Measuring fish reactions to survey vehicles

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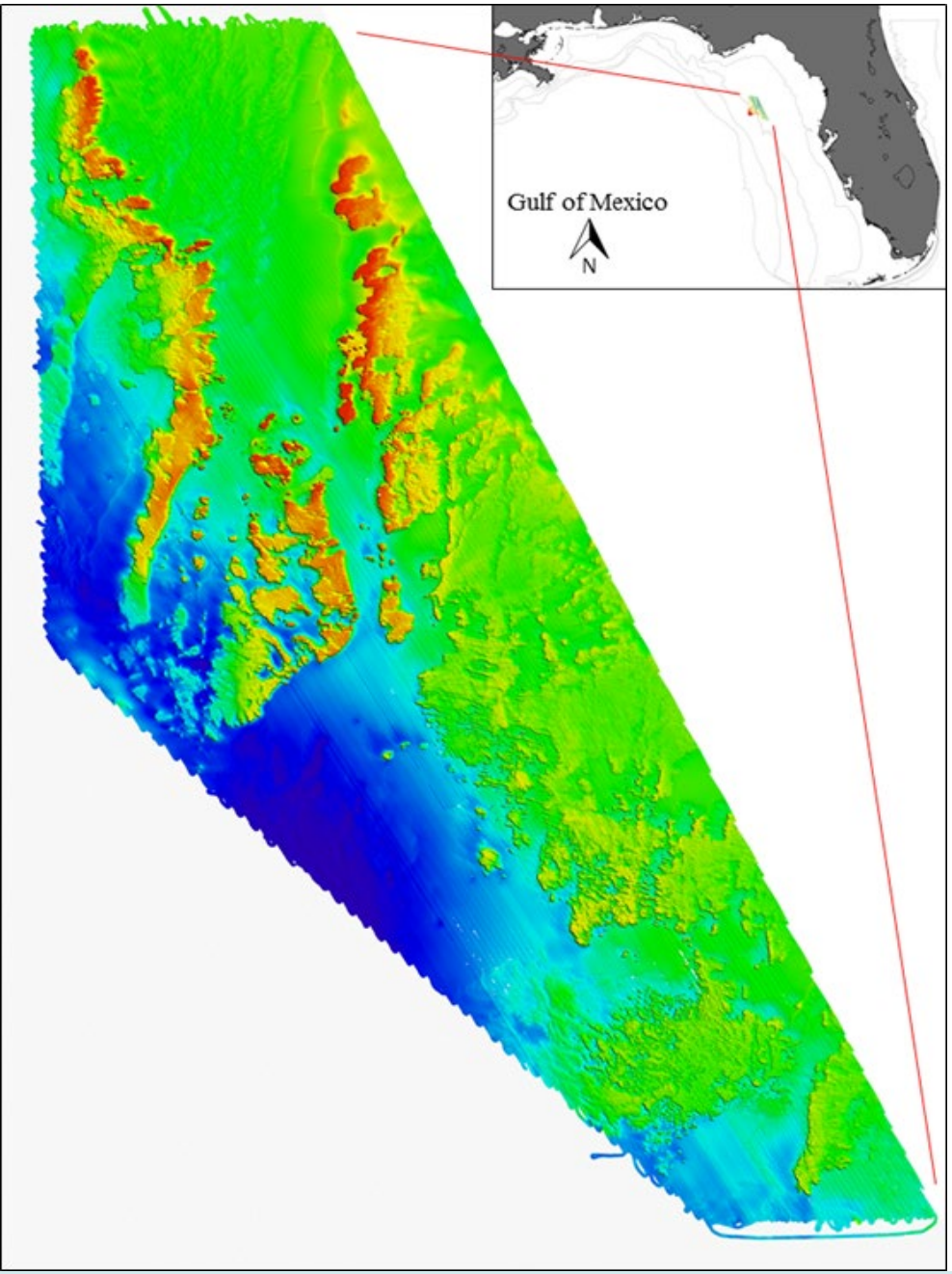
What is the Untrawlable Habitat Strategic Initiative?

