Bigger is better: Enhancing the catch composition of sablefish in the U.S. West Coast groundfish bottom trawl fishery

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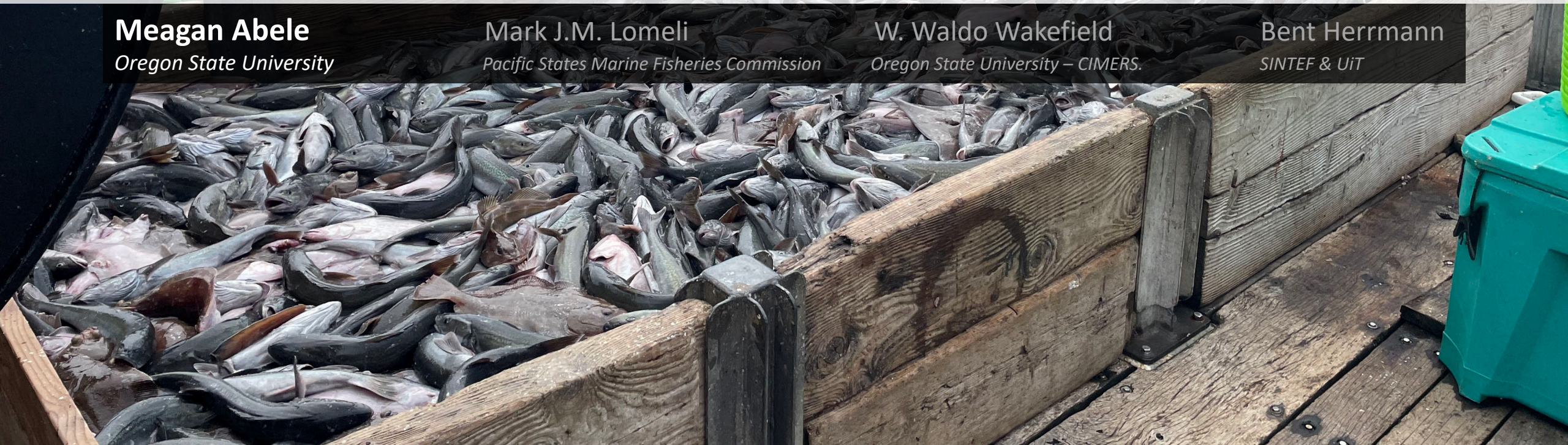
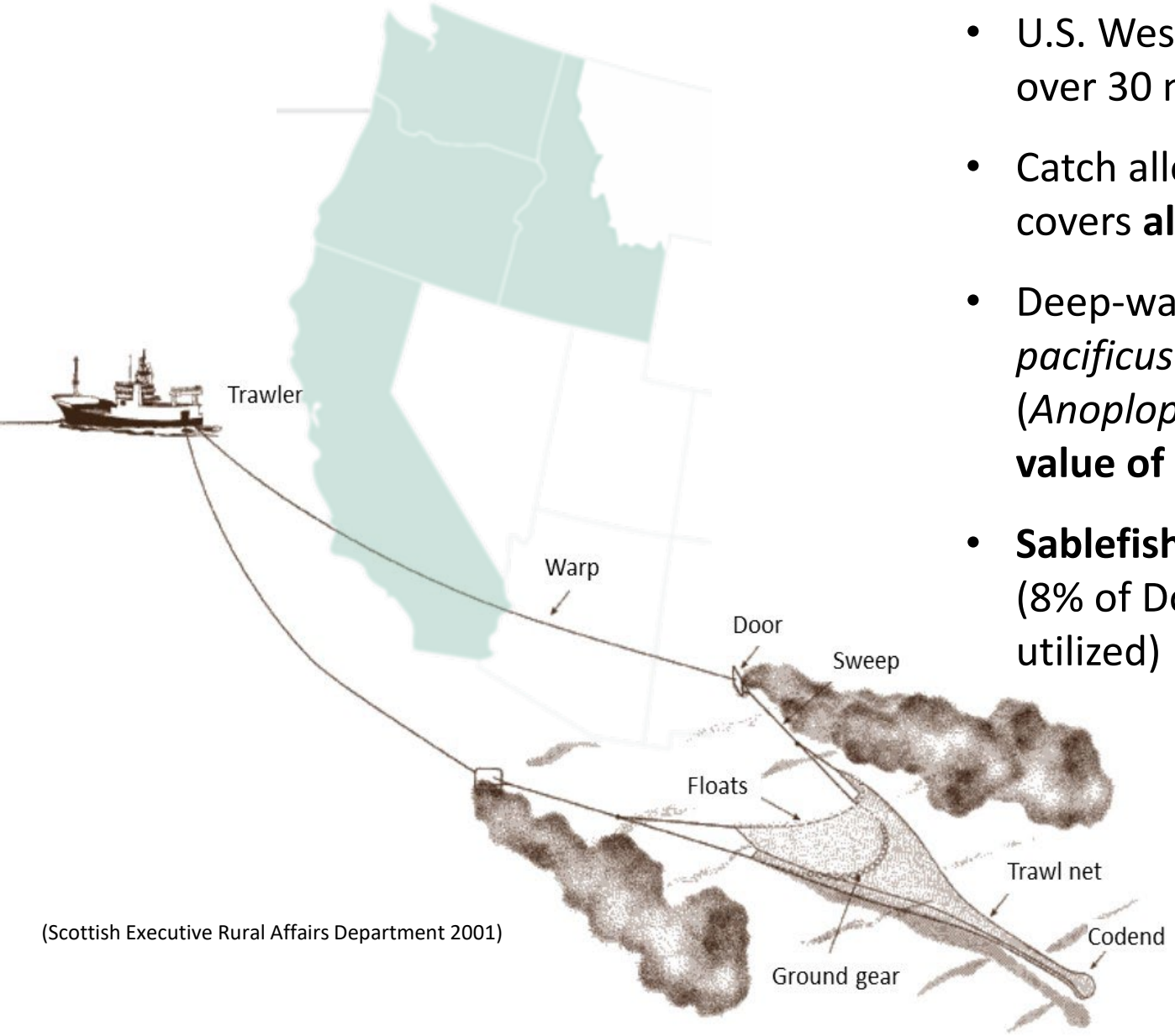
SINTEF & UiT





