

Testing of two industry-designed BRDs to reduce Pacific halibut bycatch

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West Coast Limited Entry Groundfish Trawl Fishery

- Managed under a Catch Shares / IFQ Program
 - establishes ACLs, IFQs, and IBQ for Pacific halibut
 - 100% observer coverage
- Two trawl components
 - groundfish bottom trawl fishery
 - Pacific hake midwater trawl fishery
- Groundfish bottom trawl fishery
 - Dover sole/thornyheads/sablefish are targeted over the cont. slope (know as the deepwater DTS complex fishery)
 - over the cont. shelf, fishermen target a variety of species including flatfishes, rockfishes, roundfishes, & skates

Concern Over Pacific Halibut Bycatch

- Limited quota is available relative to the more abundant and more productive flatfish and roundfish stocks targeted
- For example, 2014 ACLs vs IBQ
 - Dover sole = 25, 000 mt
 - English sole = 5,646 mt vs Pacific halibut = 78 mt
 - petrale sole = 2,652 mt
 - sablefish = 2,038 mt
- Retention of trawl-caught halibut is prohibited, therefore must be discarded at sea
 - before discarded, an observer assigns the fish to a mortality category of *excellent (20%), poor (55%), or dead (90%)*
 - this % mortality (by weight) is then deducted from the fishermen's IBQ

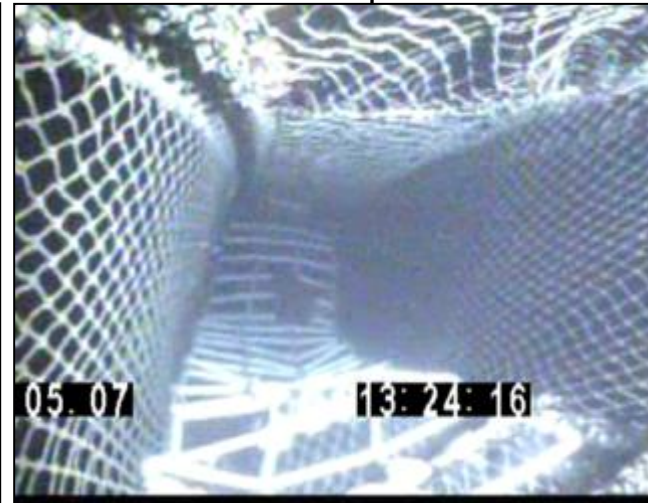
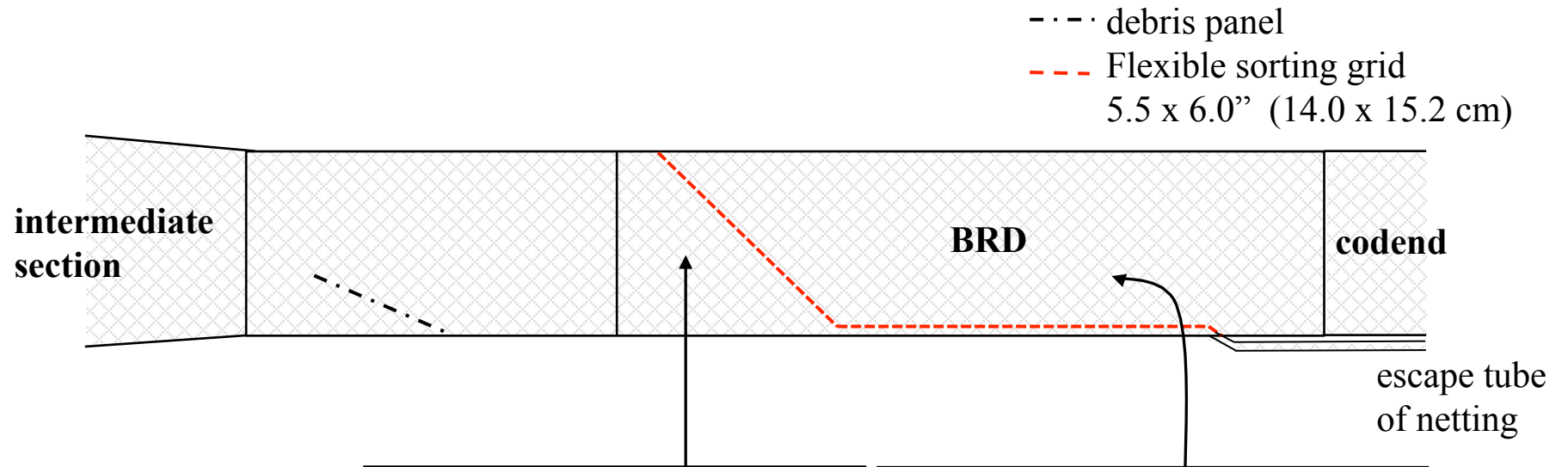
Industry-Designed BRDs Evaluated

- The BRDs evaluated were flexible sorting grid excluders
 - Concept: fishes smaller than the sorting grids will pass through and move aft towards the codend, whereas fish larger than the grid opening will be excluded
- 1) Developed for the deepwater DTS complex fishery for reducing halibut bycatch
- 2) Developed for the nearshore flatfish fishery for reducing halibut and roundfish bycatch (i.e. overfished and rebuilding rockfishes, juvenile sablefish)
 - Vessels targeting Dover sole, petrale sole, English sole, Pacific sanddab, etc.

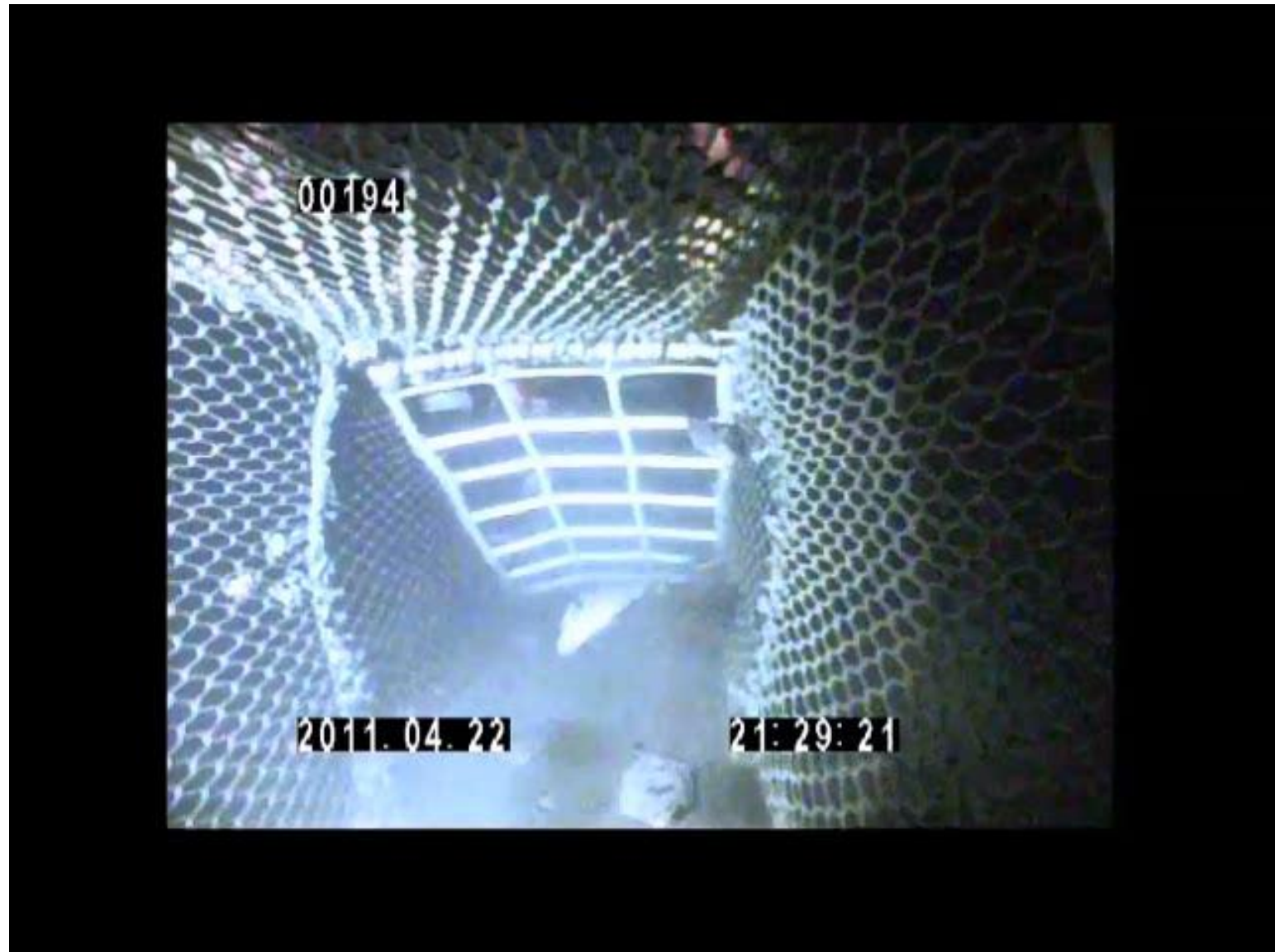
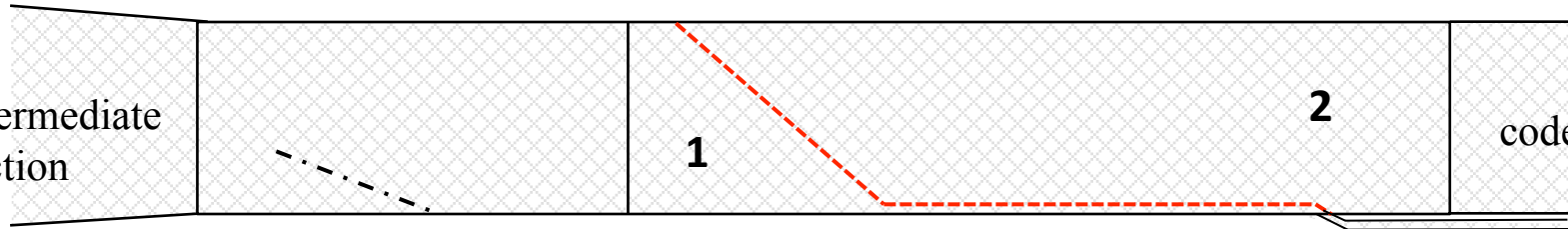
Gear Trials

- Fishing occurred off Oregon aboard the *F/V Miss Sue* in 2013
- Tow durations were set to 45 min.
 - Towing speed ranged from 2.2-2.6 knots
- Fish retention/escapement was quantified using a recapture net, with length and weight data being collected on halibut and species of commercial importance
- Deepwater DTS Complex Fishery:
 - 23 tows were conducted; avg. bottom depth = 301 m
- Nearshore Flatfish Fishery:
 - 15 tows were conducted; avg. bottom depth = 189 m

