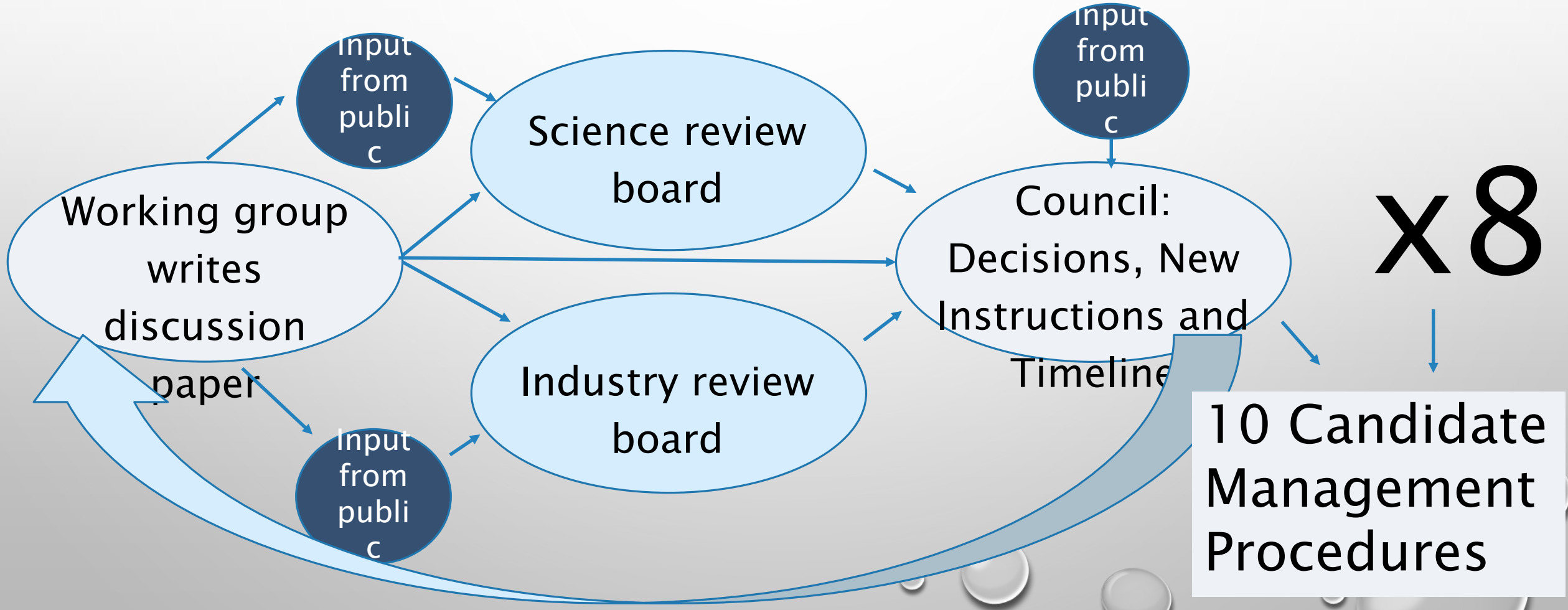


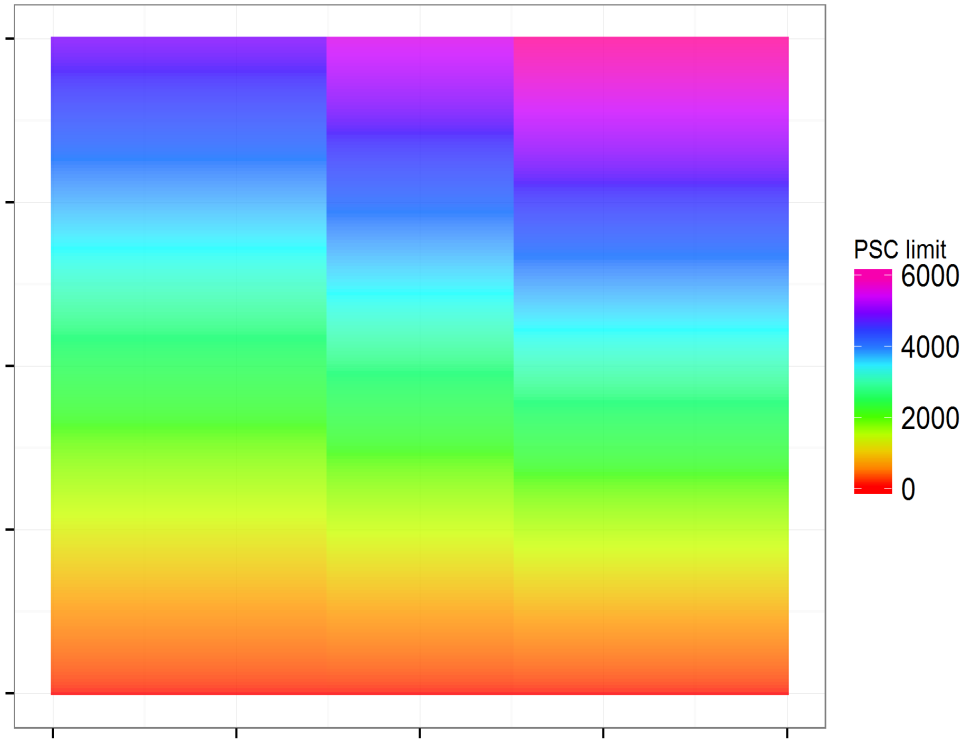
5 Council Objectives

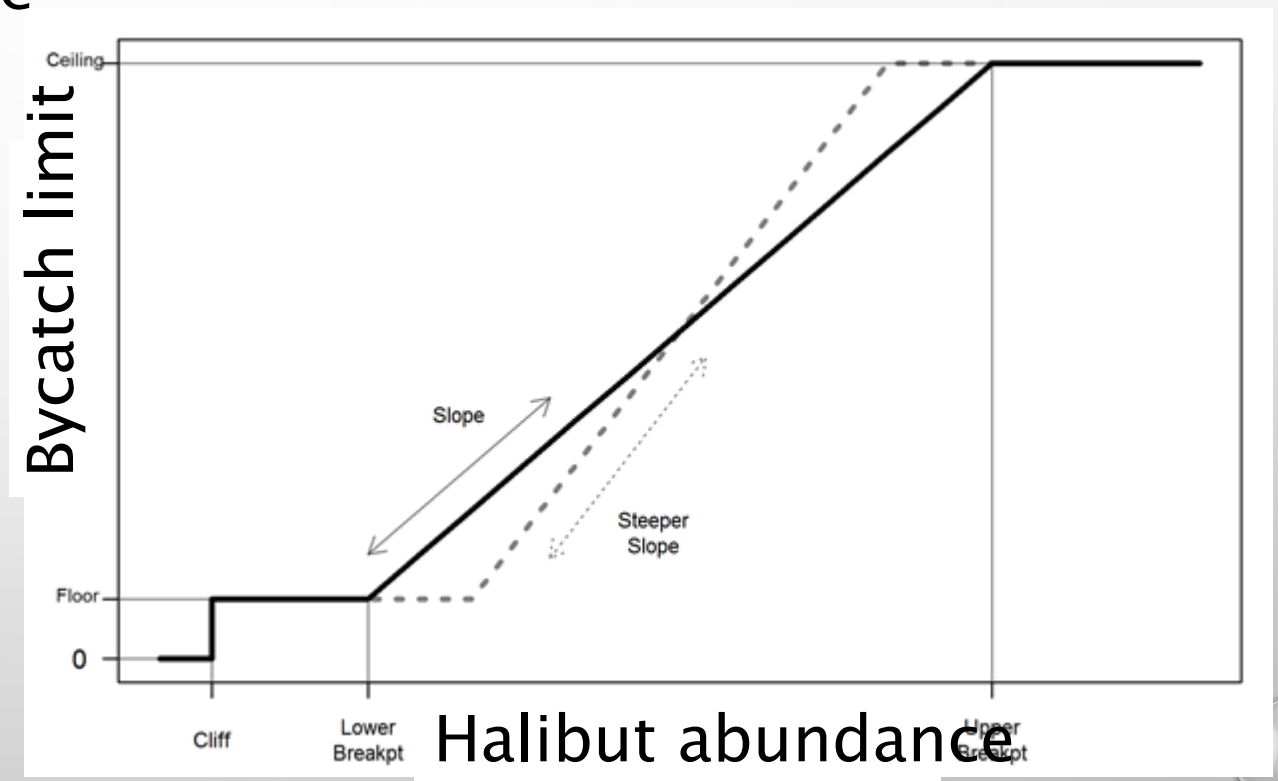
The Council Process
Iterative "pre-analysis" to guide stakeholders and the Council towards defining objectives and management procedures