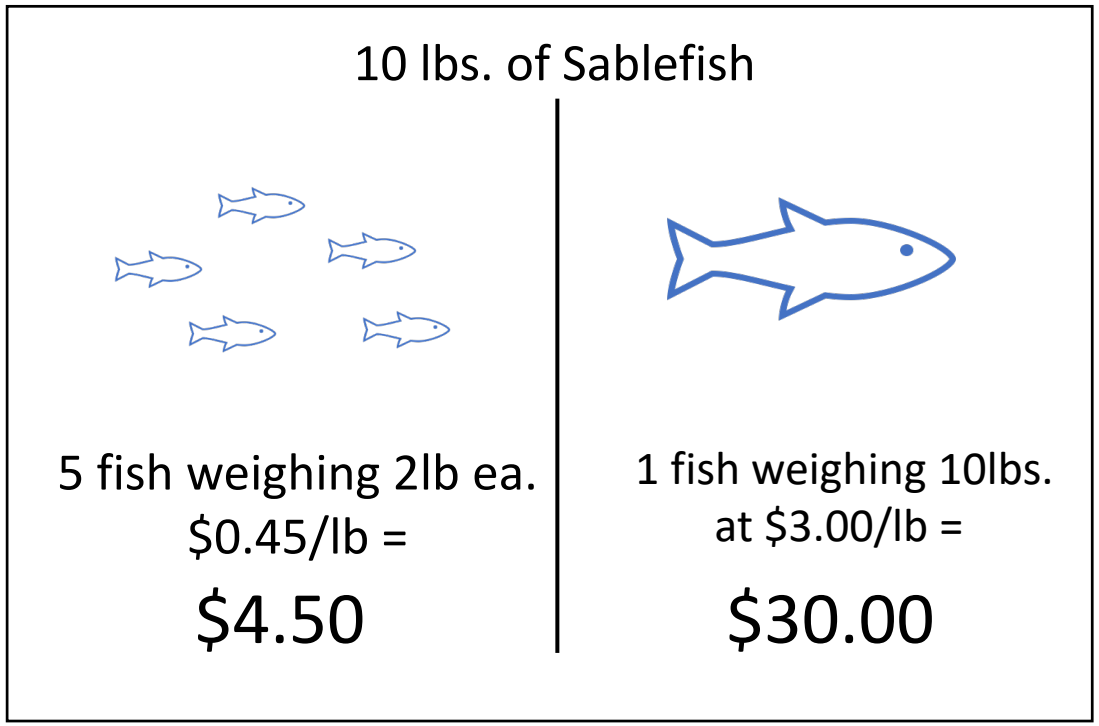
(Scottish Executive Rural Affairs Department 2001)

- U.S. West Coast groundfish bottom trawl fishery comprises over 30 managed units
- Catch allocated as individual fishing quotas (IFQs) which covers **all fish caught** (including discards)
- Deep-water complex made of Dover sole (*Microstomus pacificus*), thornyheads (*Sebastolobus spp*.), and sablefish (*Anoplopoma fimbria*) makes up **56% of the ex-vessel value of the groundfish fishery** in 2022 (PacFIN, 2023)
- **Sablefish is most valuable and constraining specie** (8% of Dover sole and 30% of thornyhead quota being utilized)

- Sablefish recruitment is *highly* variable
- Large cohort years were also associated with warm years (Rosellon-Druker et al. 2021)
- **This intensifies catches of smaller-sized sablefish in trawl fisheries**

Catches of smaller-sized sablefish along the West Coast prompted our research for two reasons

- **Ecologically** – Catching immature fish can exacerbate poor recruitment
- **Economically** – Using catch quota for less economically valuable fish (growth overfishing)



Stock Name	Retained Weight (mt)	Discard Weight (mt)	Total Mortality (mt)	Annual Catch Limit (mt)
Sablefish (N of 36)	5840	796	6636	6566
Sablefish (S of 36)	292	12.6	304.6	1809