Deepwater DTS Complex Fishery BRD



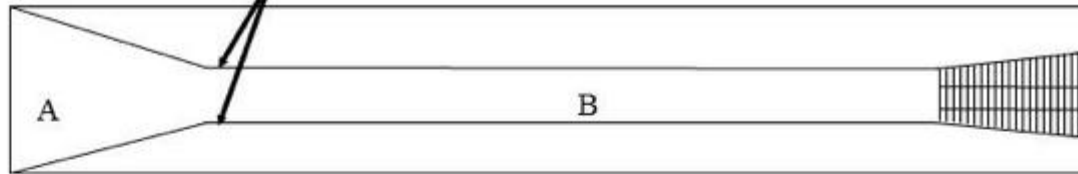
intermediate
section



Nearshore Flatfish Fishery BRD

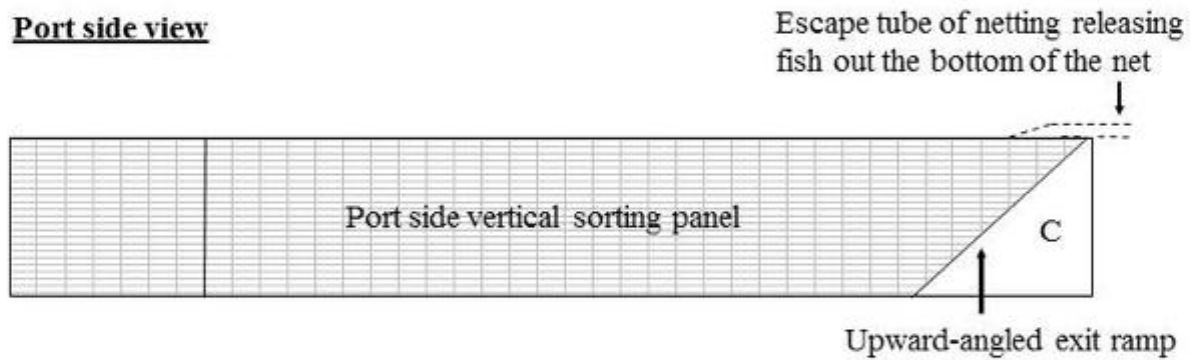
Top view

Vertical sorting panels: 7 meshes apart on top and bottom

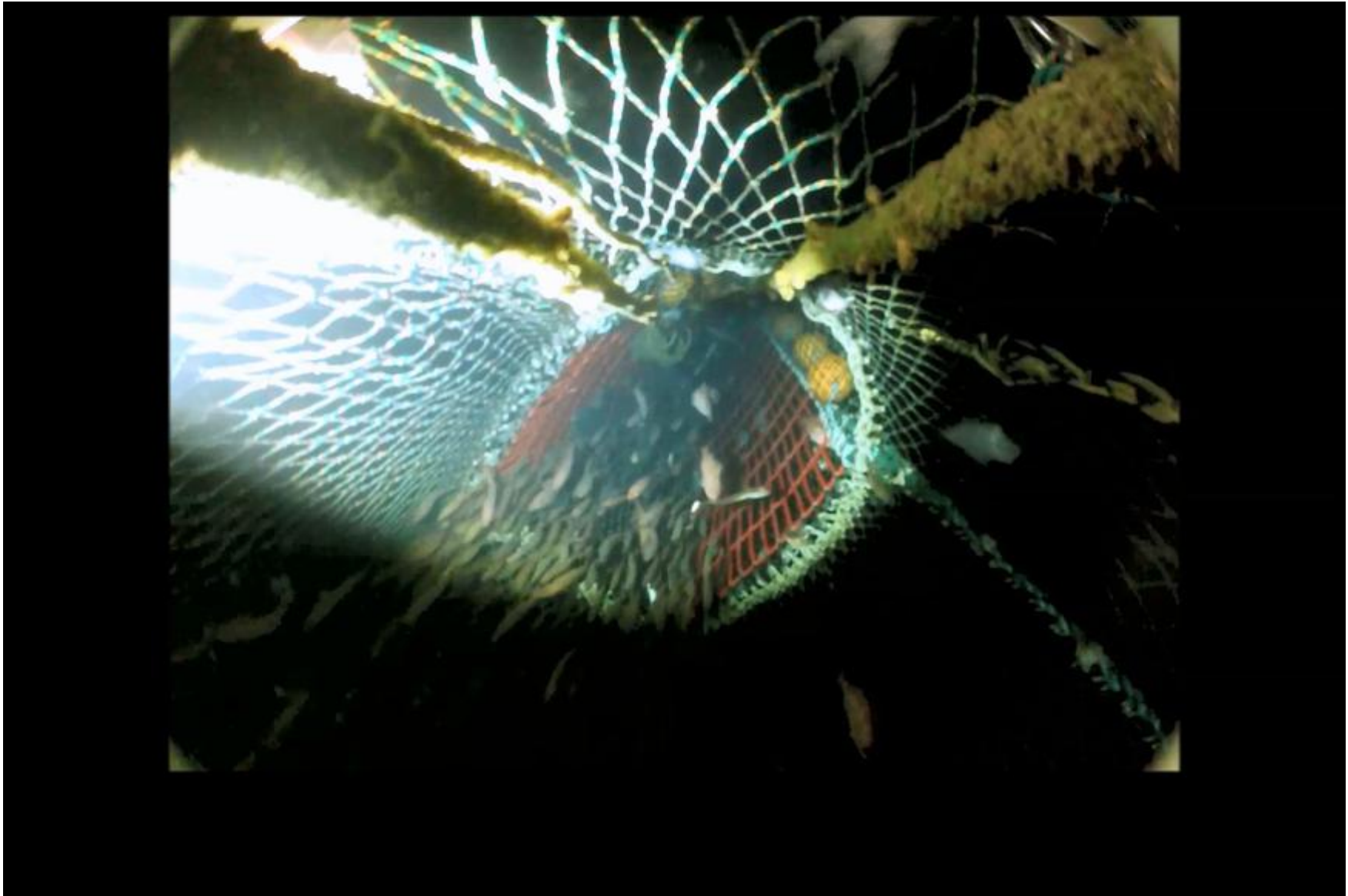
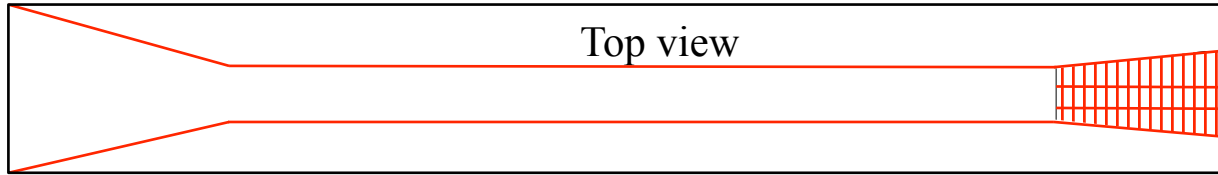


Grid size = 1.75 x 8.5" (4.4 x 21.6 cm)

Port side view



Camera view



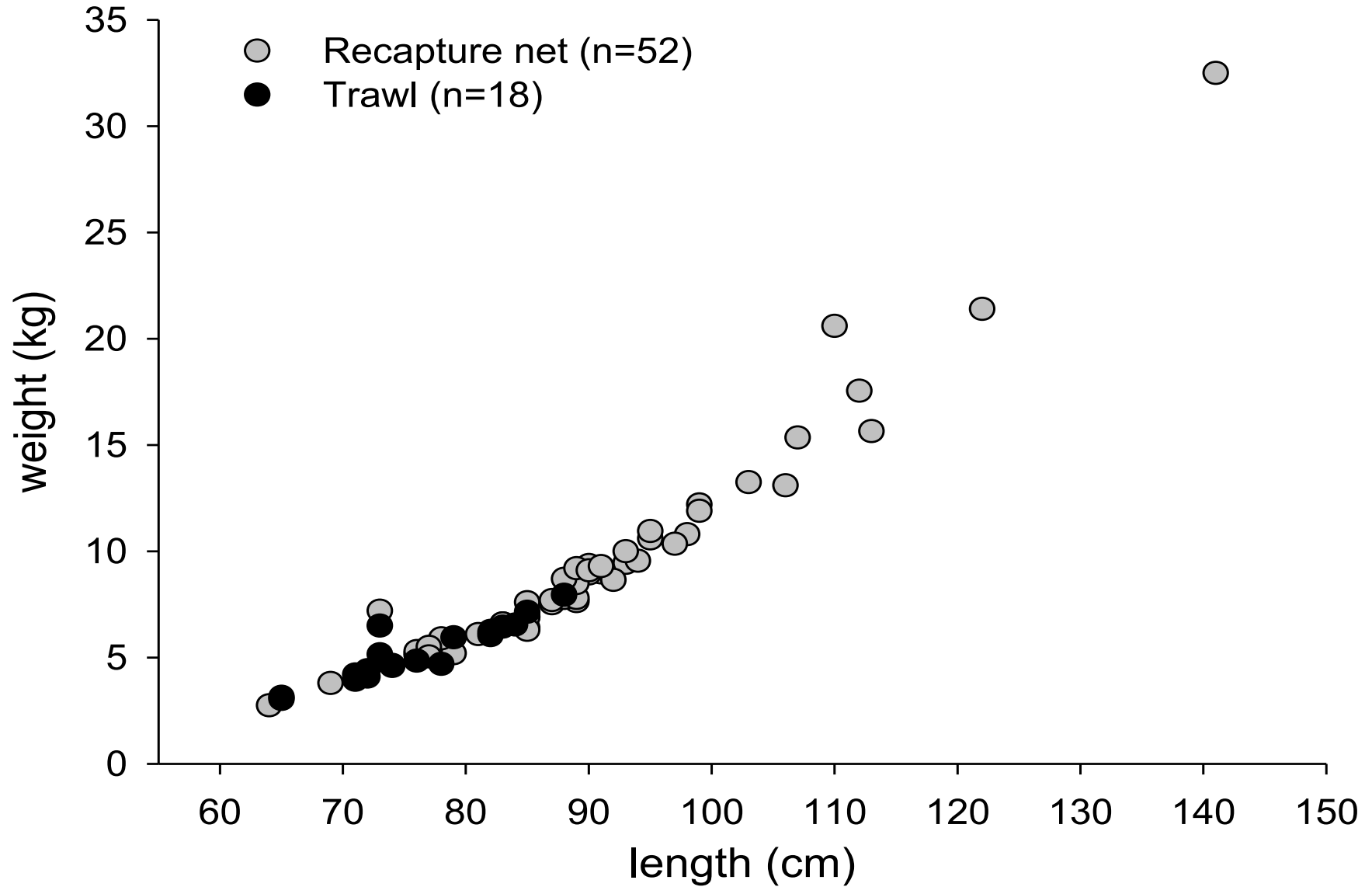
Deepwater DTS Complex Fishery Results



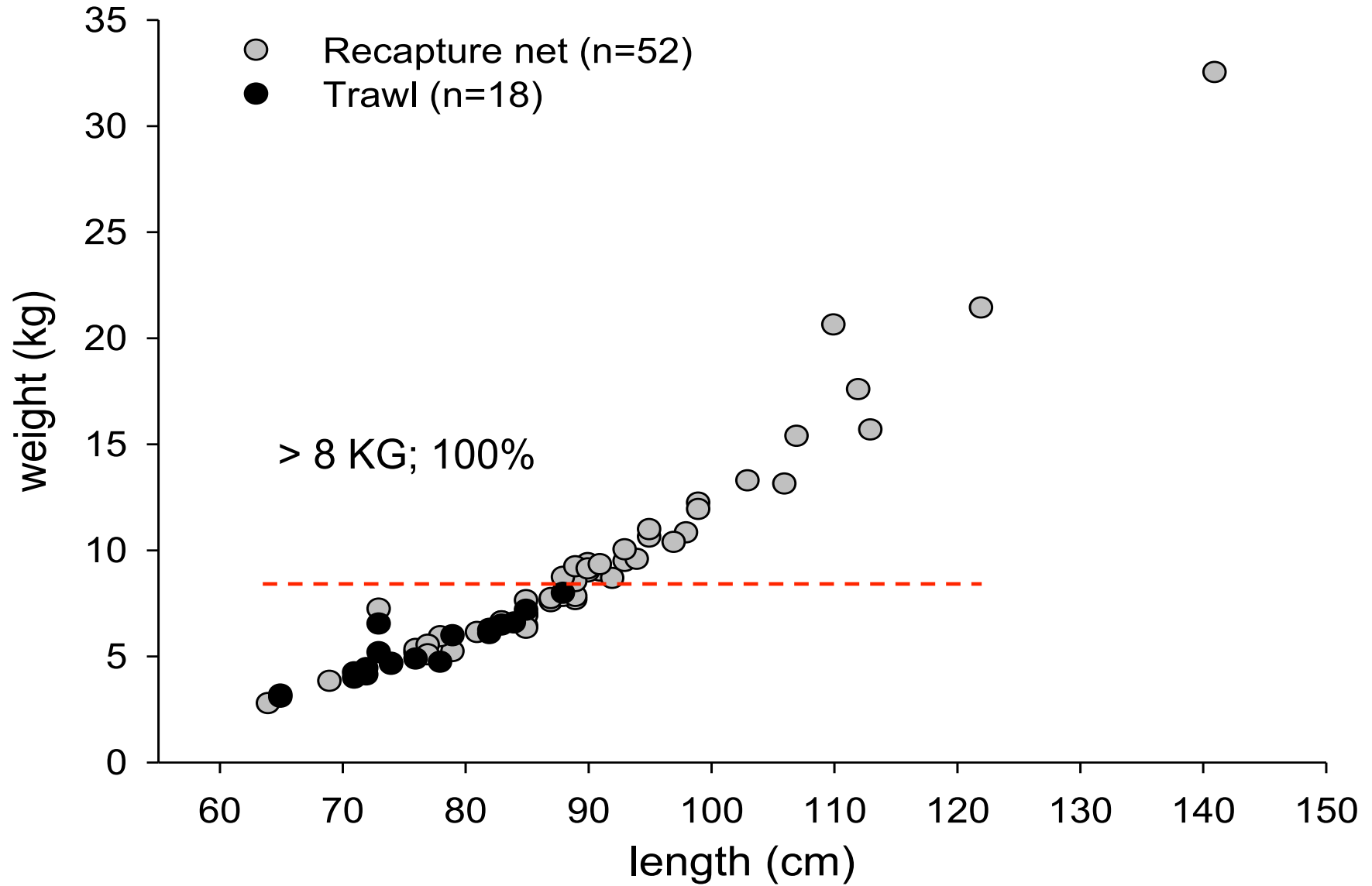
Pacific Halibut Bycatch Reduction

| | Trawl | Recapture net | Result |
|------------------|--------------------|--------------------|----------|
| Number of fish | 18 | 52 | 74.3% |
| Weight (kg) | 95.0 | 486.7 | 83.7% |
| Mean length (cm) | 76 (± 1.6 SE) | 90 (± 1.9 SE) | P<0.0001 |