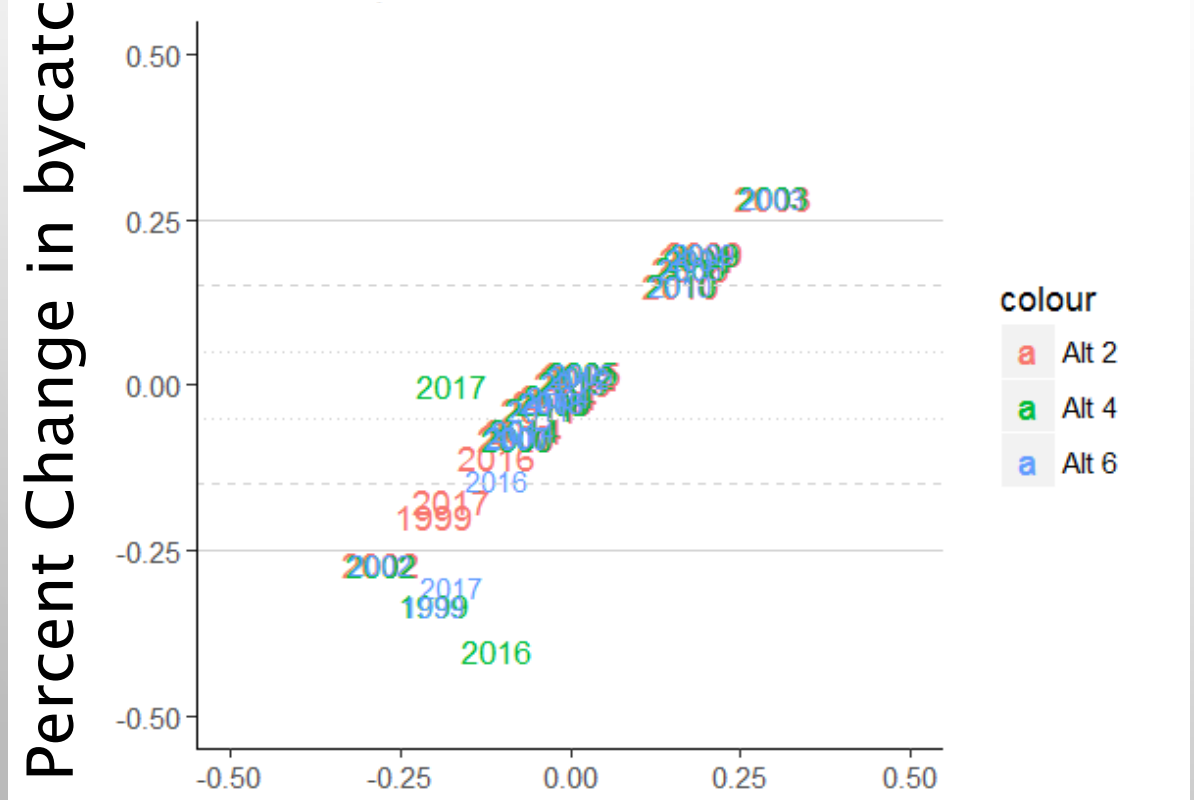
Pre-Analysis: Provided building blocks for defining bycatch limits based on halibut abundance indices

