

Developing a camera chute to assess halibut bycatch of Alaska's trawl fisheries

Craig S. Rose¹, Farron Wallace², Jenq-Neng Hwang³, Tsung-Wei Huang³, Suzanne Romain⁴, and Jason Sagmiller⁴

¹ FishNext Research LLC, ² Fisheries Management and Assessment Div., Alaska Fisheries Science Center, NOAA Fisheries,

³ Information Processing Lab, Electrical Engineering Dept., University of Washington, ⁴ Pacific State Marine Fisheries Commission

The Need

- Pacific halibut (*Hippoglossus stenolepis*) bycatch constrains Alaska bottom trawl fisheries
- Bycatch reduction efforts are strongly motivated if limits are tracked for each vessel
- Conventional halibut bycatch accounting is either imprecise at vessel level or laborious
- Effective and efficient accounting of halibut bycatch for each vessel could be achieved by electronic monitoring of all halibut as they are released.

Applications

Bering Sea deck-sorting

- Catcher-processor trawler crews sort and release halibut from catches before putting below deck
- Requires on-deck monitoring to be added to usual, later sampling as catch enters processing area.



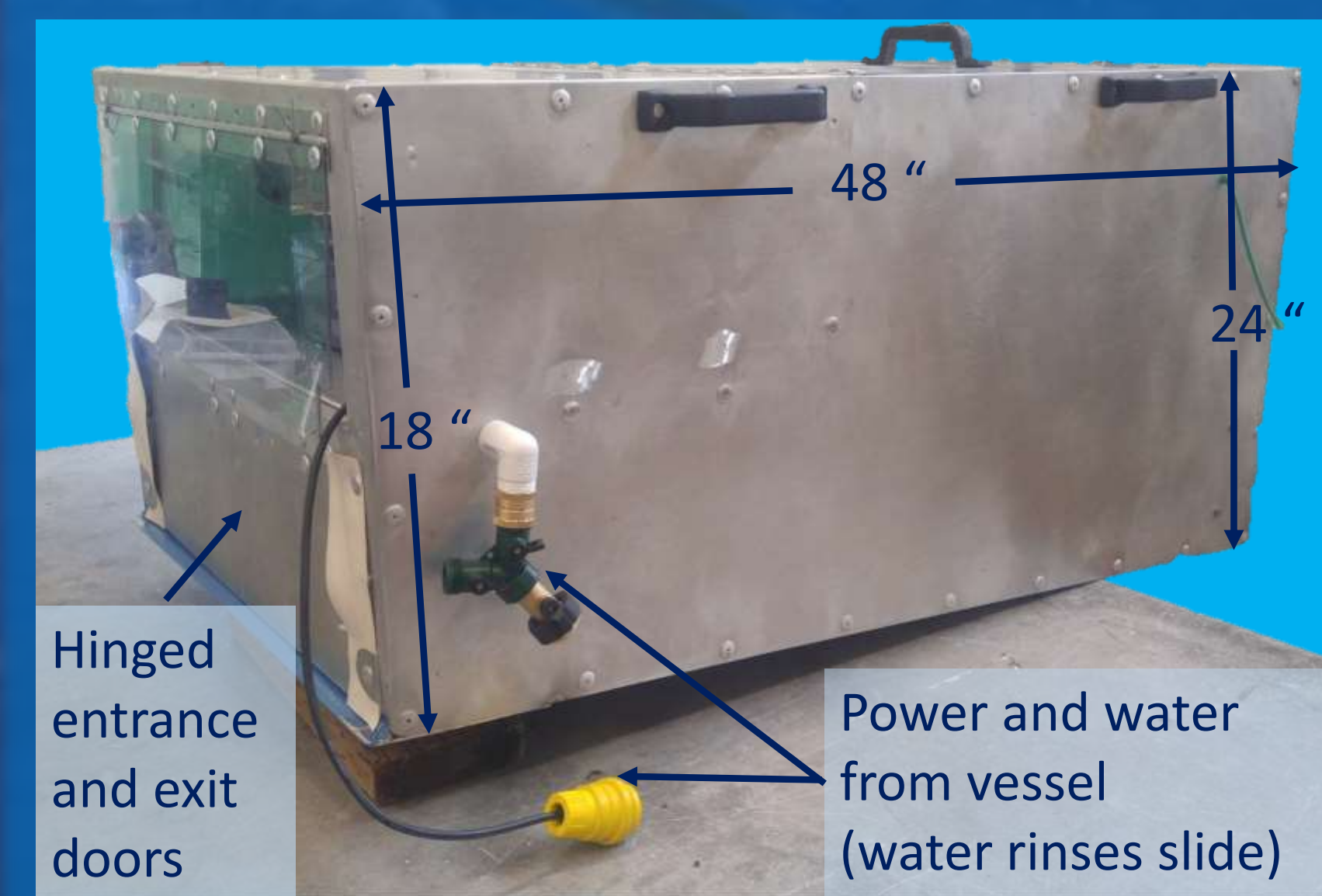
Gulf of Alaska fleet

- Smaller decks and catch handling limit number of halibut sampled
- Sampling only done on some trips



Basic Design

- Full enclosure for light control



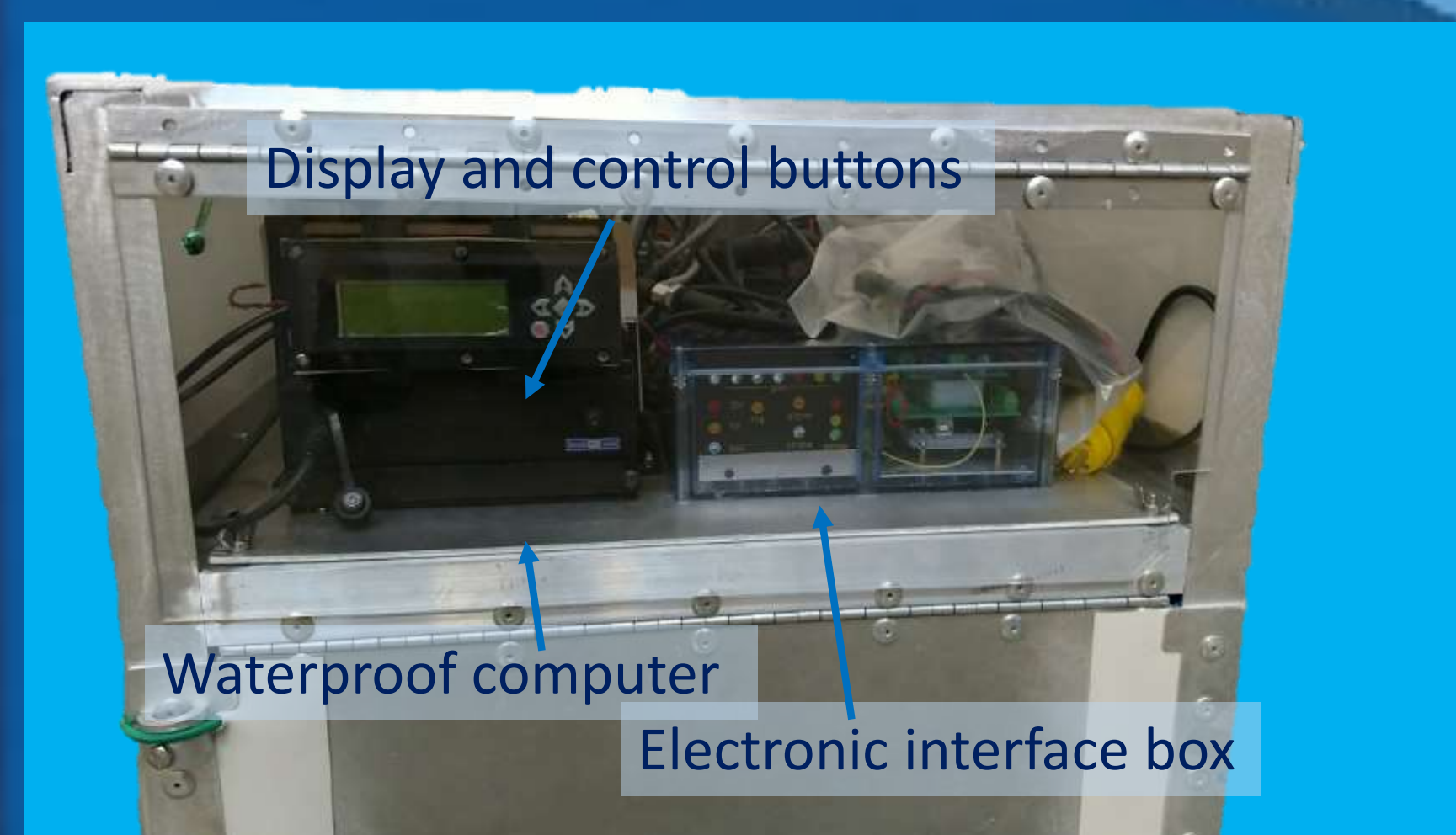
- Light from strobed LED strips
- Image triggered by exit sensors