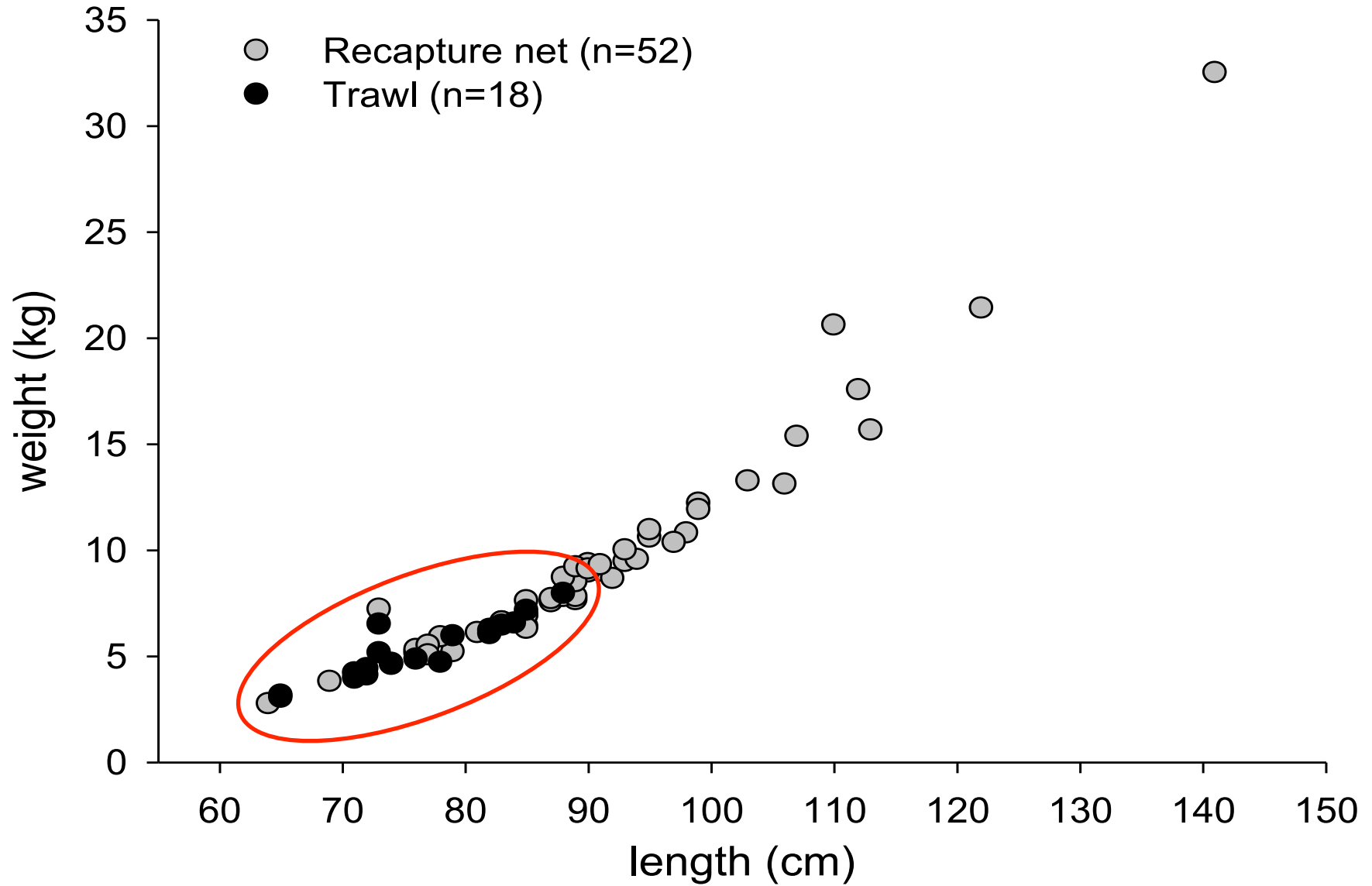
Halibut Size Selectivity



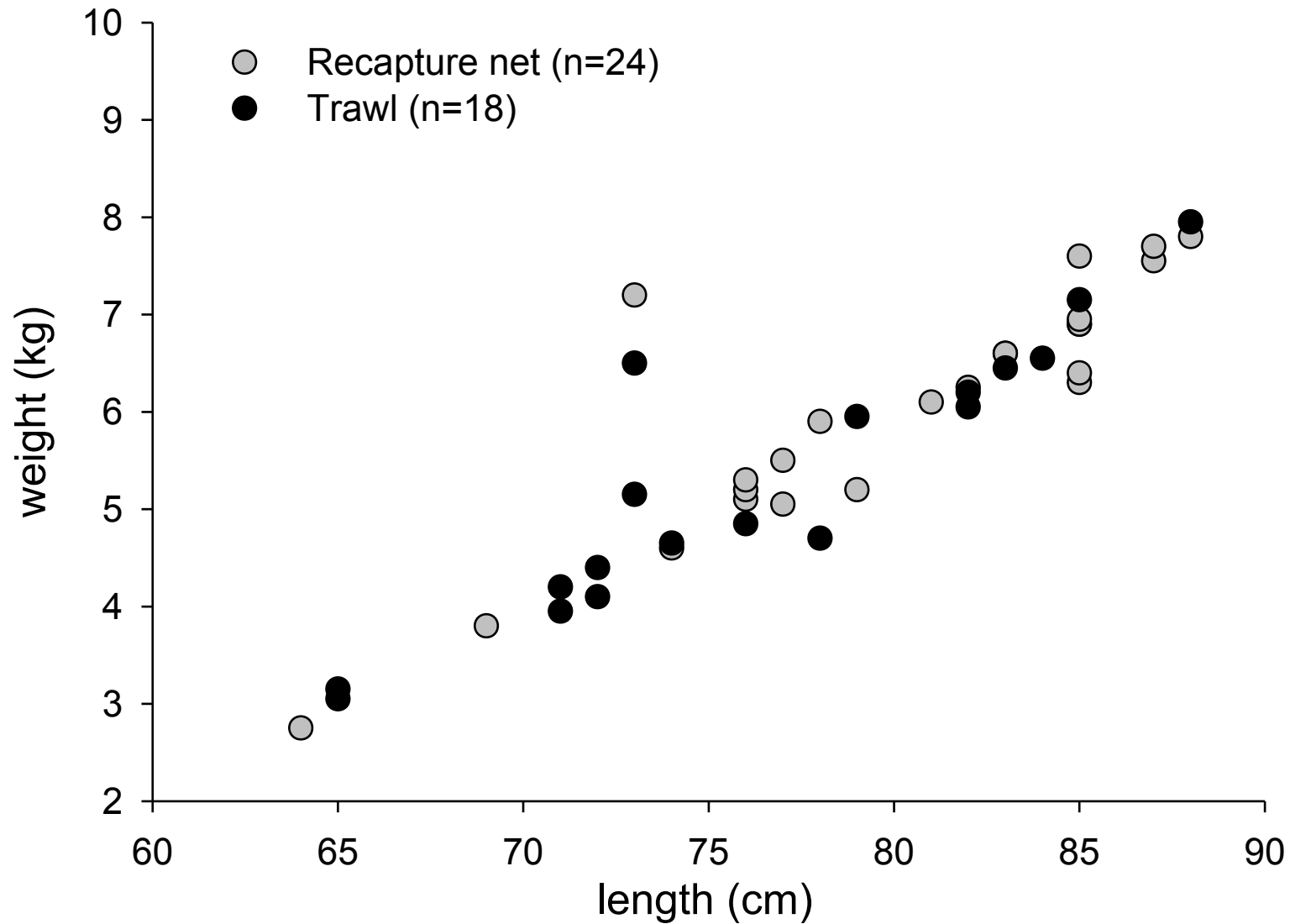
Halibut Size Selectivity



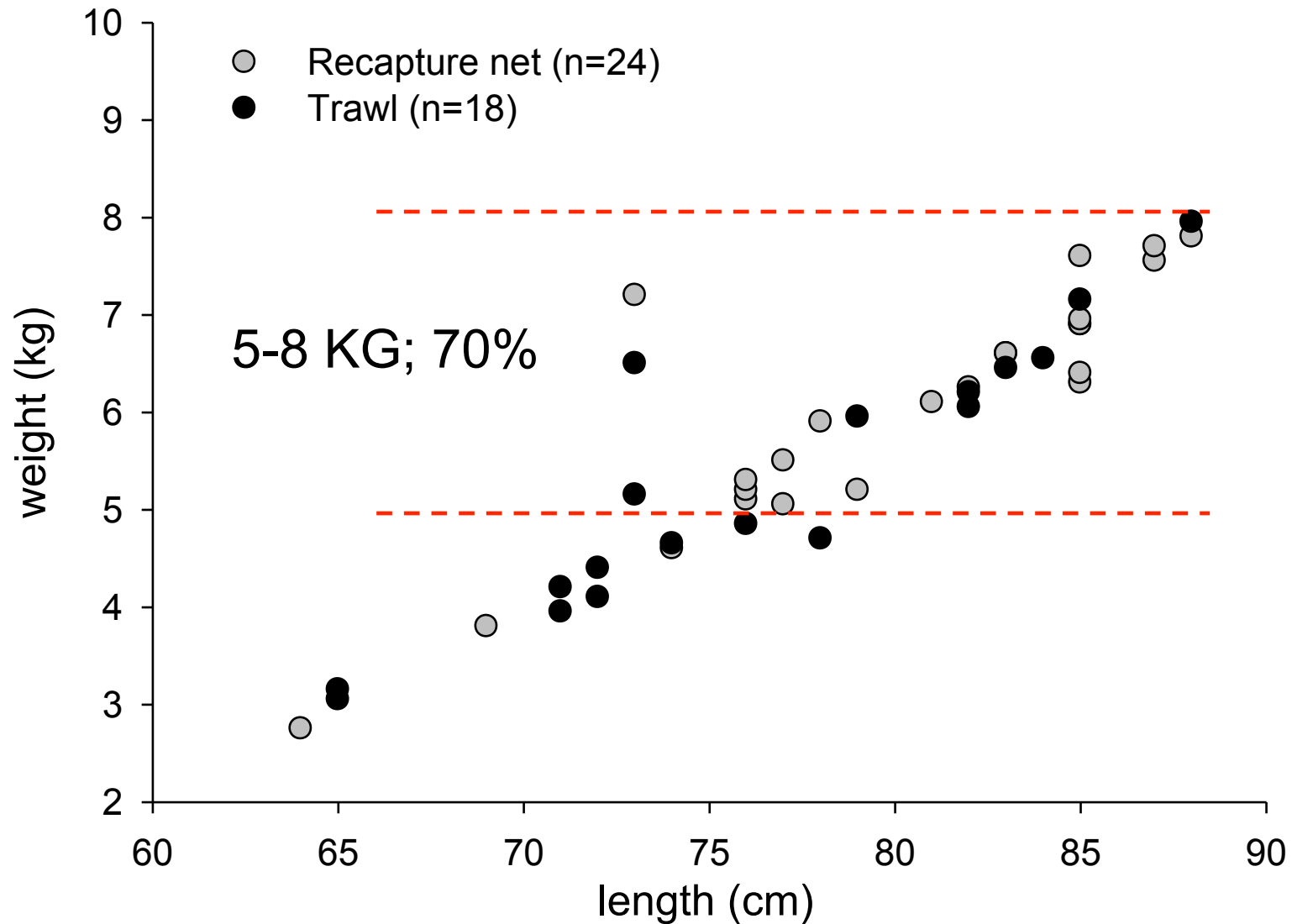
Halibut Size Selectivity



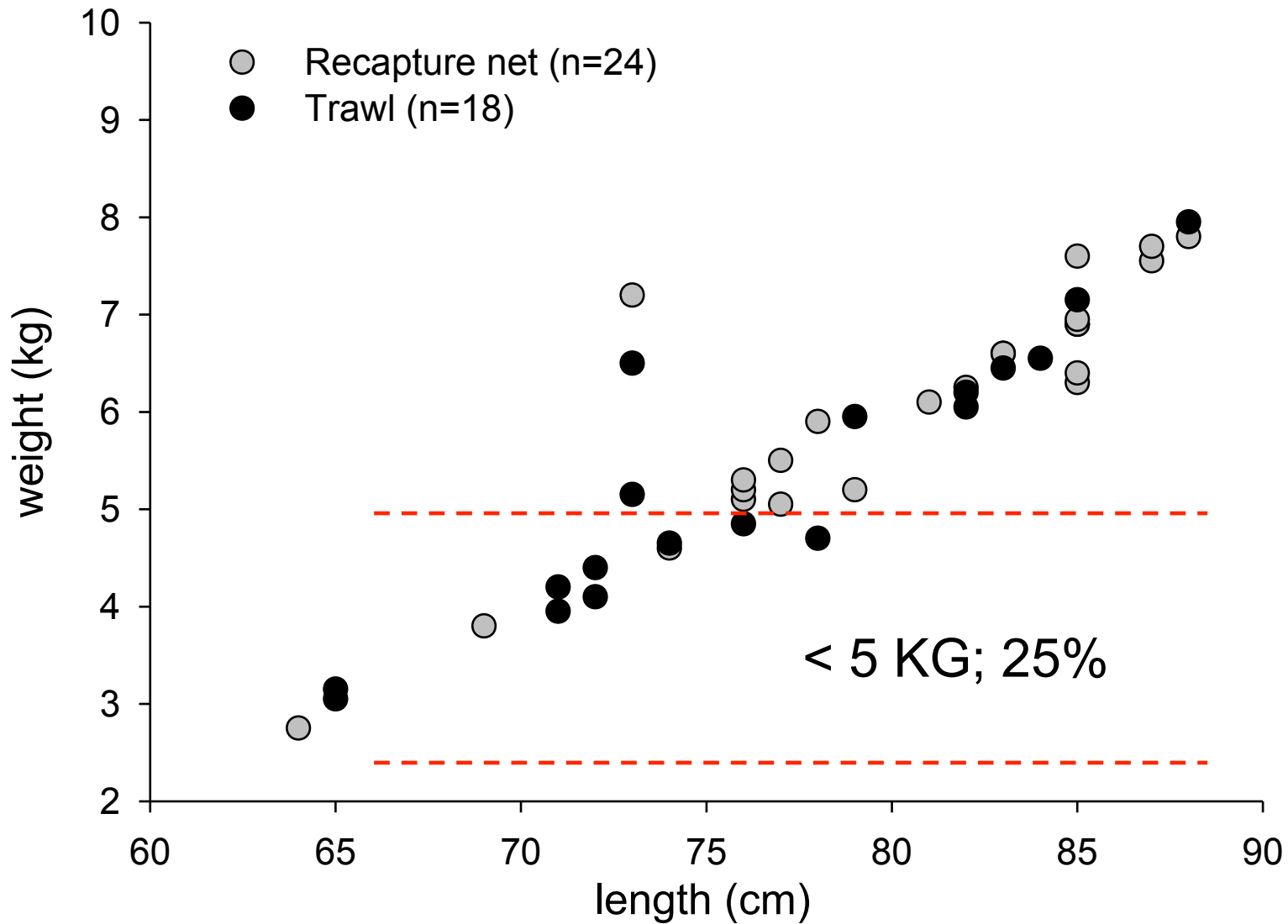
Size Selectivity for Halibut < 8 kg



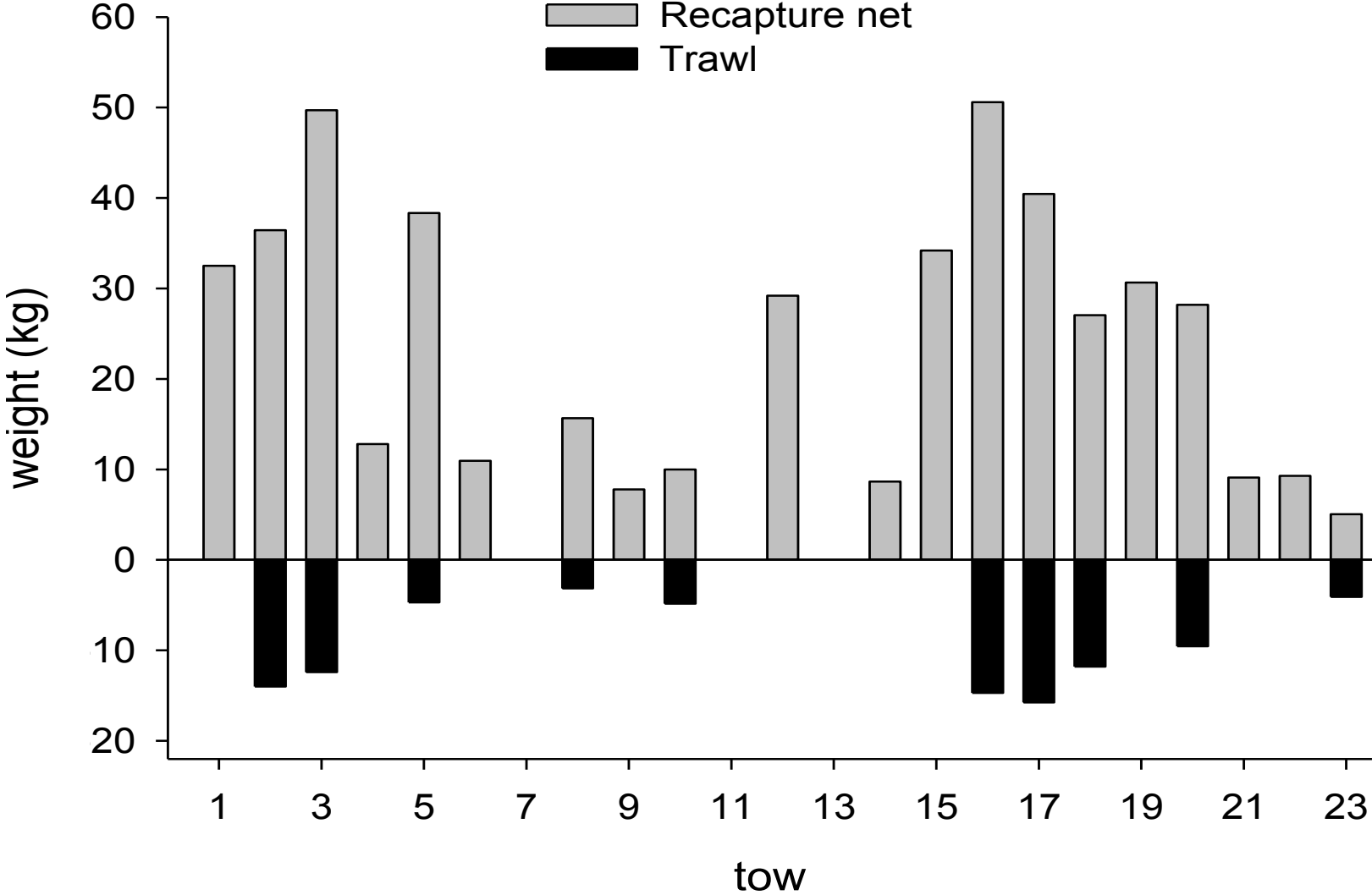