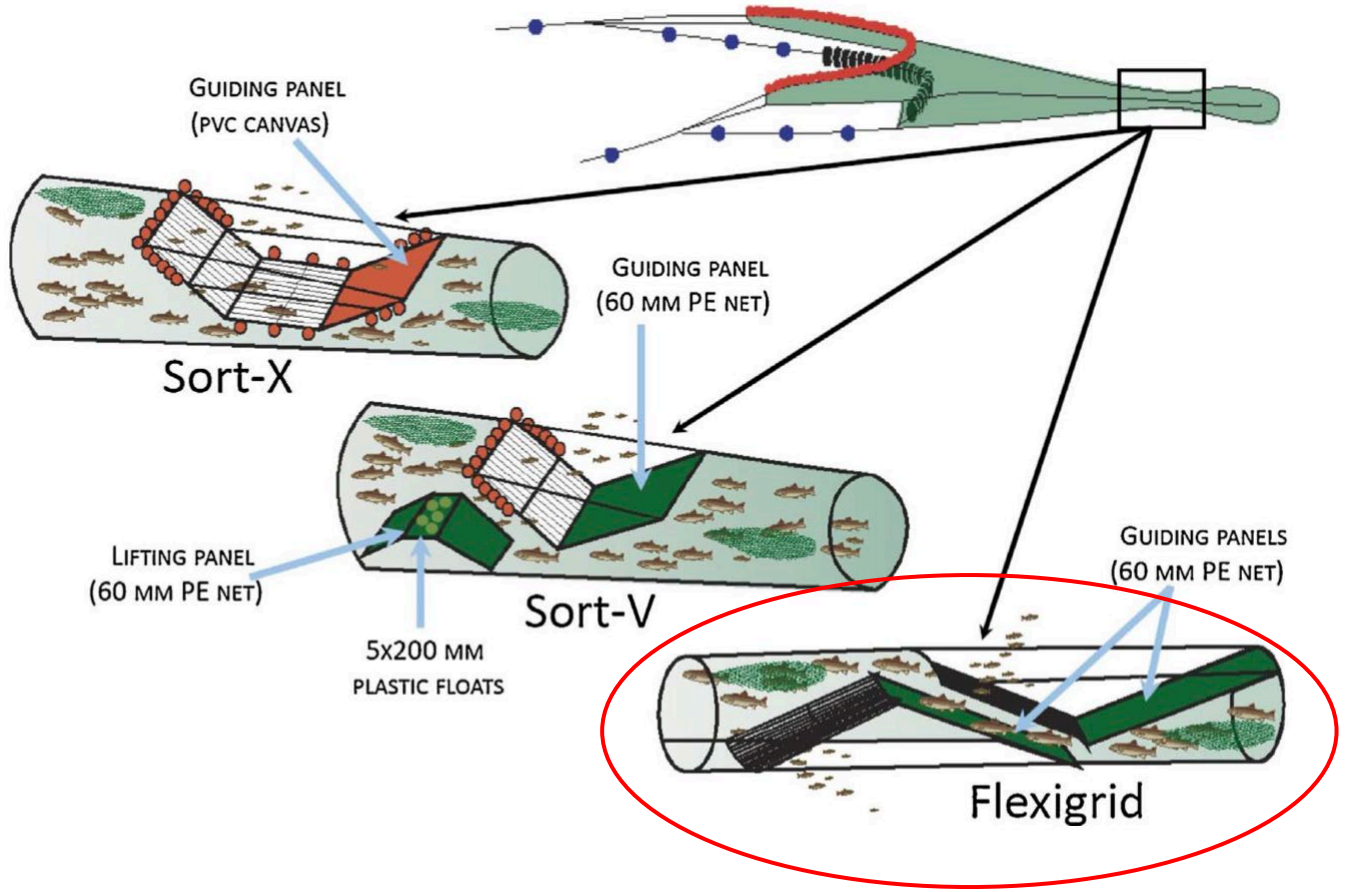
COMPOUNDS CONSTRAINTS

PacFIN 2023

Bycatch Reduction Devices

- Bycatch reduction devices (BRDs) can be used to **increase fishing selectivity**
- Dual grid sorting devices have been effectively used for excluding undersized cod and haddock in the North Atlantic trawl fishery
- Grid BRDs for excluding smaller-sized groundfish have not been tested in the West Coast bottom trawl fishery

(Larsen et al. 2018)