Bycatch Limits for one alternative





Pre-Analysis: Provided historical examples using building blocks



Secondary index influences PSC limit when above or below threshold

Primary index matches gear type for PSC limit

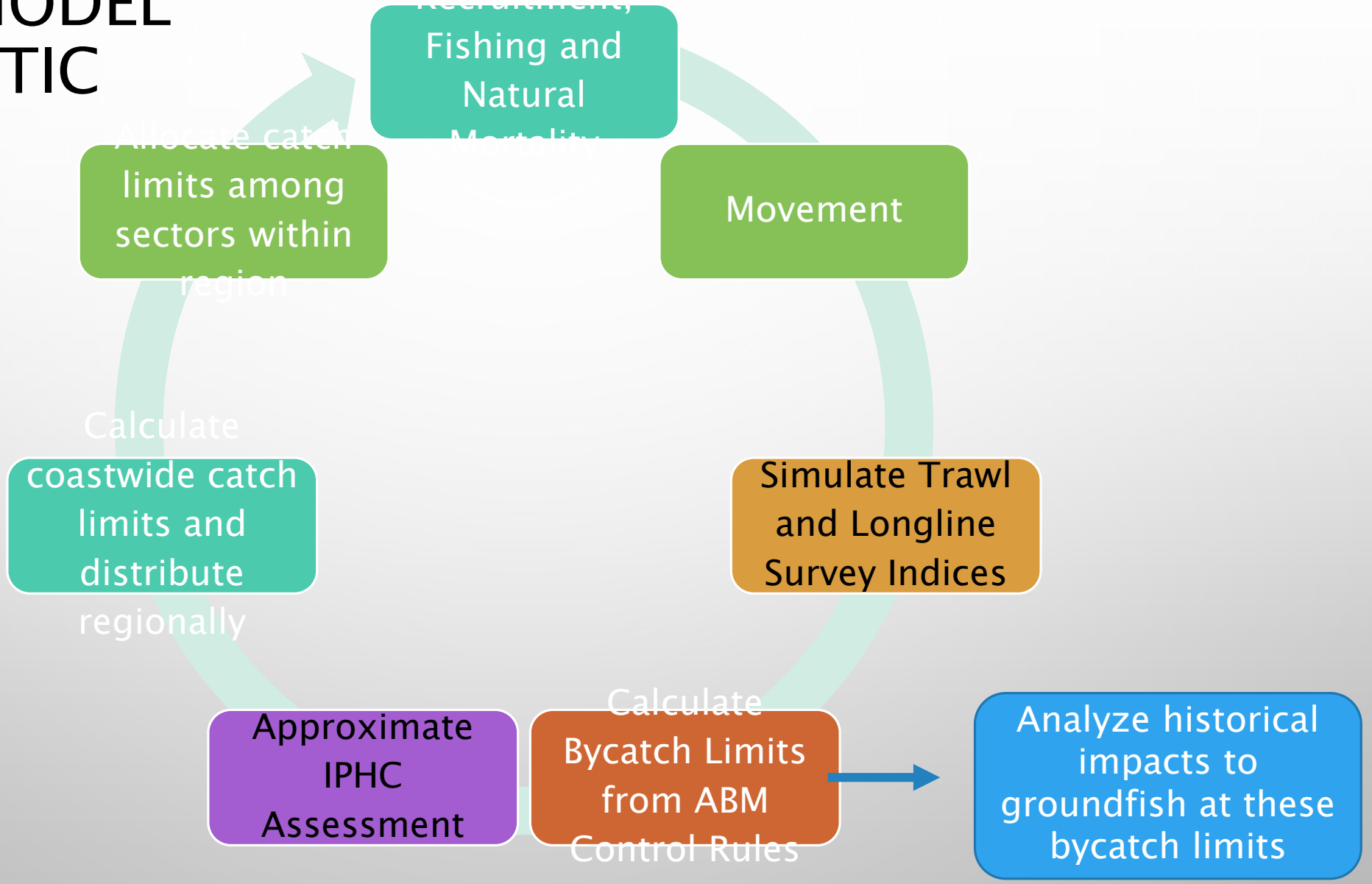
Alternative 2 is only influenced by the primary index while Alts 4 and 6 are influenced by both

Year	Primary (trawl) index % change	Secondary (longline) index status	Alternative 2 % change in PSC limit	Alternative 4 % change in PSC limit	Alternative 6 % change in PSC limit	Historical % change in bycatch mortality	Historical % change in PSC limit
1998	NA	high	NA	NA	NA	NA	NA
1999	-20%		-20%	-33%	-33%	3%	0%
2000	-8%		-8%	-8%	-8%	-8%	0%
2001	19%		19%	19%	19%	1%	0%
2002	-28%		-27%	-27%	-27%	6%	0%
2003	30%		28%	28%	28%	4%	0%
2004	-2%		-2%	-2%	-2%	-4%	0%
2005	2%		2%	2%	2%	4%	0%
2006	18%		18%	18%	18%	-3%	0%
2007	-8%		-8%	-8%	-8%	2%	0%
2008	-3%		-3%	-3%	-3%	-19%	0%
2009	20%		20%	20%	20%	1%	-1%
2010	16%		15%	15%	15%	-2%	0%
2011	-5%		-4%	-4%	-4%	-8%	-1%
2012	1%		1%	1%	1%	19%	-1%
2013	-3%		-3%	-3%	-3%	-1%	0%
2014	-7%		-7%	-7%	-7%	-2%	0%
2015	0%		0%	0%	0%	-34%	0%
2016	-11%	low	-11%	-40%	-12%	7%	-22%
2017	-18%	low	-18%	0%	-22%	-38%	0%