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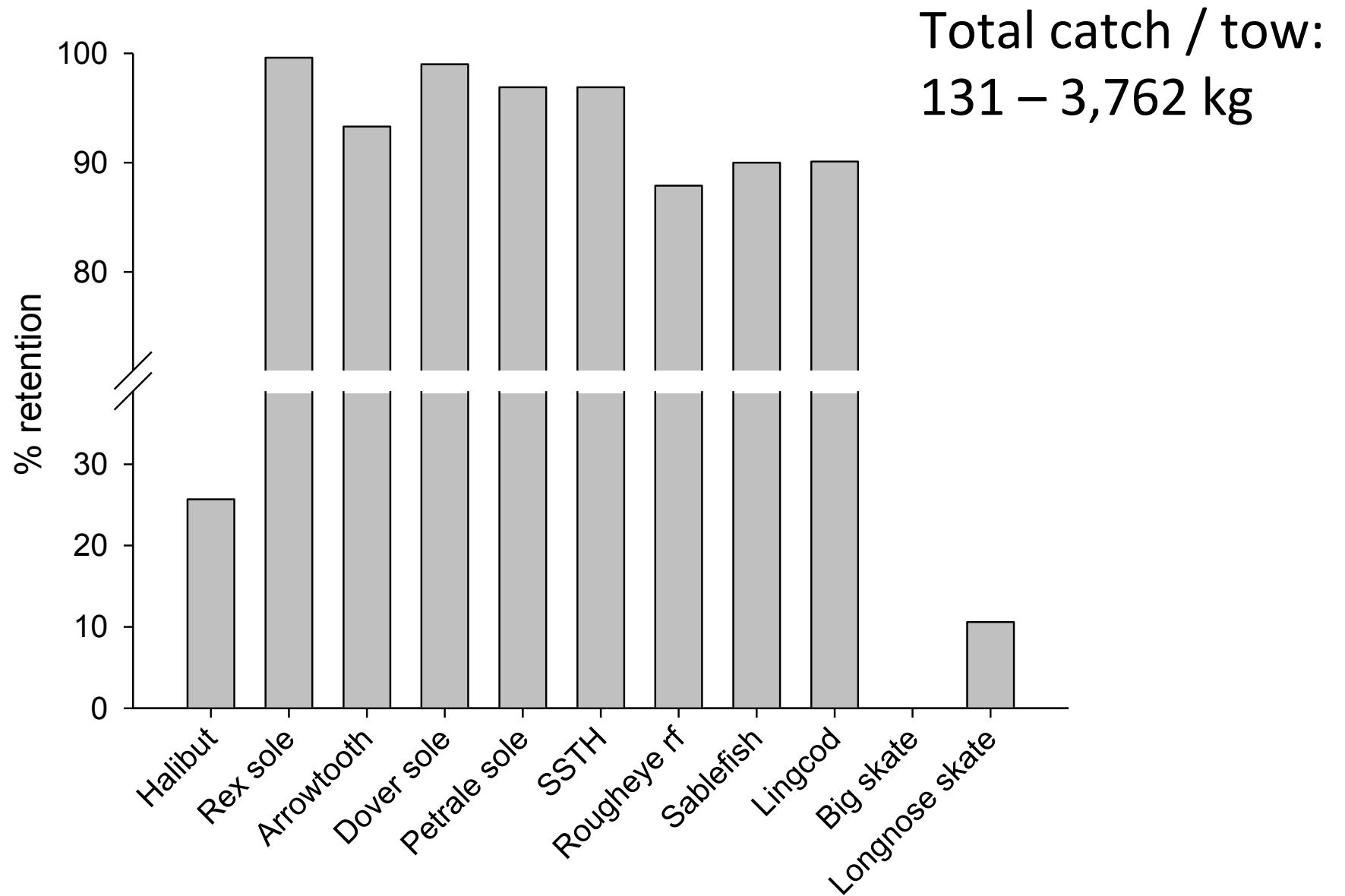
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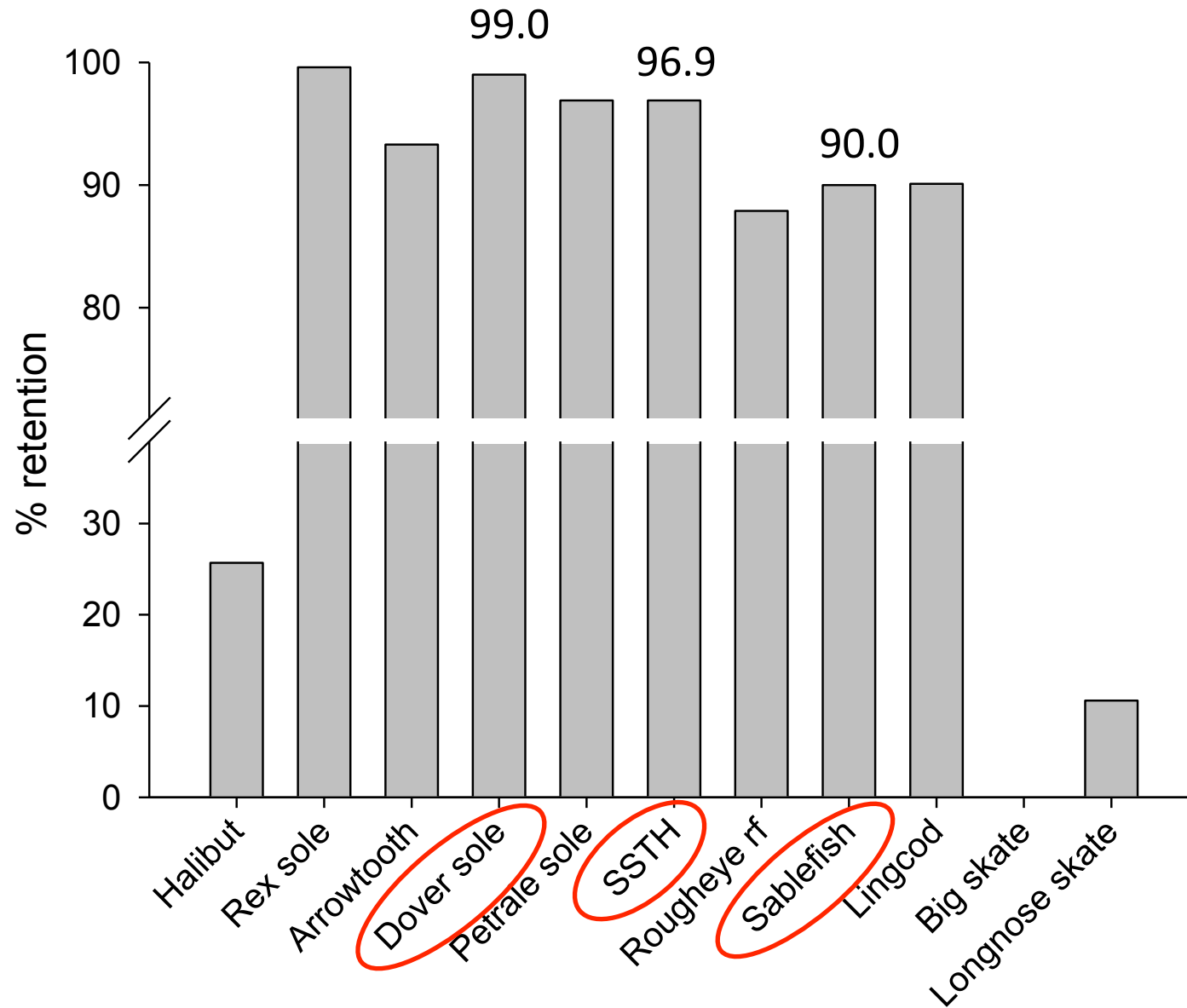
Halibut Escapement per Tow



Retention by Weight (kg)



Retention by Weight (kg)





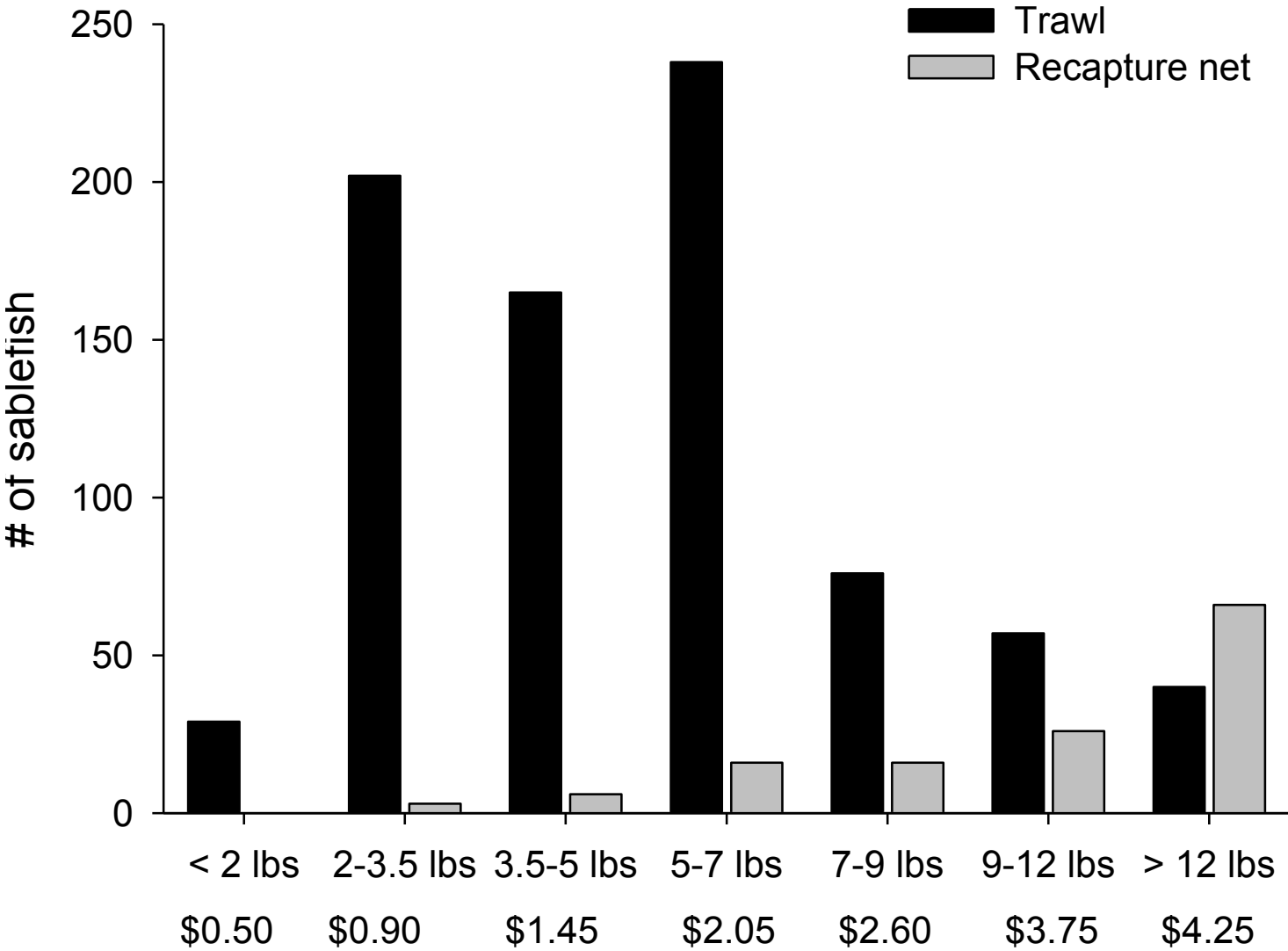
Retention (Tow 8)