- NMFS wide initiative developed by OST and Advanced Sampling Technology Program in 2013

- Developed to improve the sampling methodology in untrawlable habitats

- Experiments to evaluate the sampling efficiency of camera systems on visual survey vehicles or stationary platforms



Florida Middle Grounds

- Rocky outcrops
- Diverse assemblage of fishes
- Clear water
- Ambient light
- 20 – 35 m depth

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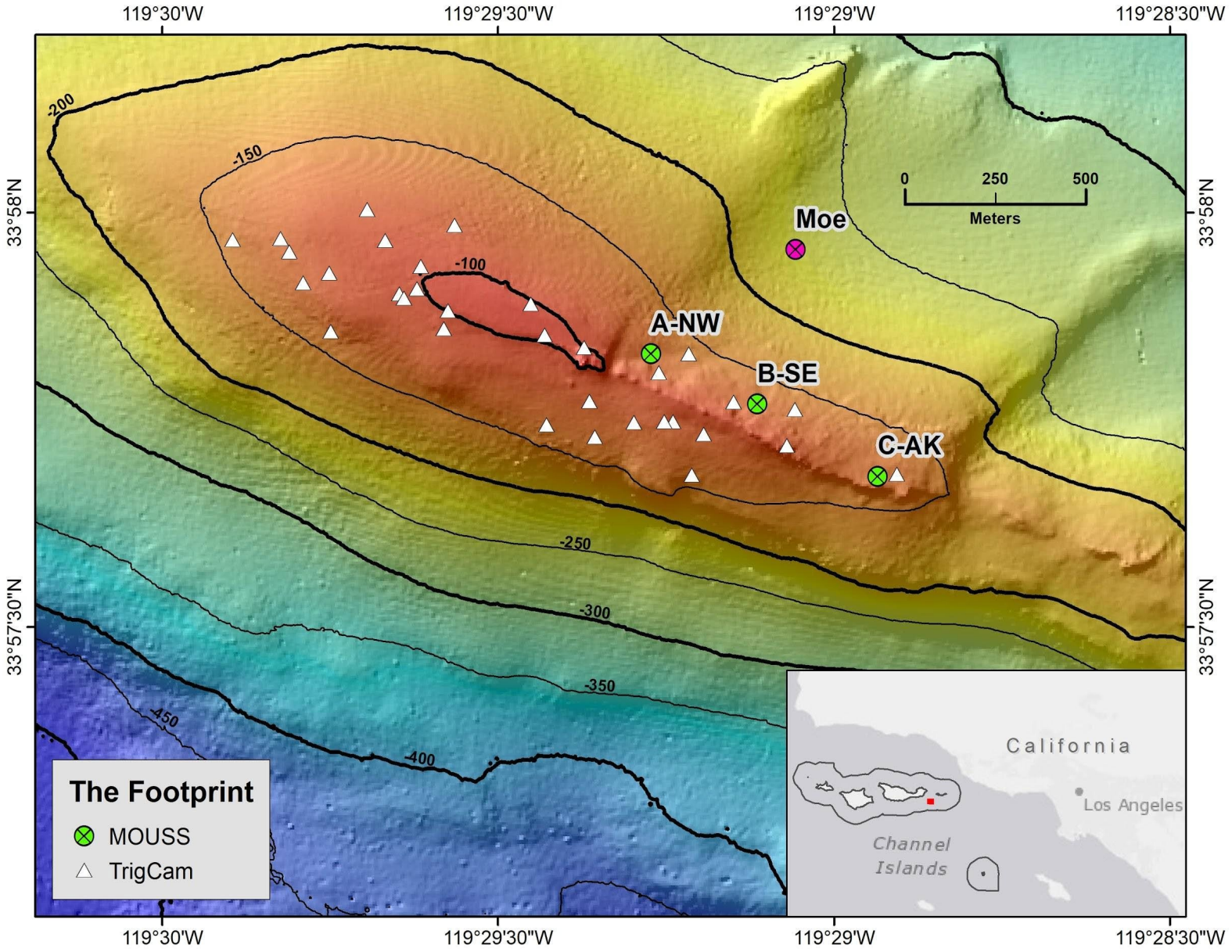