Research Objectives

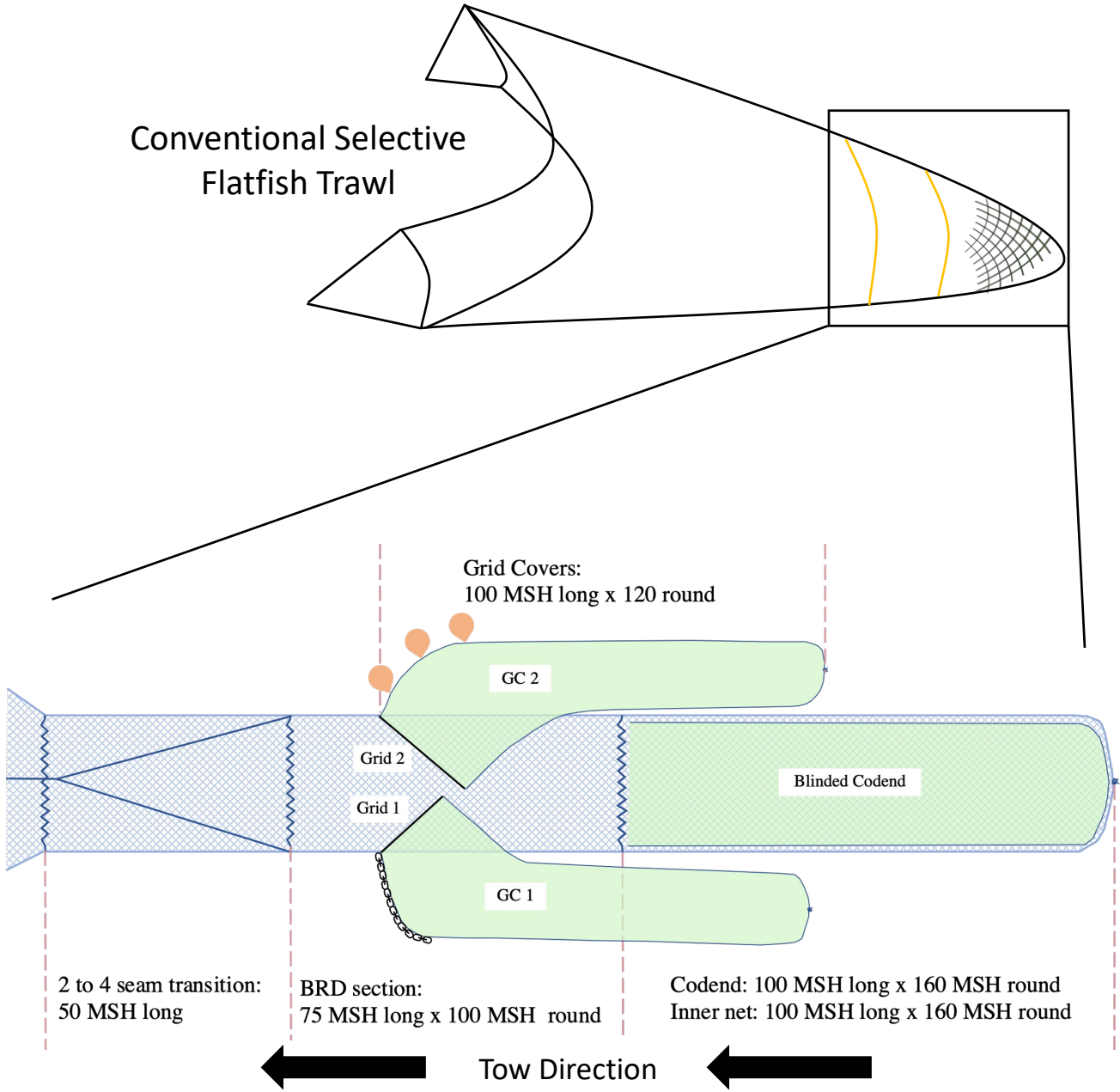
1) Test the efficacy of a sorting-grid BRD designed to reduce catches of smaller-sized sablefish (and other undersized groundfishes) in the U.S. West Coast groundfish bottom trawl fishery

2) Provide fishery managers and fishers with the size selection abilities of sorting-grid BRD tested

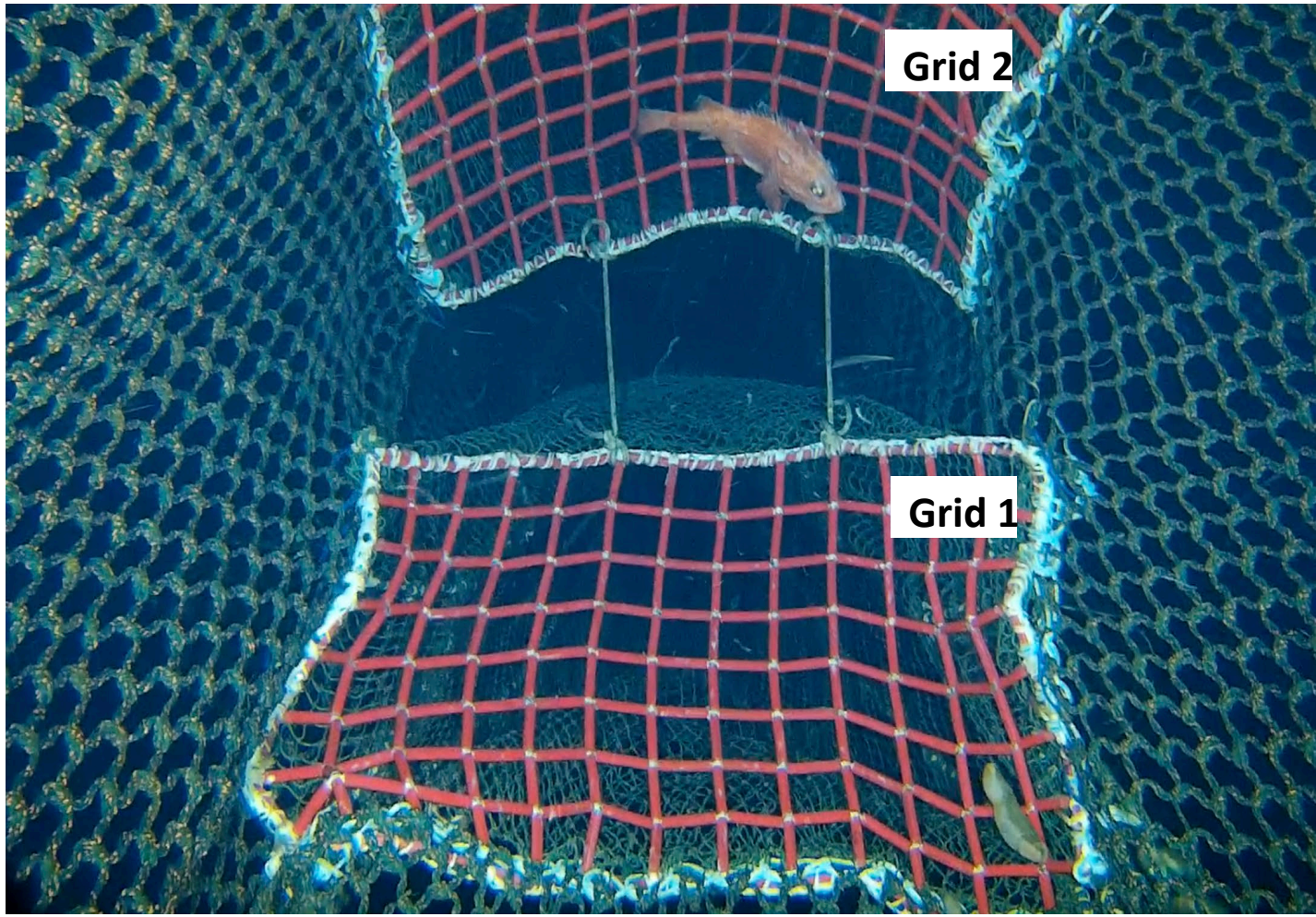
- Modified North Atlantic Flexigrid design for West Coast bottom trawl fishery
- Tested 3 different grid size openings for ability to exclude undersized fish