Halibut = 16.8%

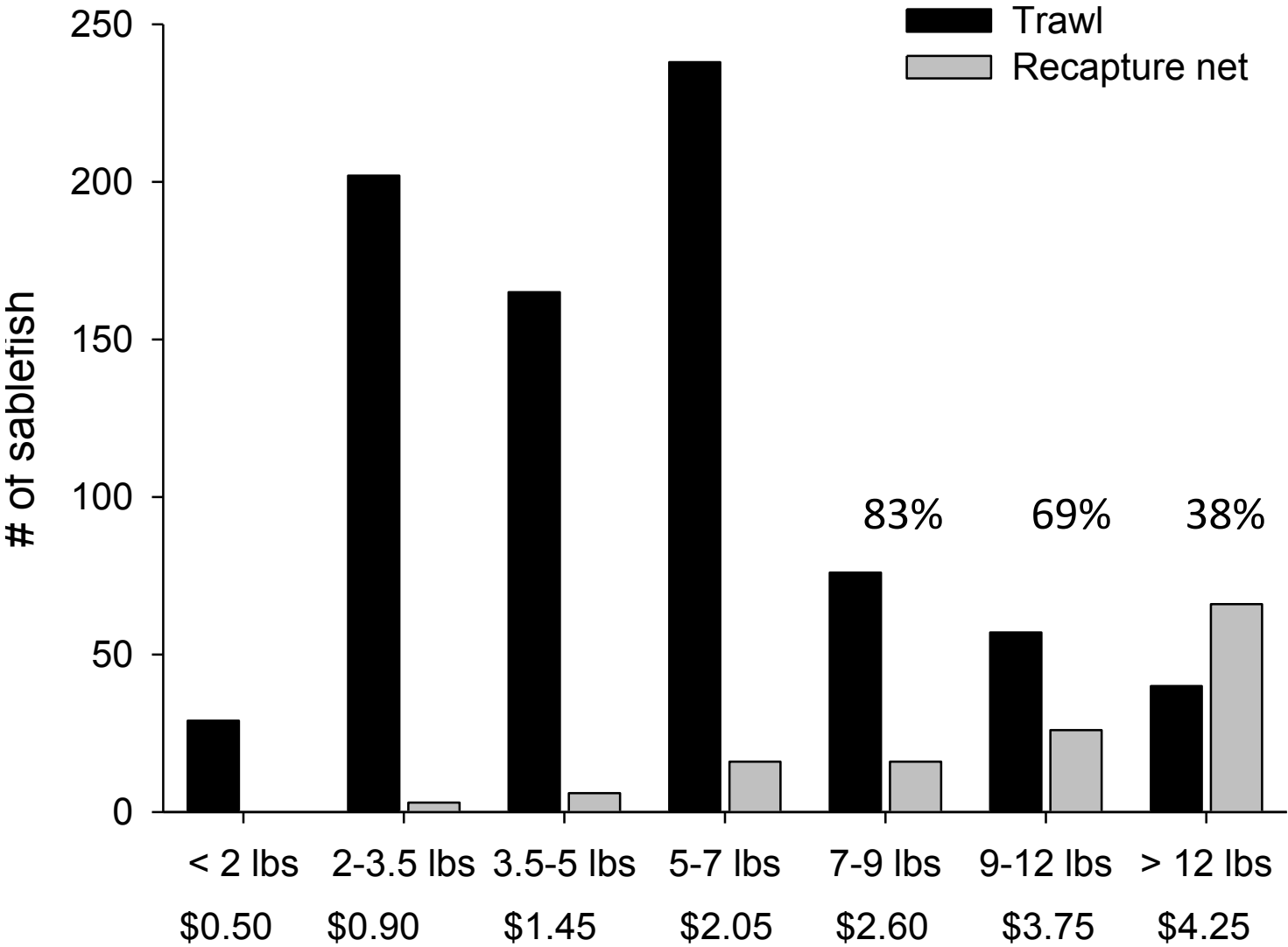
Groundfishes = 91.9%



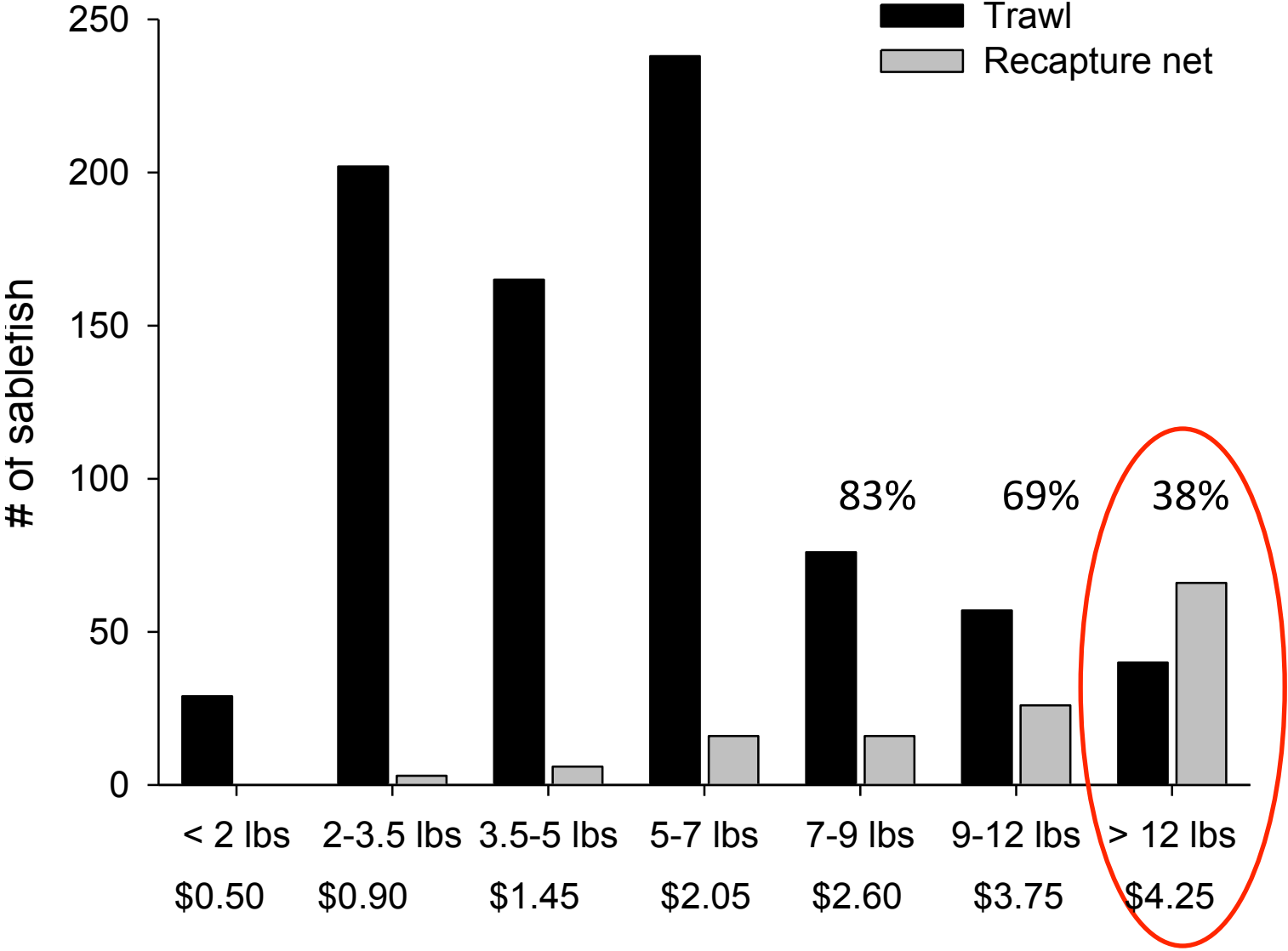
Sablefish Retention by Ex-Vessel Price / lb



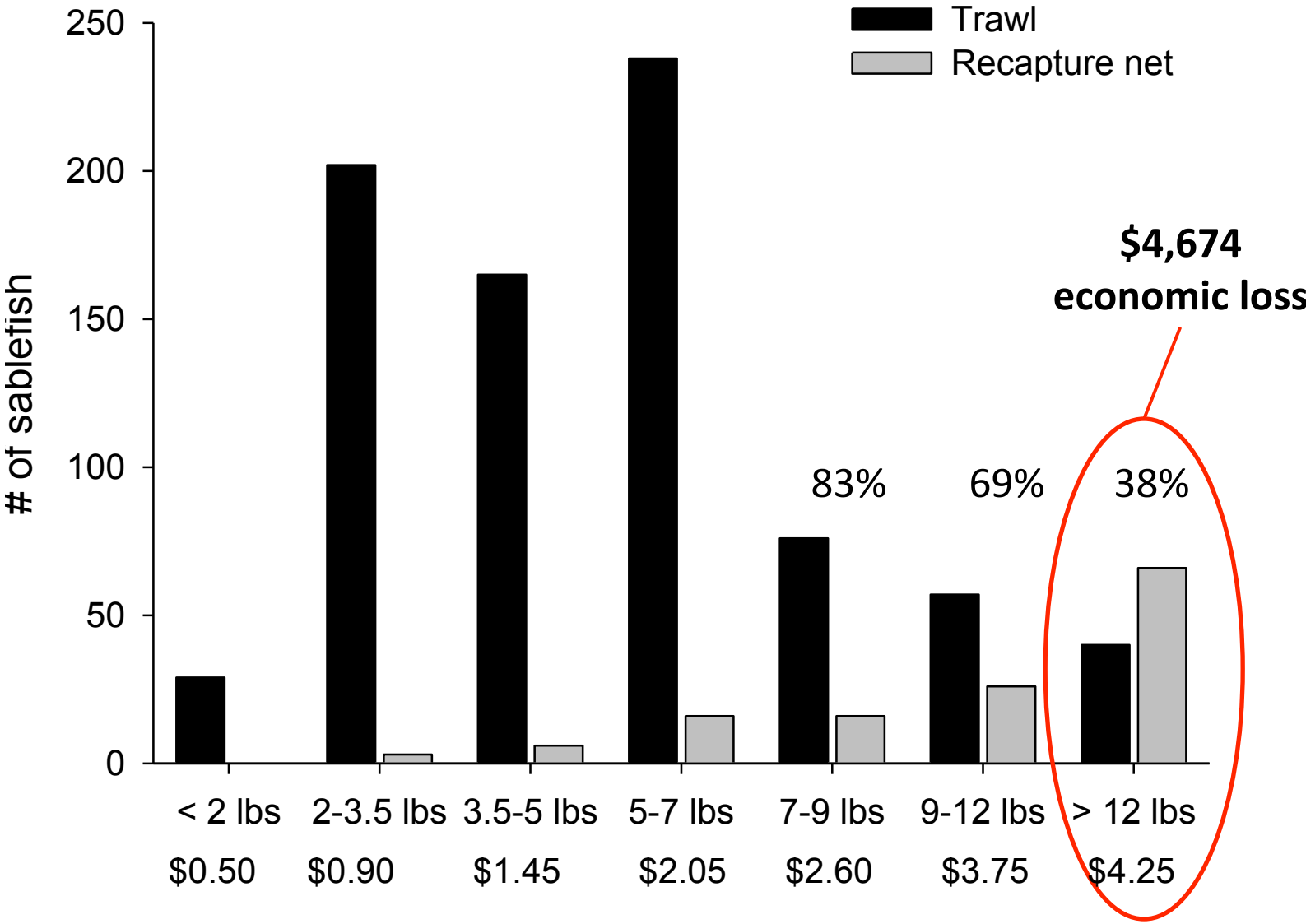
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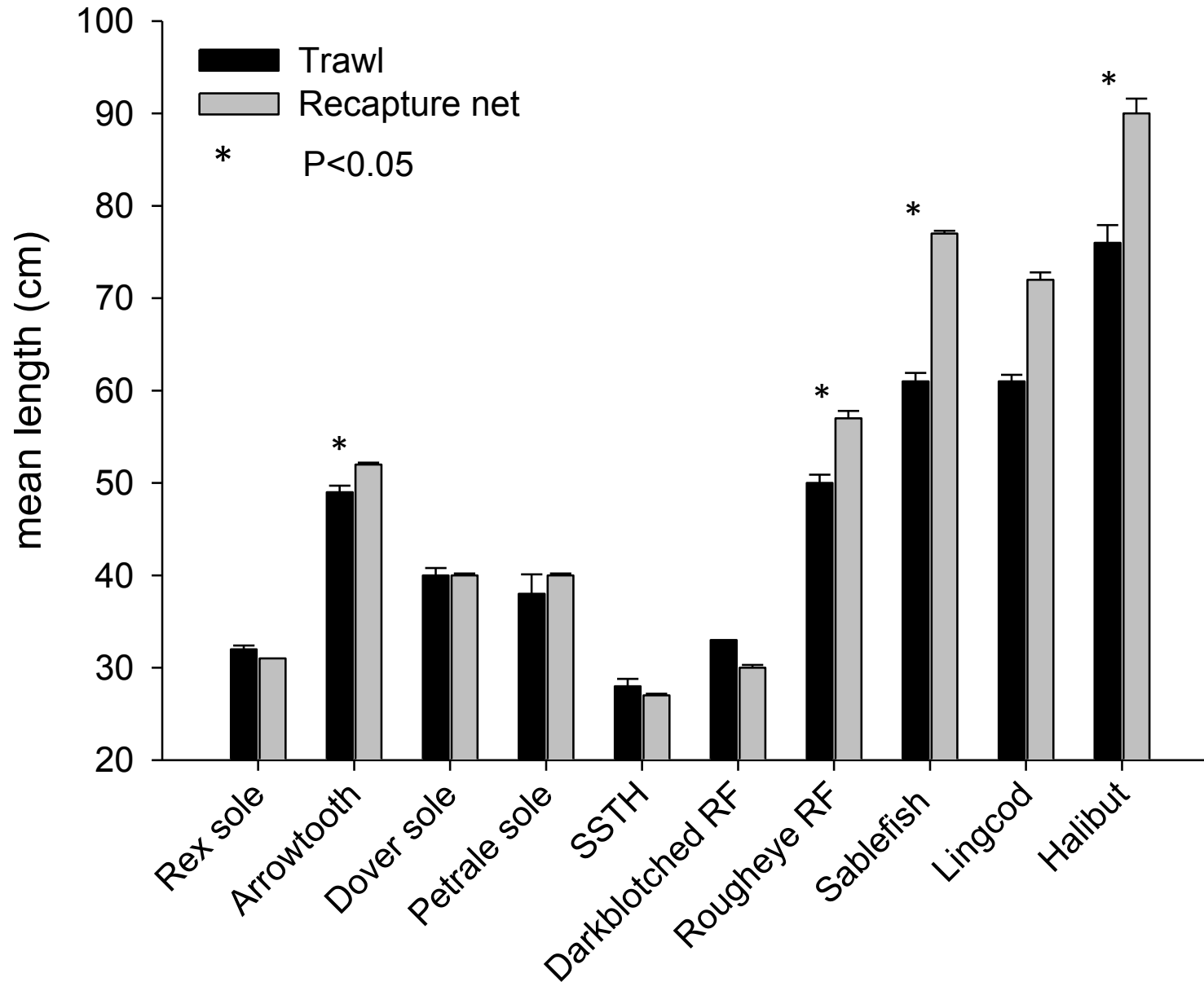
Sablefish Retention by Ex-Vessel Price / lb