The Footprint

- Rocky outcrops
- 120 – 130 m depth
- Cold water
- Artificial light
- Diverse assemblage of fishes


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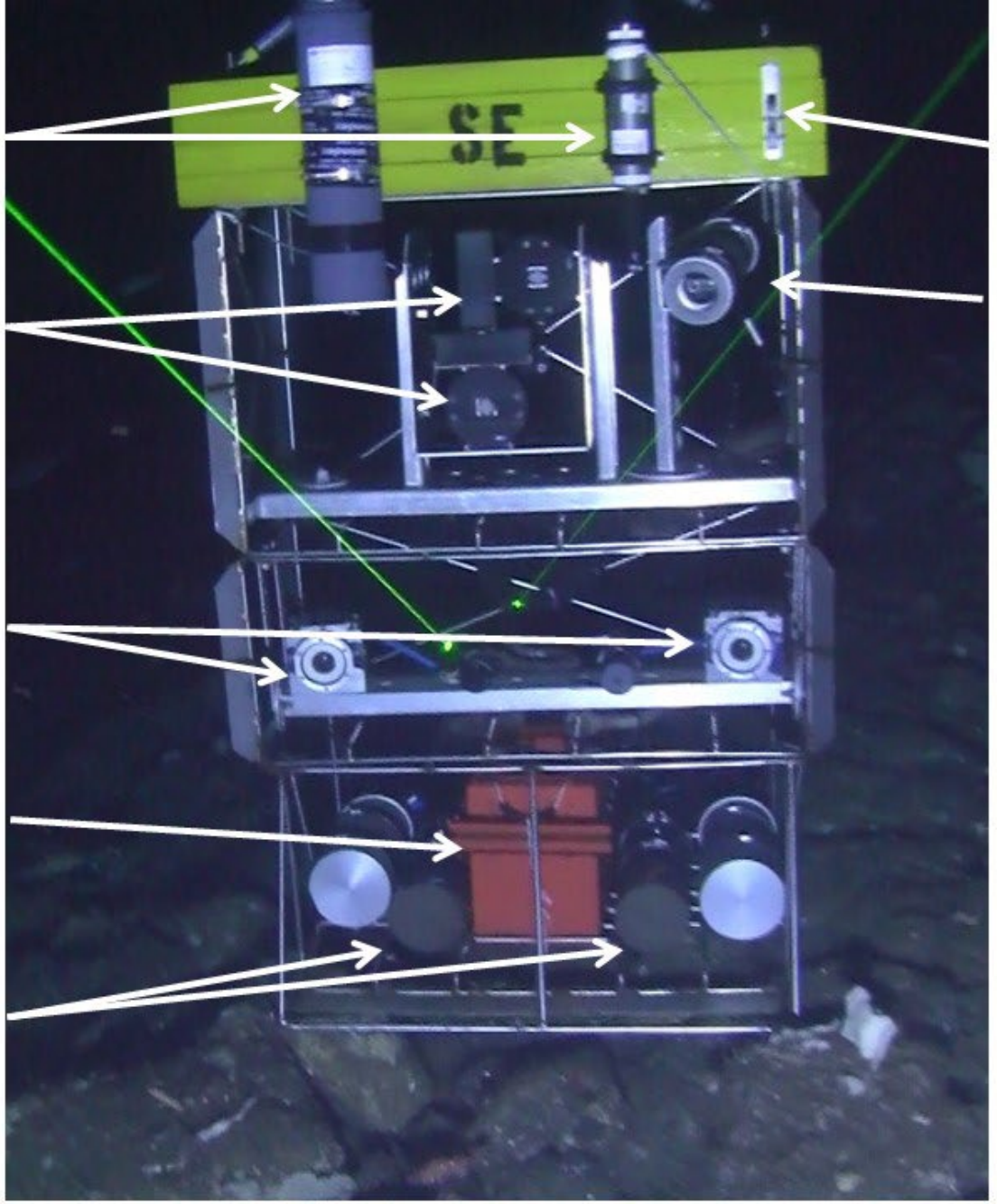
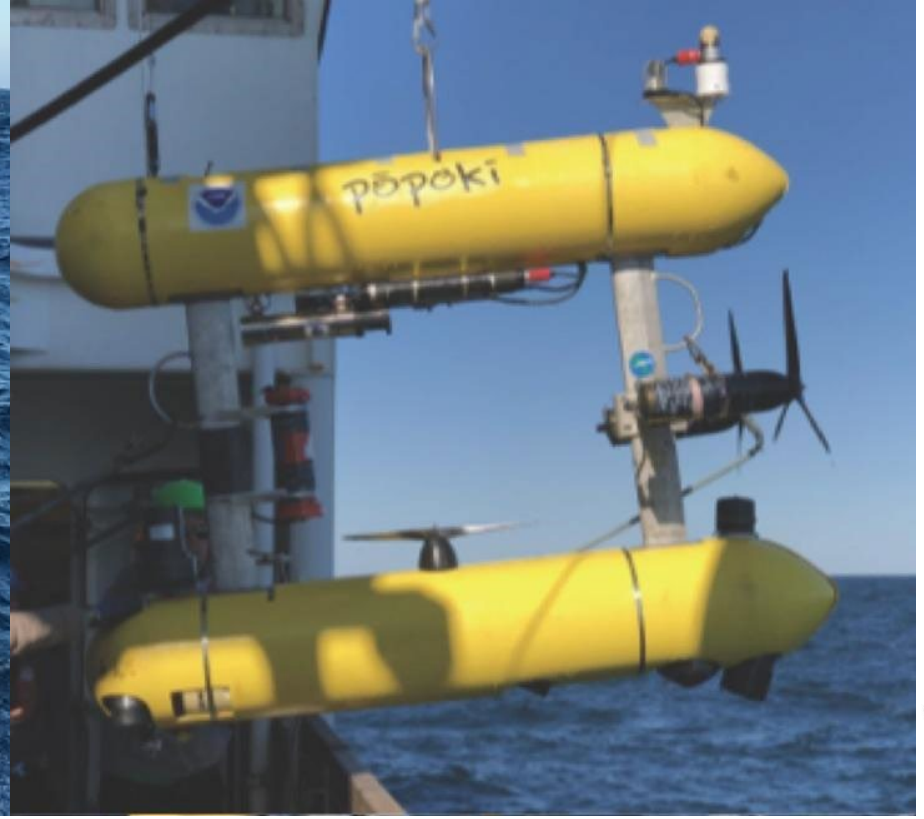
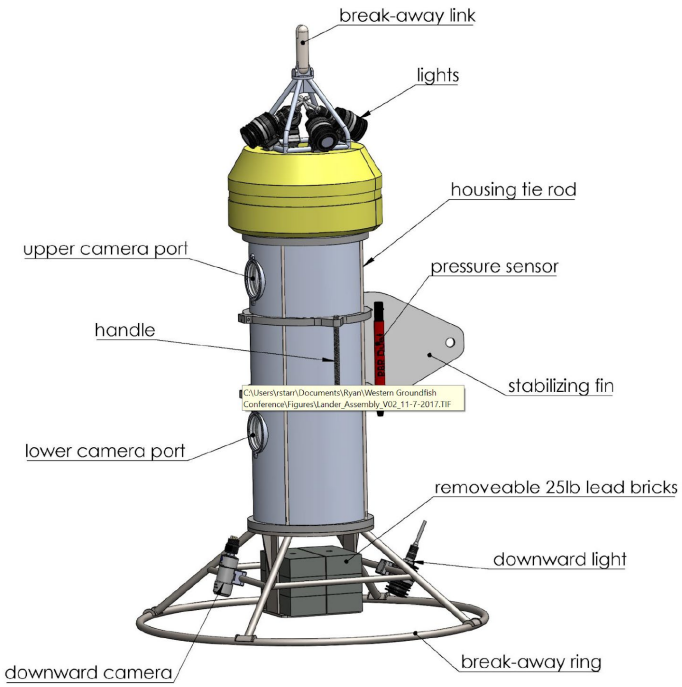