Dark gray = hit ceiling therefore cannot go higher

light gray = hit floor therefore cannot go lower

TWO-AREA HALIBUT MODEL SCHEMATIC



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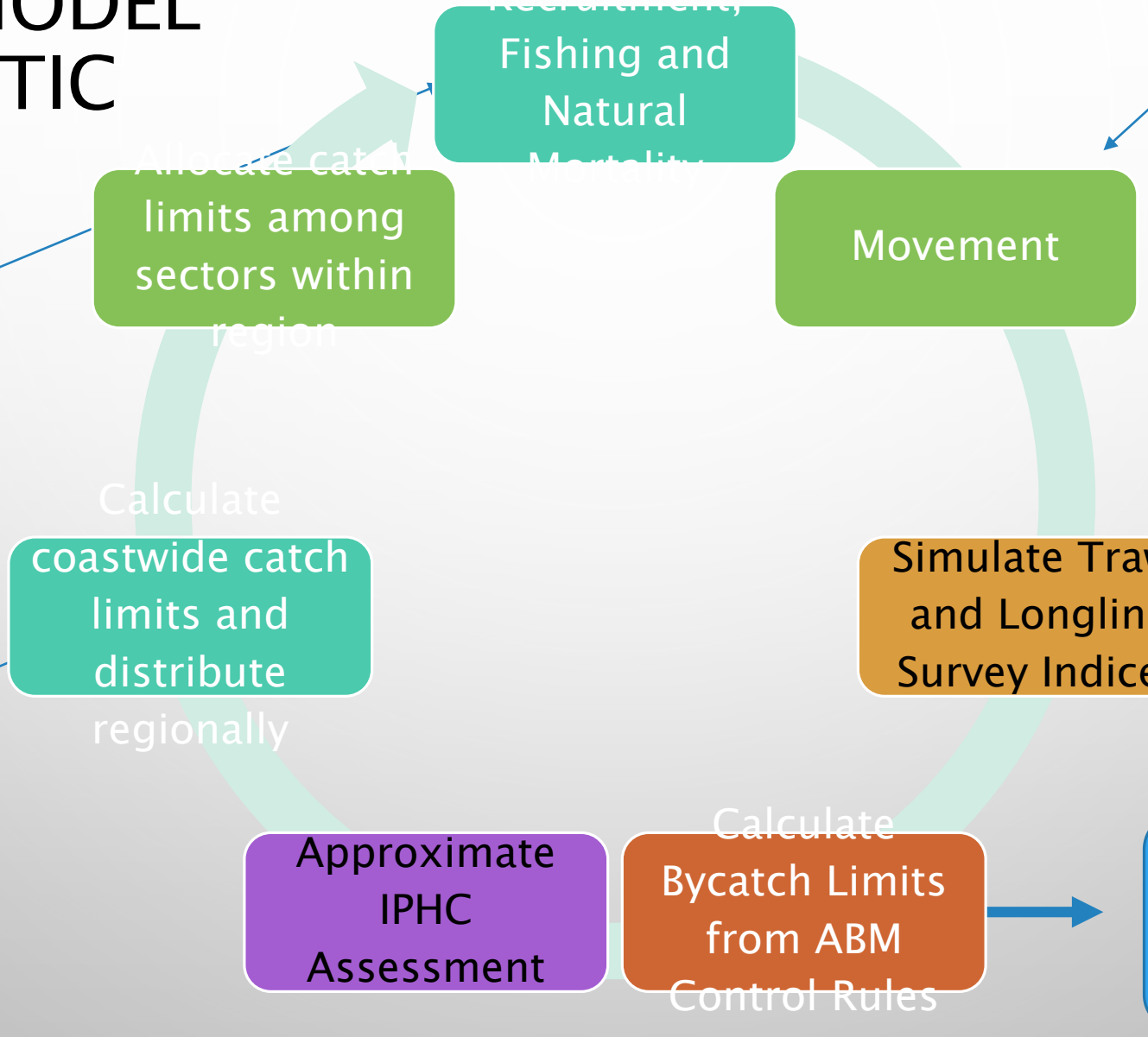

Allocation of recruitment and movement between areas is a major source of uncertainty

The relationship between bycatch limits and actual bycatch is a major source of uncertainty

The IPHC harvest policy is currently evolving

Analyze historical impacts to groundfish at these bycatch limits

Challenges

- Modeling fleet behavior
  - ability to adjust to bycatch limit changes
- Consistency with concurrent IPHC analyses
- Council defines next step and timeline, not the science working group
- Stakeholders ability to define objectives
- Changes in harvest strategies for target species occurring concurrently
- Ecosystem changes (e.g., lack of sea ice) affecting targeting by species, gear, and sector, and overlap with halibut

End