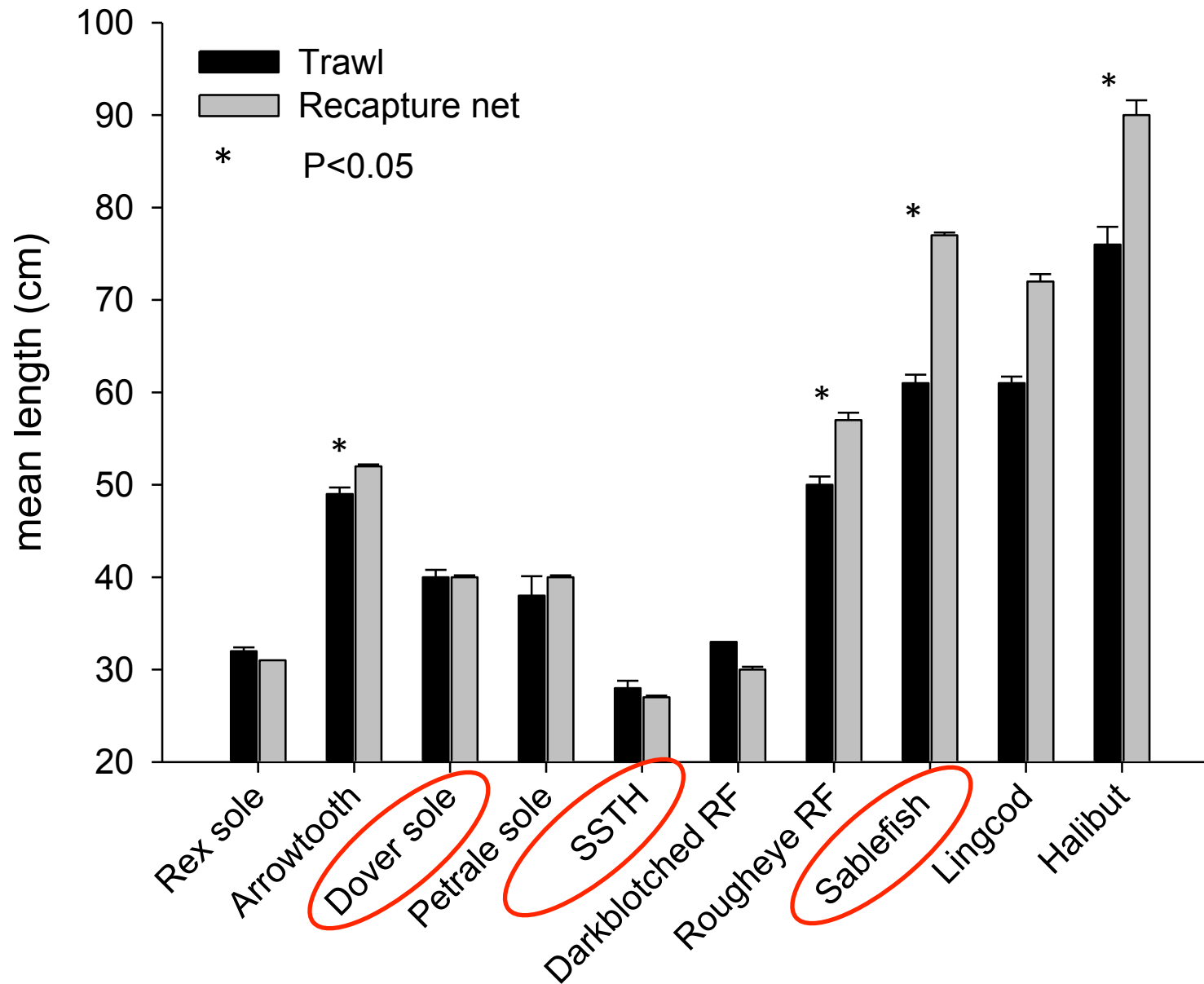
Sablefish Retention by Ex-Vessel Price / lb



Mean Length Comparison - DTS Fishery



Mean Length Comparison - DTS Fishery



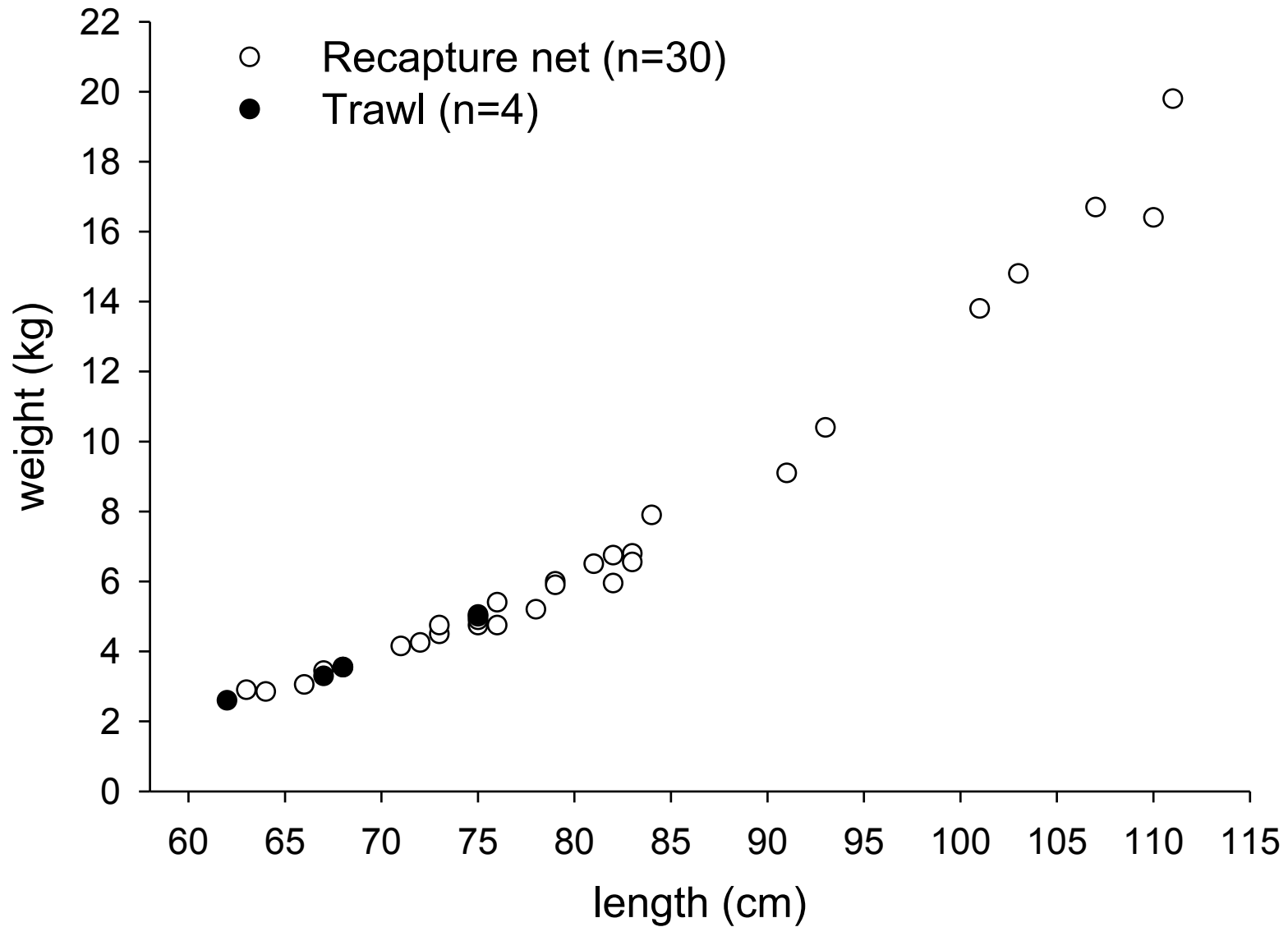
Nearshore Flatfish Fishery Results



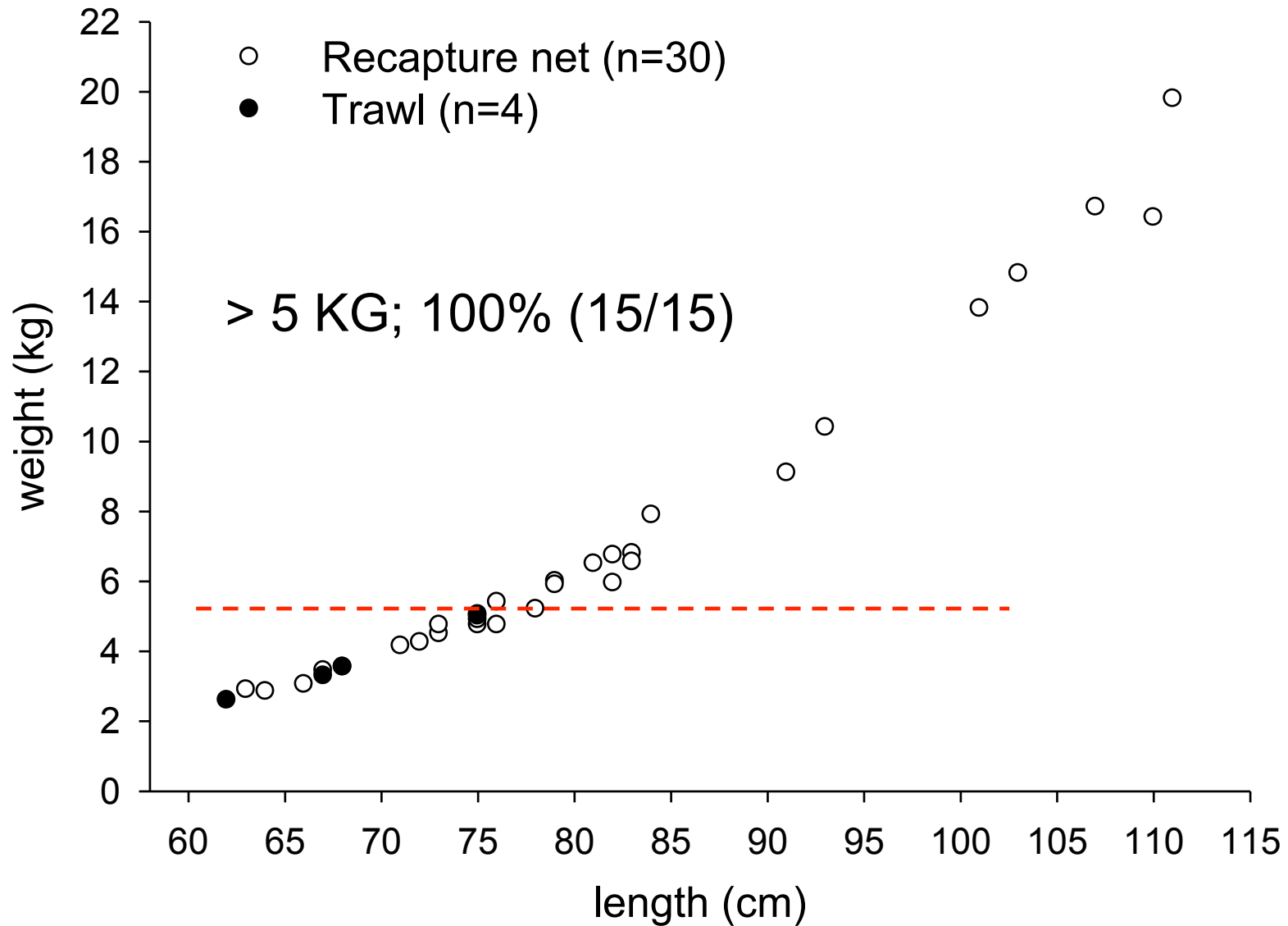
Pacific Halibut Bycatch Reduction

| | Trawl | Recapture net | Result |
|------------------|--------------------|--------------------|----------|
| Number of fish | 4 | 30 | 88.2% |
| Weight (kg) | 14.5 | 216.8 | 93.7% |
| Mean length (cm) | 68 (± 2.7 SE) | 81 (± 2.4 SE) | P=0.0282 |