70x70 mm | 83x83 mm | 95x95 mm

- Recapture bags & blinded codend used to quantify retention/exclusion
- All species catch weights as well as lengths of sablefish, Dover sole, and petrale sole recorded
- *CLogit* modeled size selectivity probability of fish entering each compartment
- Delta analysis to compare length-based retention between grid size openings



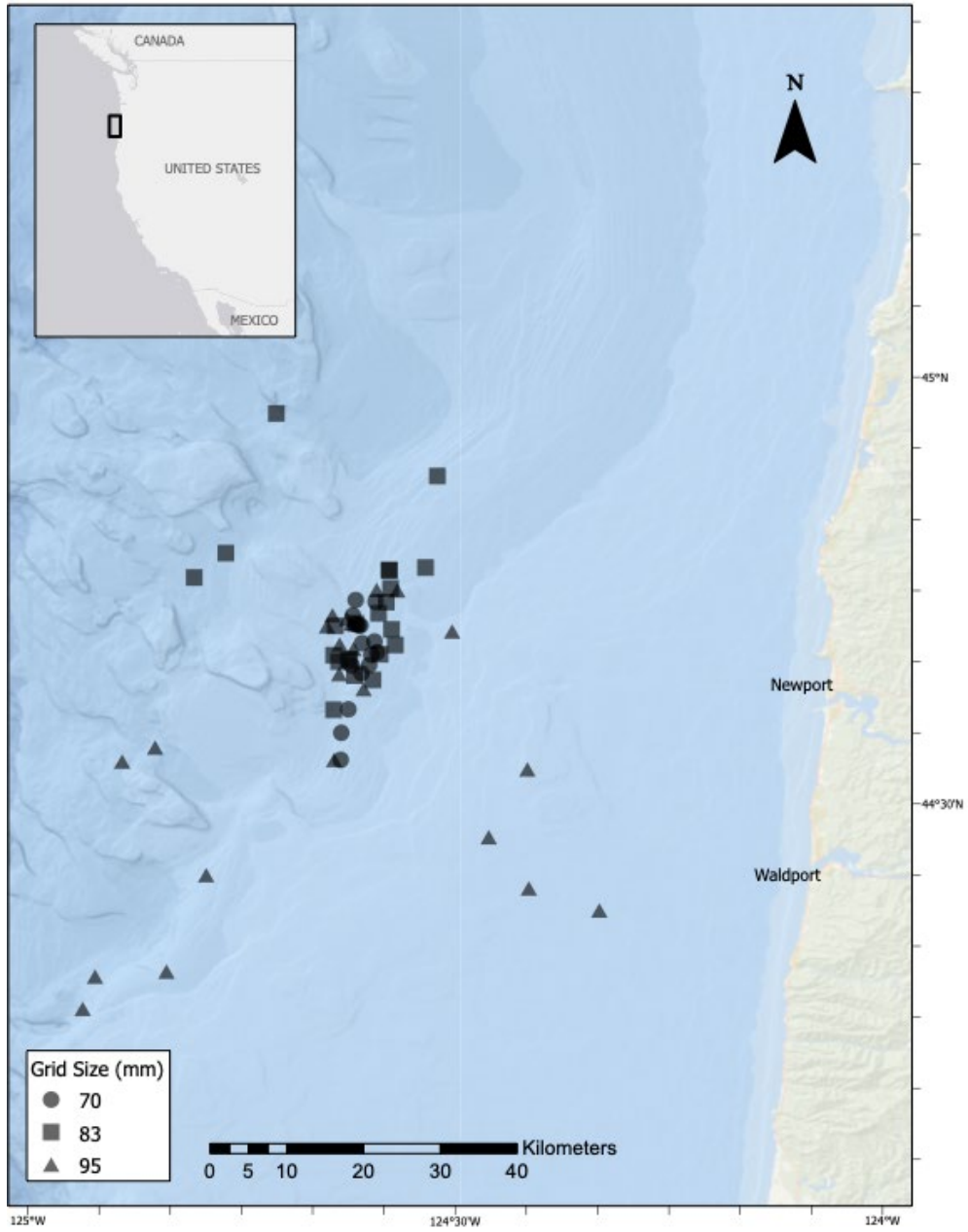

F/V *Last Straw*
23.2 m LOA, 540 HP
LAST STRAW
18 August - 04 September 2021
(during daylight hours)