- 2.8 megapixel machine-vision camera
- Oblique view (camera at head end)

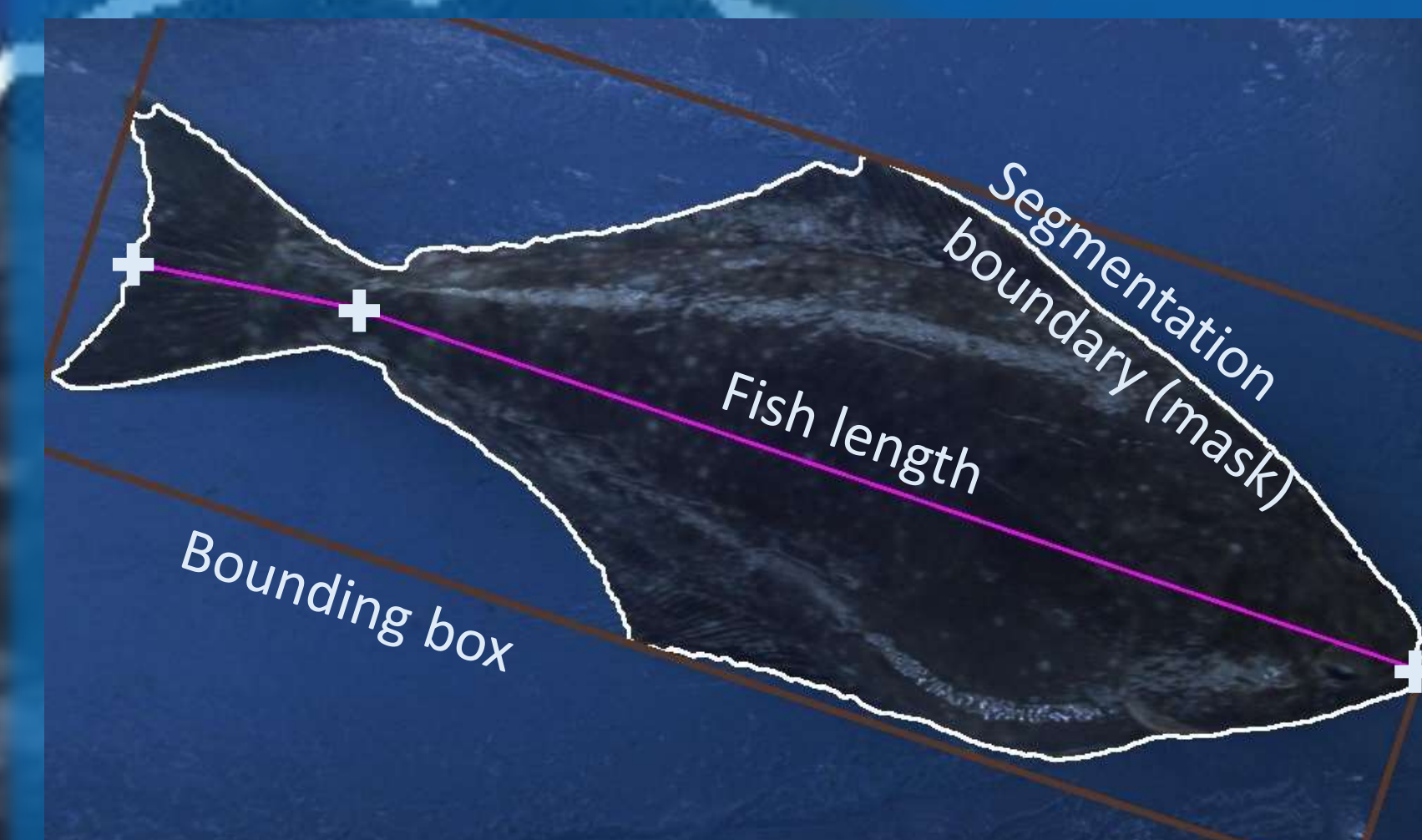


- Computer control, storage, processing



Processing

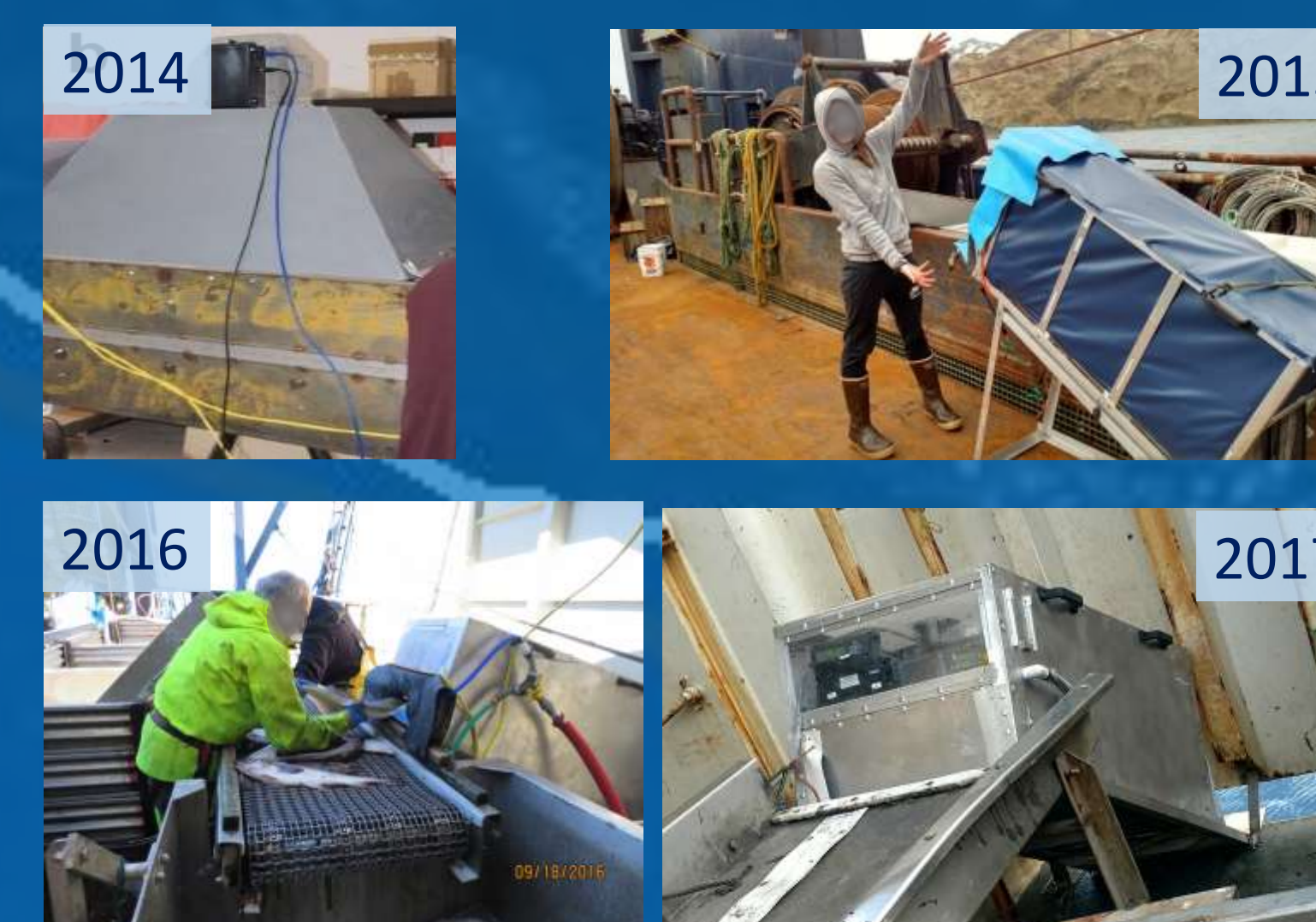
- Calibration
- Segmentation
 - Separate fish from background
 - Many methods and options in place
- Measure fish length
 - 3 point – nose, tail, narrowest point
 - more accurate than center tracking