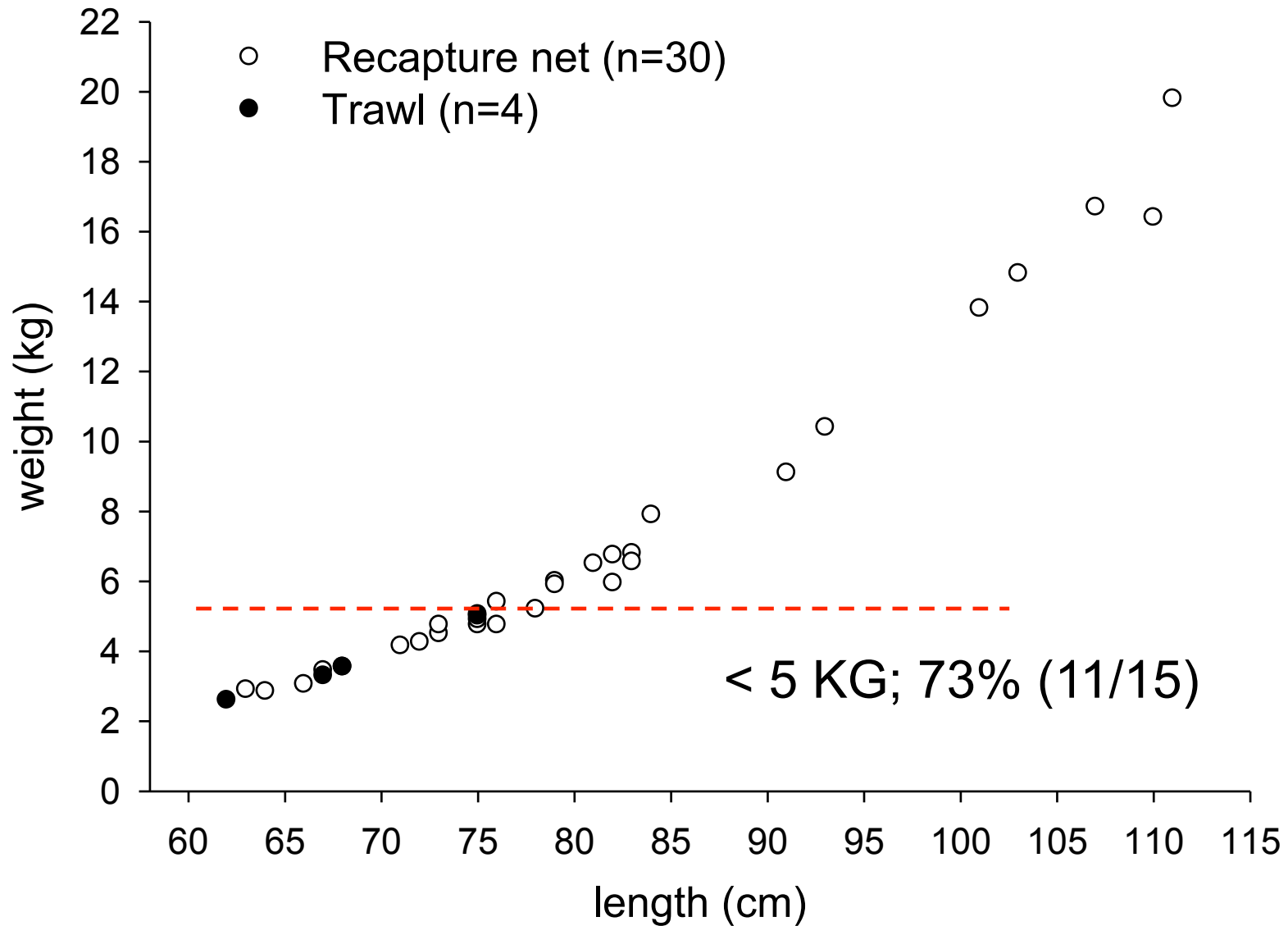
Halibut Size Selectivity



Halibut Size Selectivity

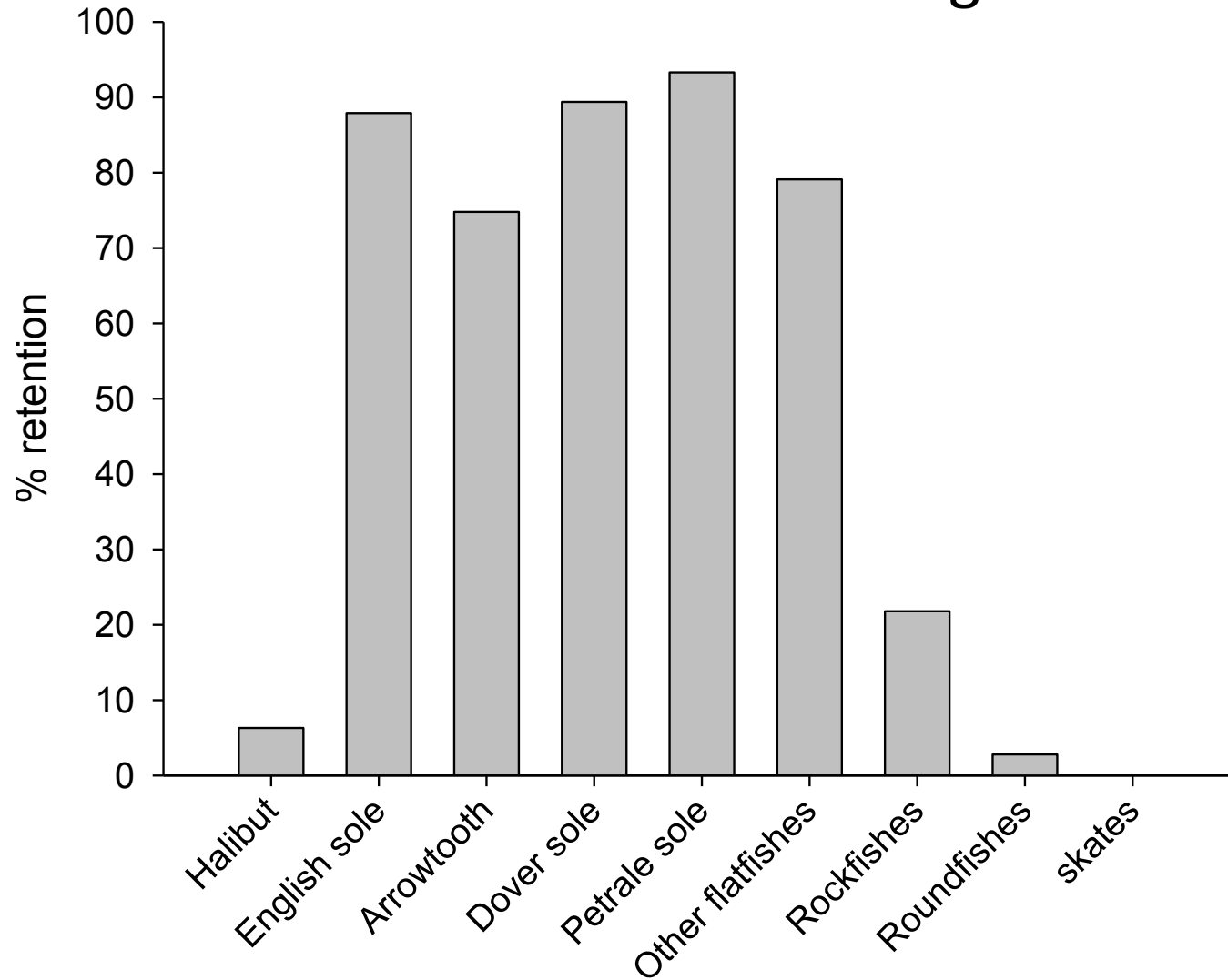


Halibut Size Selectivity

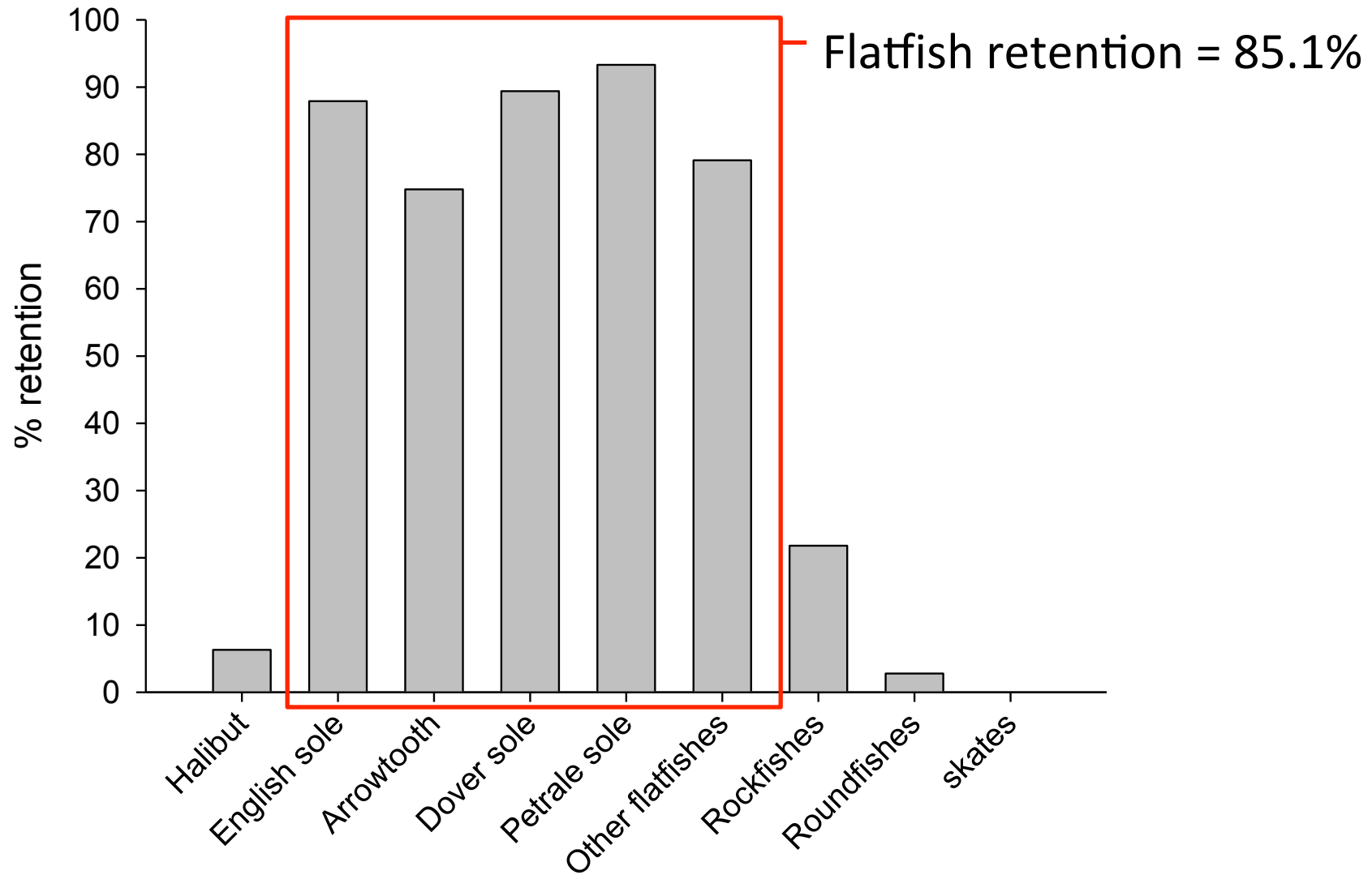


Retention by Weight (kg)

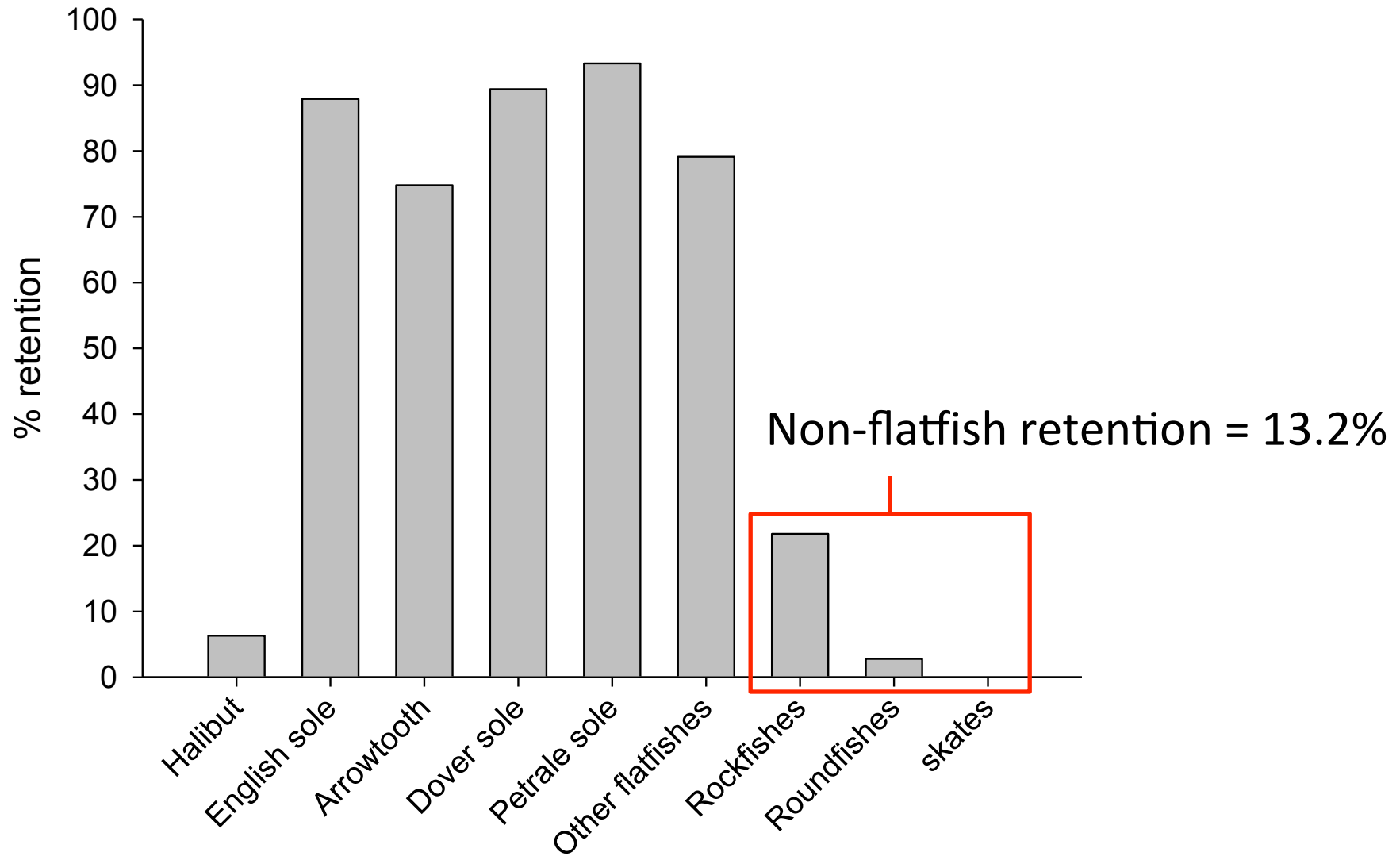
Avg. total catch = 191 kg



Retention by Weight (kg)