Grid 2
Grid 1

Study Area

Targeted fishing grounds likely to encounter smaller sablefish

	Grid Size Opening		
	70 mm	83 mm	95 mm
	mean (range)	mean (range)	mean (range)
n tows	16	22	22
n sablefish	2,148	1,971	1,225
n Dover sole	12,641	11,485	12,181
n petrale sole	1,013	1,123	1,559
Bottom Time (min)	35.3 (30 – 41)	35.7 (33-44)	32.1 (24-44)
Depth (m)	216.2 (188-237)	251.4 (178-466)	261.6 (135-504)
DO (mL L^{-1})	1.1 (0.7 – 1.4)	1.2 (0.9-1.5)	1.2 (0.6-1.6)
Temperature (ºC)	7.4(7.1 – 7.6)	7.2 (5.8 – 7.6)	7.2 (6.1 – 7.7)



BRD Performance

1) Grid 2 (upper panel) had a higher contact probability for sablefish and Dover sole

- Significant for the 83mm and 70mm grid sizes, respectively

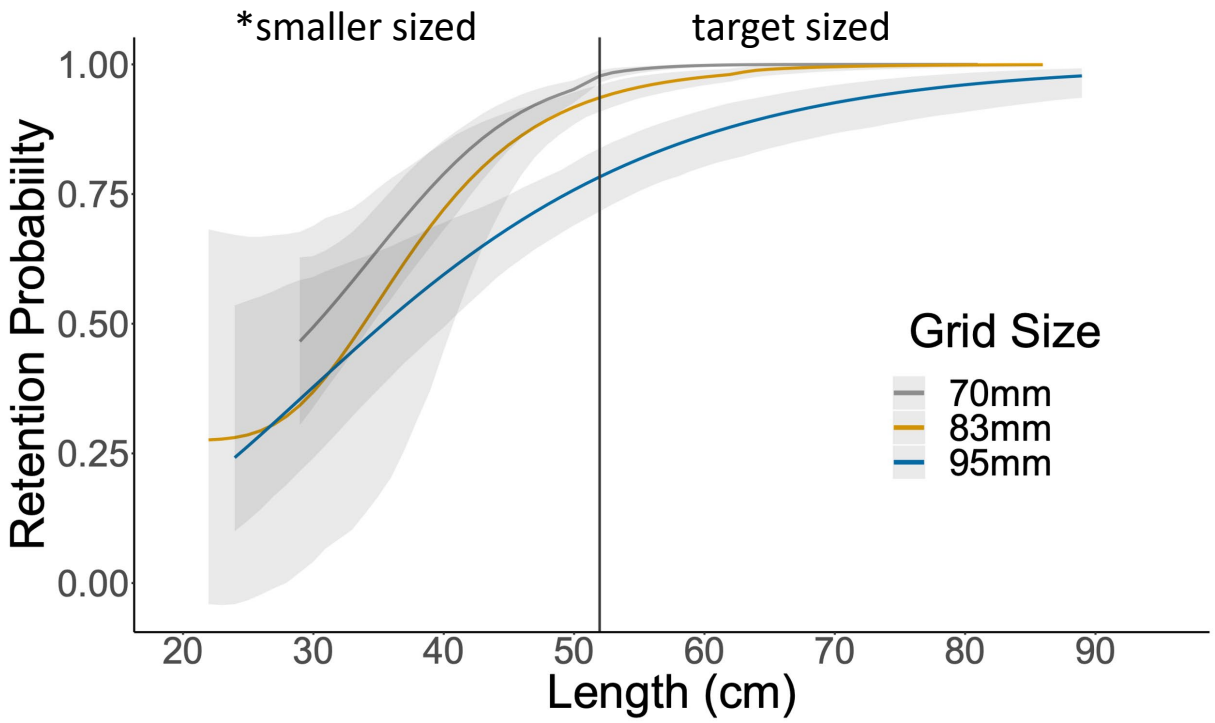
2) No petrale sole escaped through the 70mm grid

3) Petrale sole had a higher contact probability for Grid 1 (lower panel)

- All BRD contact probabilities were less than sablefish and Dover sole

Contents of recapture bag from Grid 2

Sablefish



Smaller grid sizes

- Showed more stable performance (steep, narrow CLs)
- Higher retention over more size classes (including smaller-sized fish)