- Detect flapping fish by relative tail size
- Compute weights and counts at-sea

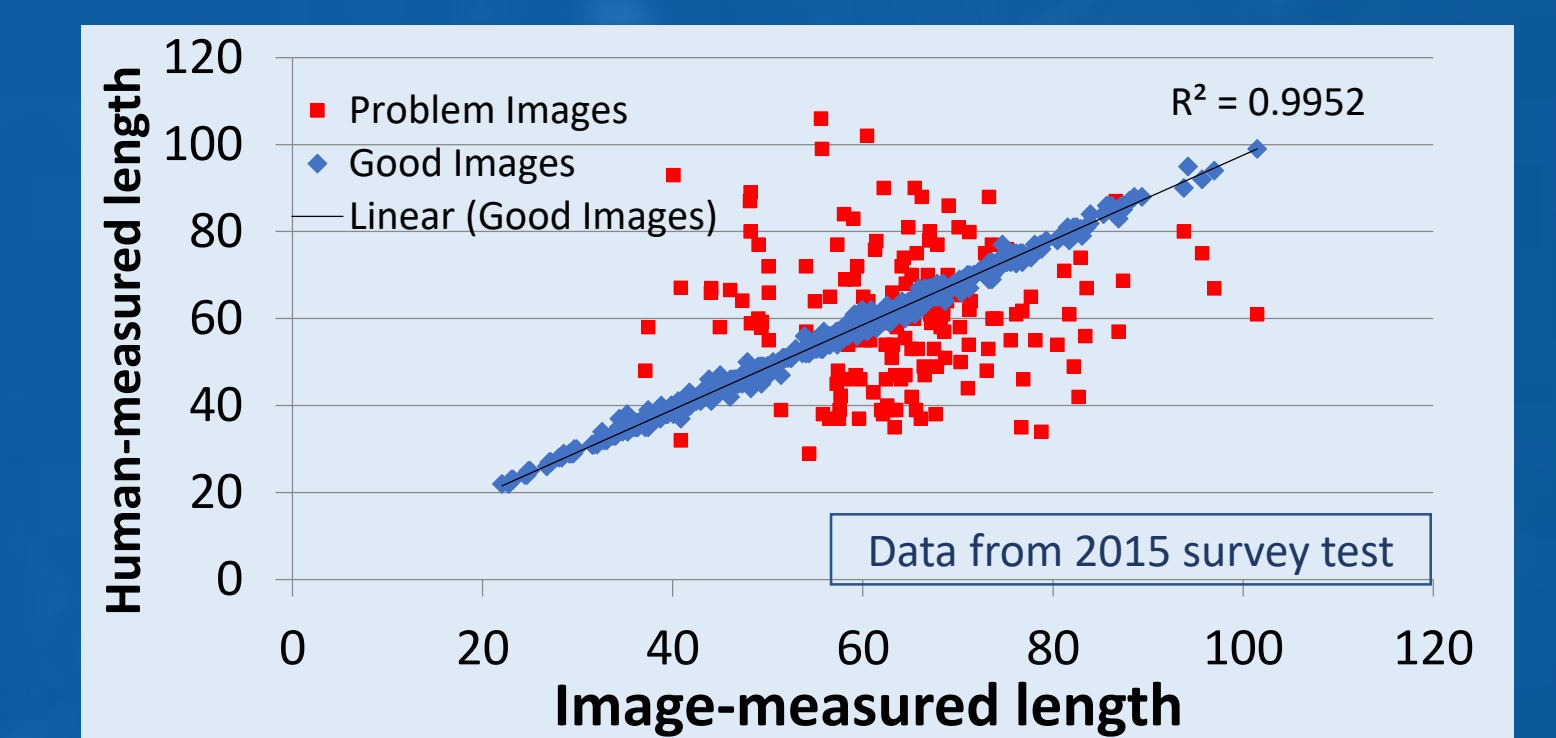
Deployments

- Prototype on Bering trawler (2014)
- Trawl survey – 146 species (2015 -16)
- Bering Sea deck-sort tests (2015 – 17)
 - 4 deployments – up to 2 months
- Gulf of Alaska trawlers (2016 – 17)
 - 8 vessels, 14 trips
- Progressive improvements, based on issues identified at-sea
 - More robust in all condition
 - Familiarity and feedback from fleet

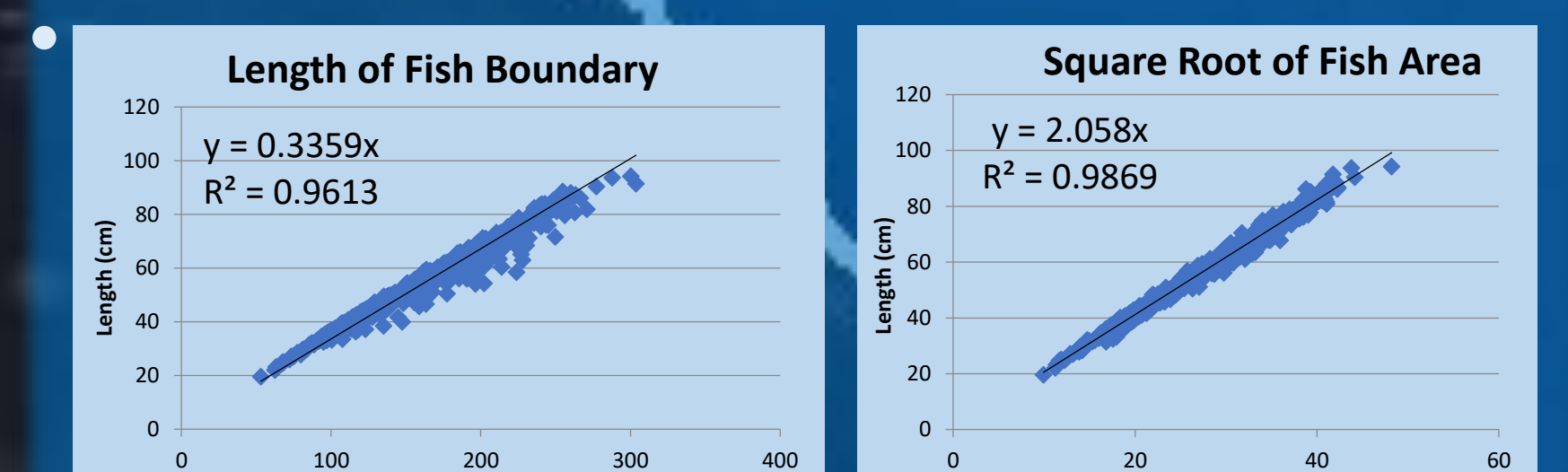


Accuracy

- Good images (81% in 2015) provide accurate measurements



- Image problem categories and solutions used to eliminate errors
 - Flapping fish– Identify by tail proportion and exclude
 - Poor separation from background– Improved segmentation routines, Clearing of camera port
 - Late trigger, nose out of image– Add more trigger beams
- Other image measurements are closely proportional to length and can help identify problem images or improve length estimates



Future

- Continue to develop and improve
- New accuracy tests – deck-sort data
- Integrate field and management use
- Open source design and software
- Measurement of problem images by fitting 'normal' halibut shape⁵

⁵ Gaoang Wang, Information Processing Lab, UWEE

Conclusion

Camera chute can provide an effective and efficient option to monitor halibut bycatch – development is proceeding

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Special thanks to the owners, captains and crews of all vessels that took our chutes to sea!