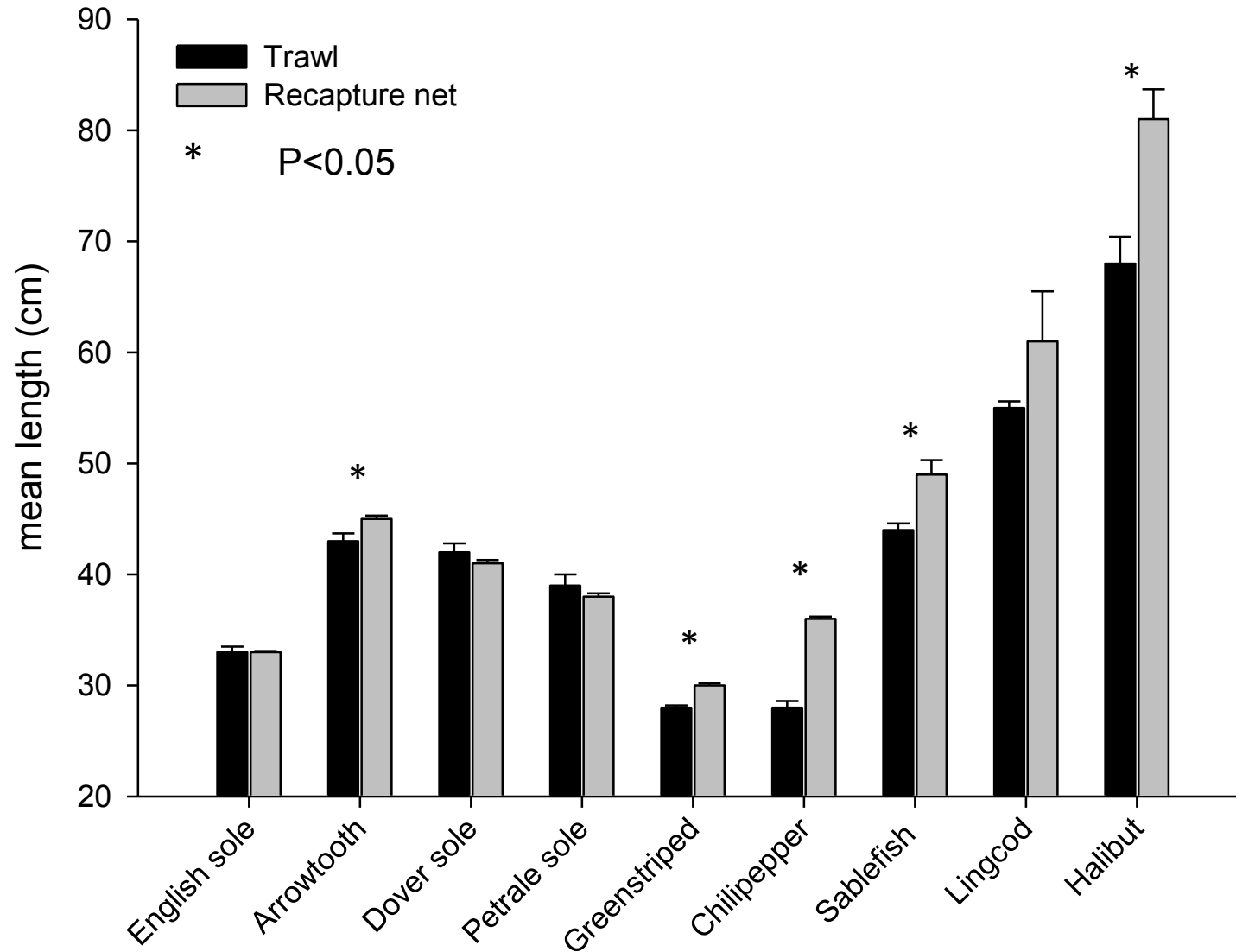


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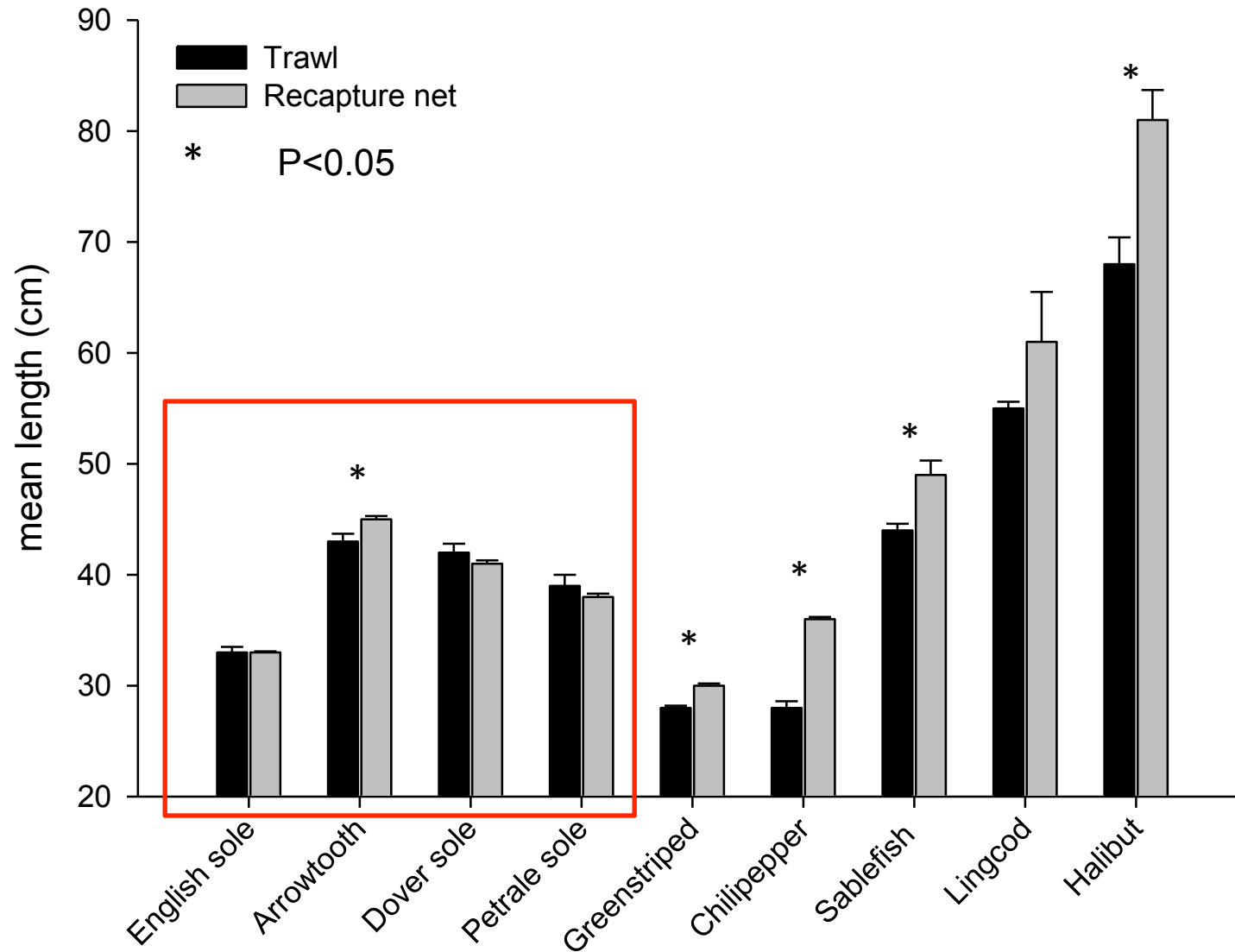




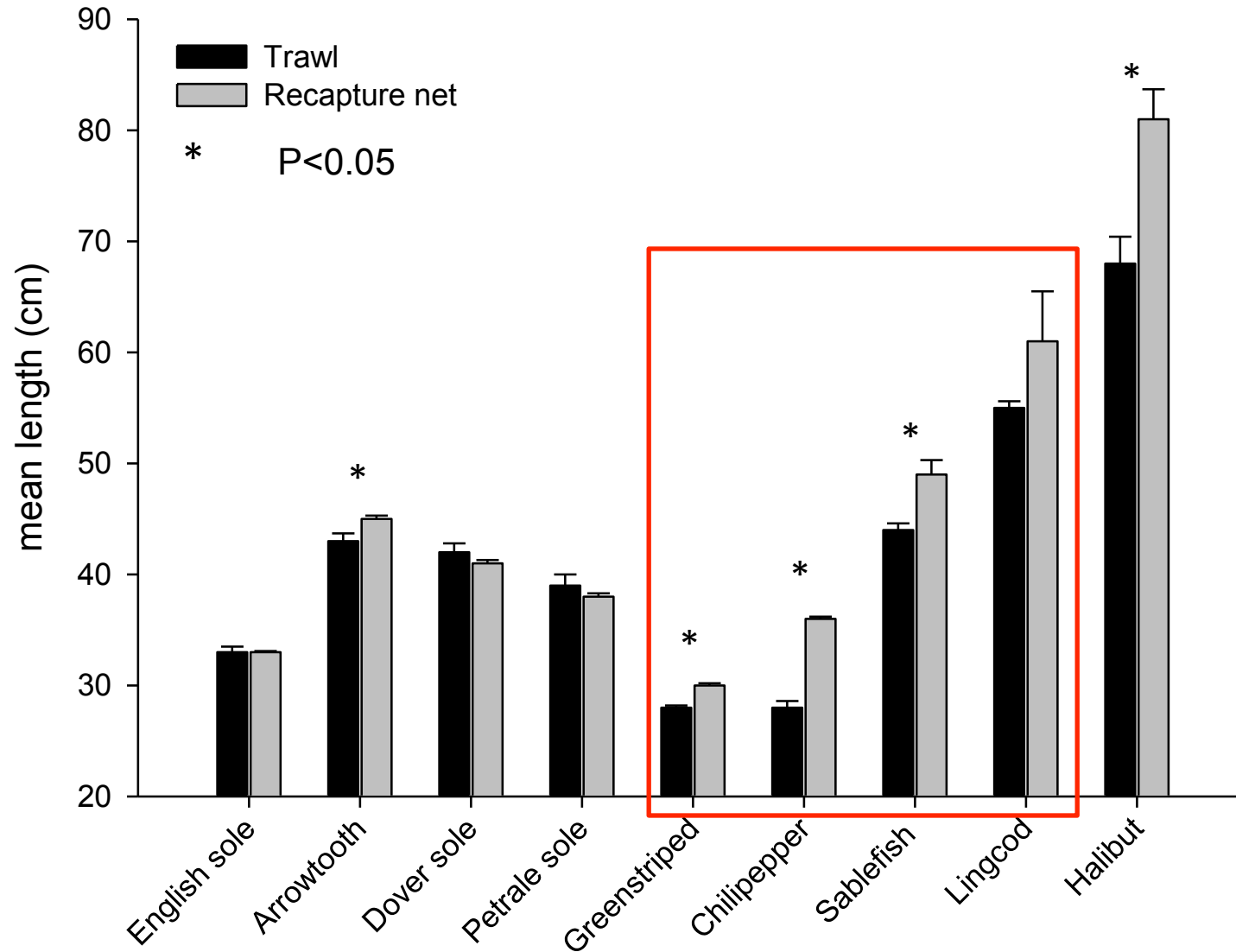
Mean Length Comparison – Flatfish Fishery



Mean Length Comparison – Flatfish Fishery



Mean Length Comparison – Flatfish Fishery



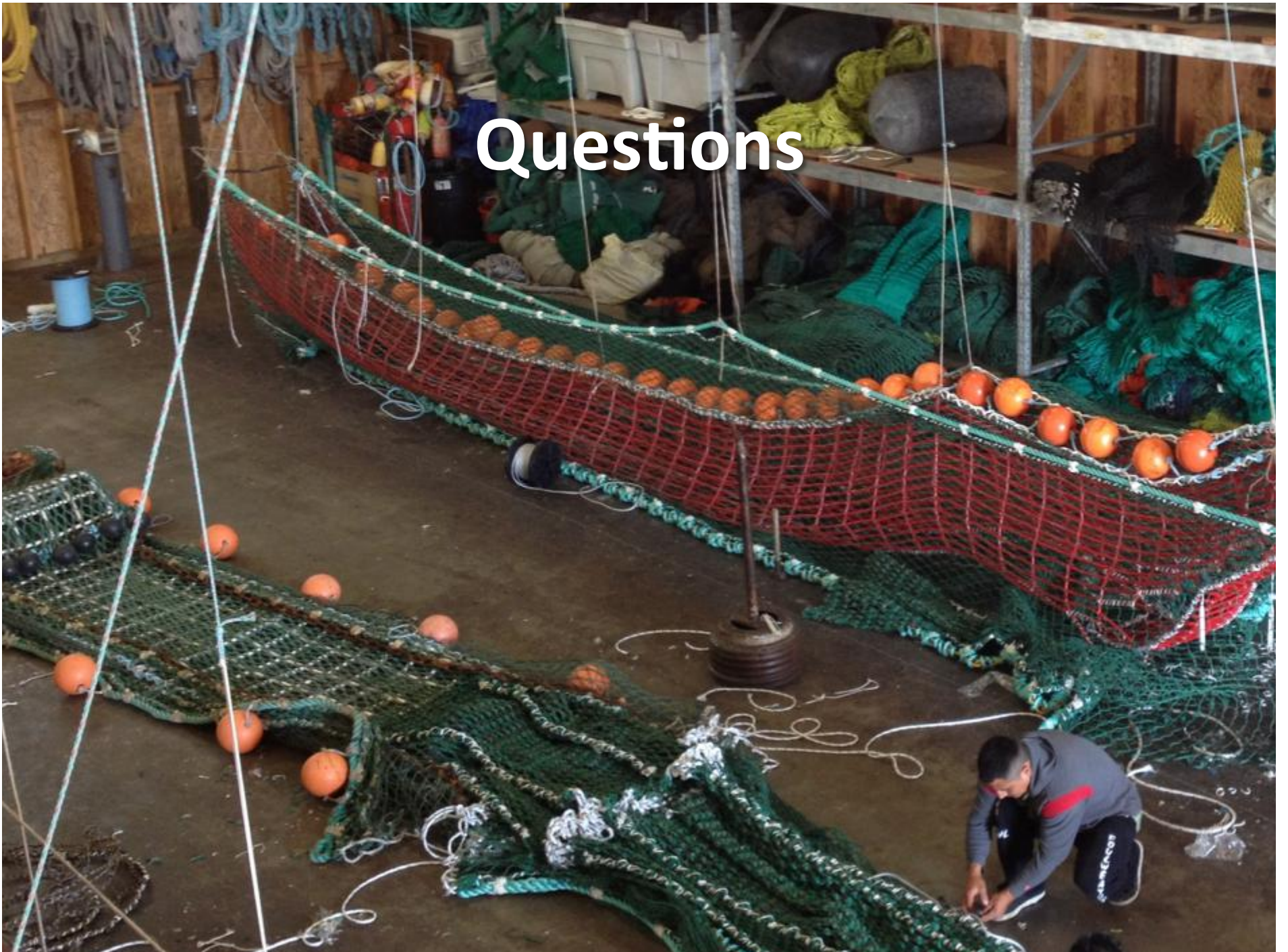
In Summary

- Two BRDs were shown to reduce Pacific halibut bycatch while maintaining catches for several target species
- Deepwater DTS Complex Fishery:
 - positive results were observed overall, *however*, the gear's ability to retain larger-sized (\$) sablefish could affect fishermen's voluntary use of this BRD
- Nearshore Flatfish Fishery:
 - encouraging results were observed
 - further testing of this BRD is scheduled to begin at the end of this month

Acknowledgments

- NOAA Fisheries Bycatch Reduction Engineering Program
- PSMFC and NWFSC
- *F/V Miss Sue* and *F/V Excalibur*
- Foulweather Trawl, LLC
- Victor Simon (NWFSC FRAM) collaborating on the set up of a wireless back deck
- 29th Lowell Wakefield Fisheries Symposium - Anchorage

Questions



Halibut Condition

| | Viability Category | | | % Excellent condition |
|---------------|--------------------|------|------|-----------------------|
| | excellent | poor | dead | |
| Trawl | 13 | 1 | 4 | 72.2 |
| Recapture net | 51 | 0 | 1 | 98.0 |
| Total | 64 | 1 | 5 | 91.4 |

- Although viability was only assessed for halibut, most fish caught in the recapture net appeared to be in good condition with the exception to rockfishes
- Small recapture net catches and short tow durations likely contributed to the excellent conditions noted

Injury Key for Trawl Caught Pacific Halibut

- 1a. Fish is alive **Go to 2a**
- 1b. Fish is dead when sorted from the catch..... **Code DEAD**
- Fish is in rigor and lifeless, even if no apparent injuries.
 - Gills appear washed out, i.e., dull red, pink, or white in color.
 - Mouth may contain sediment.
- 2a. Body of fish appears uninjured, or has only minor injuries **Go to 3a**
- 2b. Injuries to fish are significant and obvious **Code DEAD**
- Body cavity is ripped open, exposing internal organs.
 - Body tissue may be torn or ripped in a rough, ragged manner.
 - Red hemorrhaging observed on 25% or more of the white side of fish.
- 3a. Fish is able to close operculum when stimulated..... **Go to 4a**
- Operculum is closed strongly or weakly, but pressure is evident.
 - Operculum may not stay closed for long, though pressure may last up to 5 seconds or longer.
- 3b. Fish cannot close operculum, even when stimulated..... **Code DEAD**
- 4a. Fish displays activity and has muscle tone..... **Go to 5a**
- Fish displays a minimal amount of activity, especially when stimulated.
 - May be able to clench jaw tightly.
- 4b. Fish exhibits no muscle tone..... **Code DEAD**
- 5a. Fish is not bleeding, or only slightly bleeding, if at all **Go to 6a**
- 5b. Blood is flowing freely and continuously in large quantities (profusely) **Code DEAD**
- Bleeding is coming from a torn or severed gill arch, or a body injury.
- 6a. Body injuries are minimal, perhaps difficult to find..... **Go to 7a**
- May consist of superficial nicks or cuts on body.
 - Less than 10% of dorsal and anal fin area is frayed.
- 6b. Body injuries are readily apparent **Code POOR**
- Skin is damaged with abrasions.
 - Cuts and lacerations in body extend through the skin and just barely into the flesh (not deeply).
 - Dorsal and anal fin area is frayed between 10-50%.
 - Fin edges may be bleeding.
 - Roughly 10-25% of the white side of fish shows red hemorrhaging.