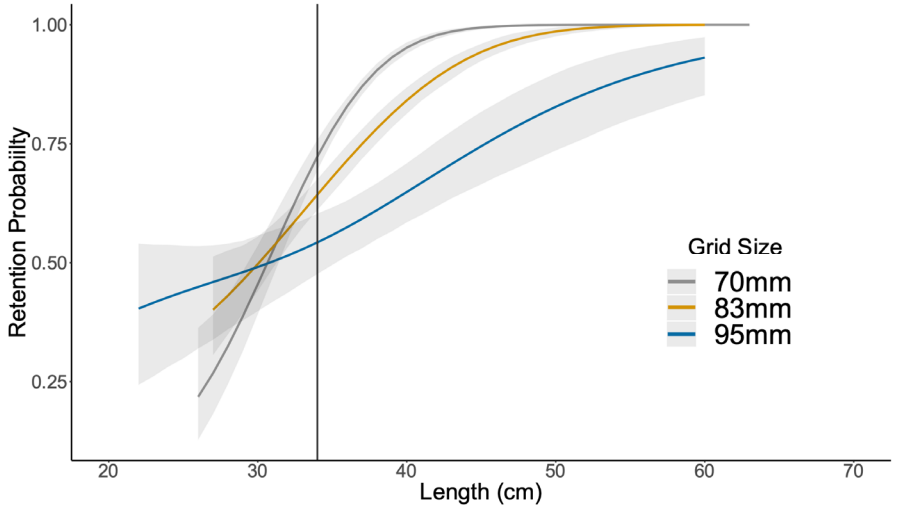
70mm grid retained more fish

- >38cm in length over 95mm grid
- >50cm in length over 83mm grid

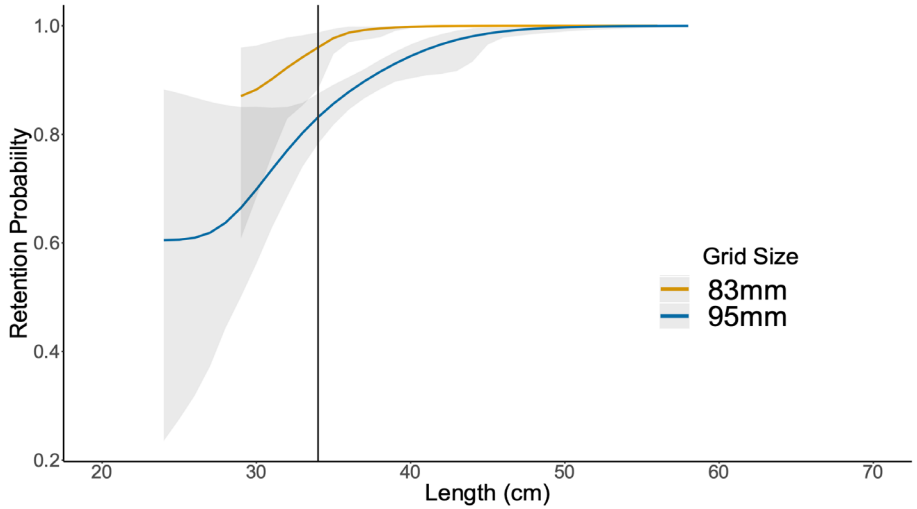
83mm grid retained more >44cm over 95mm grid

*smaller-sized sablefish refers to fish less than 52 cm (~1.4 kg in weight), which was dictated to us by regional fishers and fish processors

Dover sole



Petrale sole



Dover sole selectivity

- trends were similar to sablefish but more pronounced between grids
- 70mm and 83mm grids both had higher retention for fish >33cm in length

Petrale sole selectivity was high across all length classes

Thinking about sablefish objectives

Average retention and escapement probability of target size (≥52cm) and smaller-sized (<52cm) sablefish.

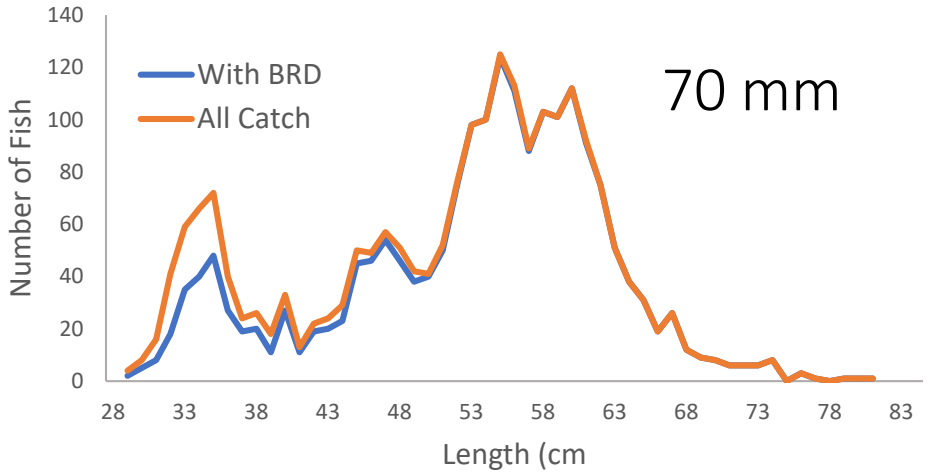
	Target Size		Smaller-sized	
	Retain	Escape	Retain	Escape
70mm	98.7%	1.3%	69.4%	30.6%
83mm	97.3%	2.7%	51.4%	48.6%
95mm	88.8%	11.2%	47.2%	52.8%

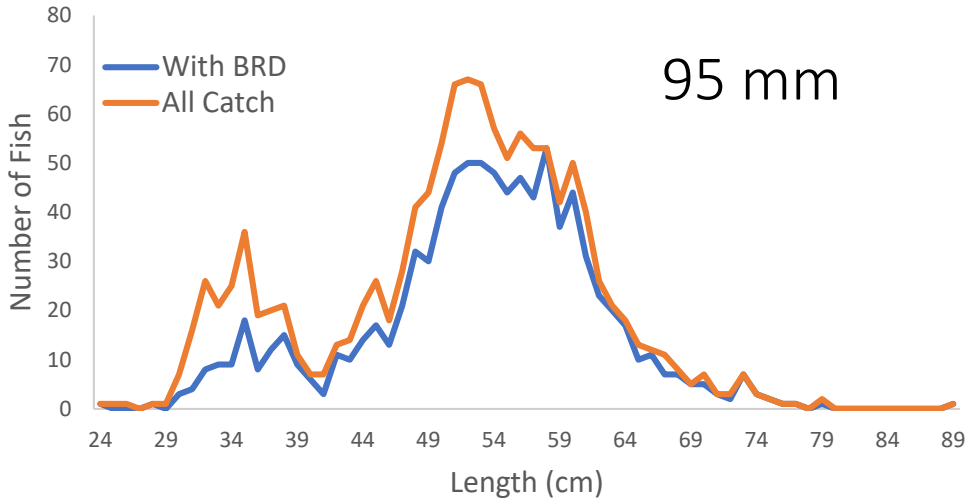
DROP IN RETENTION

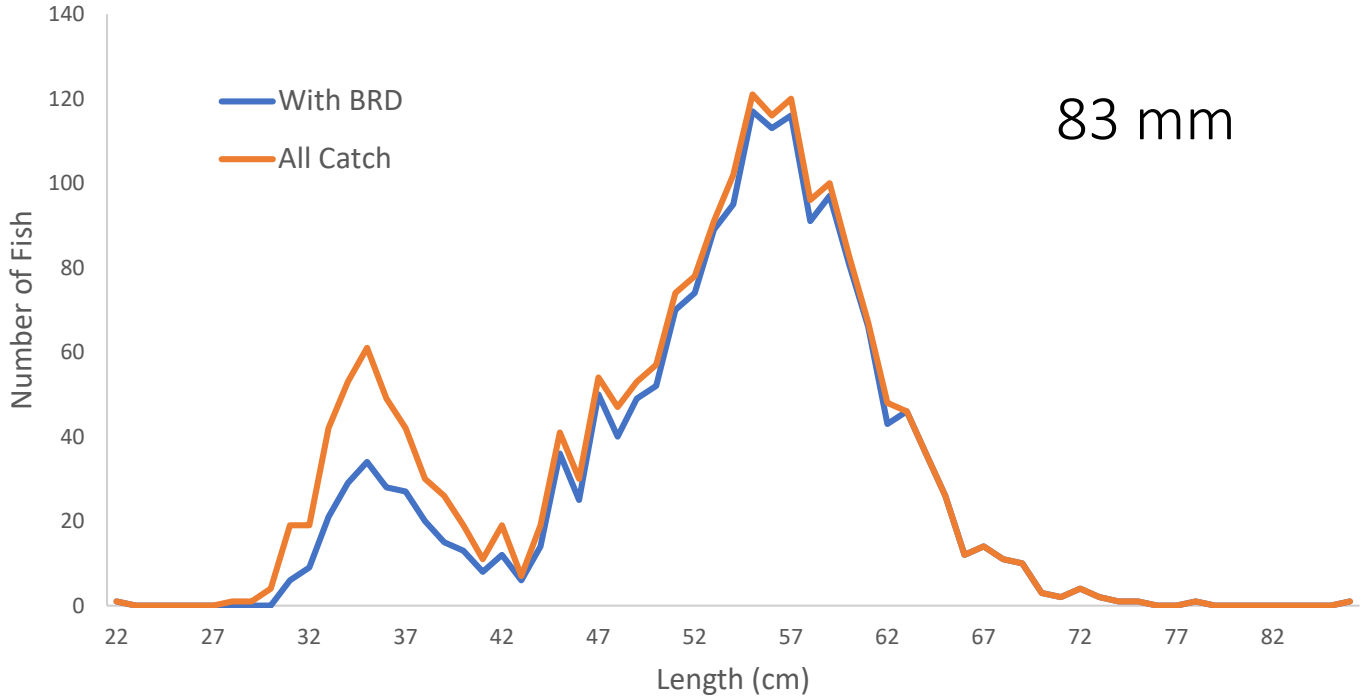
IMPROVEMENT IN EXCLUSION

For our objective of excluding smaller-sized sablefish **the 83 mm gird size tends to be the best balance for also retaining target size sablefish**

Sablefish







$ → $

Average $/lb for sablefish was greater for catch using the BRD than total combined catch

Well, so what?

- Our results show greater selection of larger-sized fish of all species, providing better economic utilization of quotas, leaving small adults in the water to mature
- Fishers could build and insert section containing dual grid system for **less than $5,000**
- Gives **flexible, in-season management options** beyond area closures
- Phase 2 of this project will happen summer 2023 to continue improving selectivity

Acknowledgements

F/V Last Straw

IDAHO • OREGON • ALASKA
PACIFIC STATES MARINE FISHERIES COMMISSION
WASHINGTON • CALIFORNIA

FOULWEATHER TRAWL LLC

OREGON TRAWL COMMISSION

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
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QUESTIONS?