DW and AUV tracking beacons
DIDSON
MOUSS cameras
Battery
Camera computers
DIDSON computers
Light meter
Strobe
SE

DeepWorker HOV



NWFSC AUV



BOSS video lander

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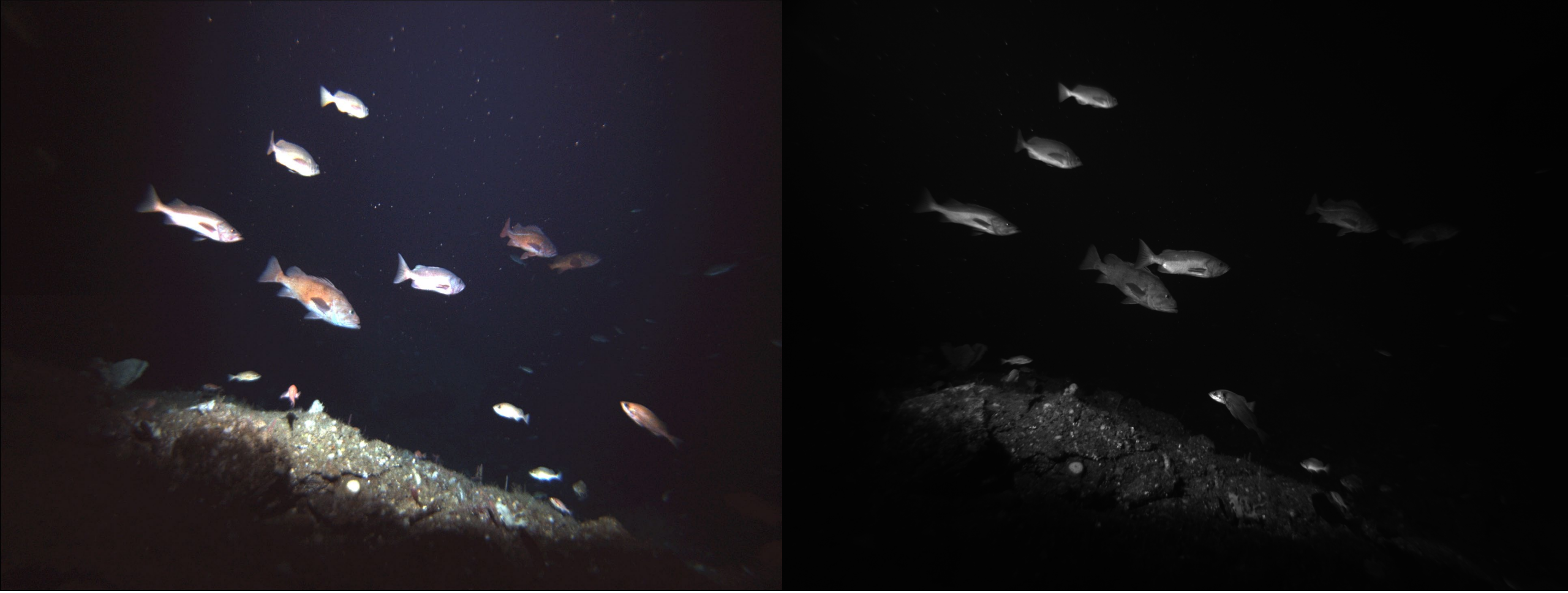
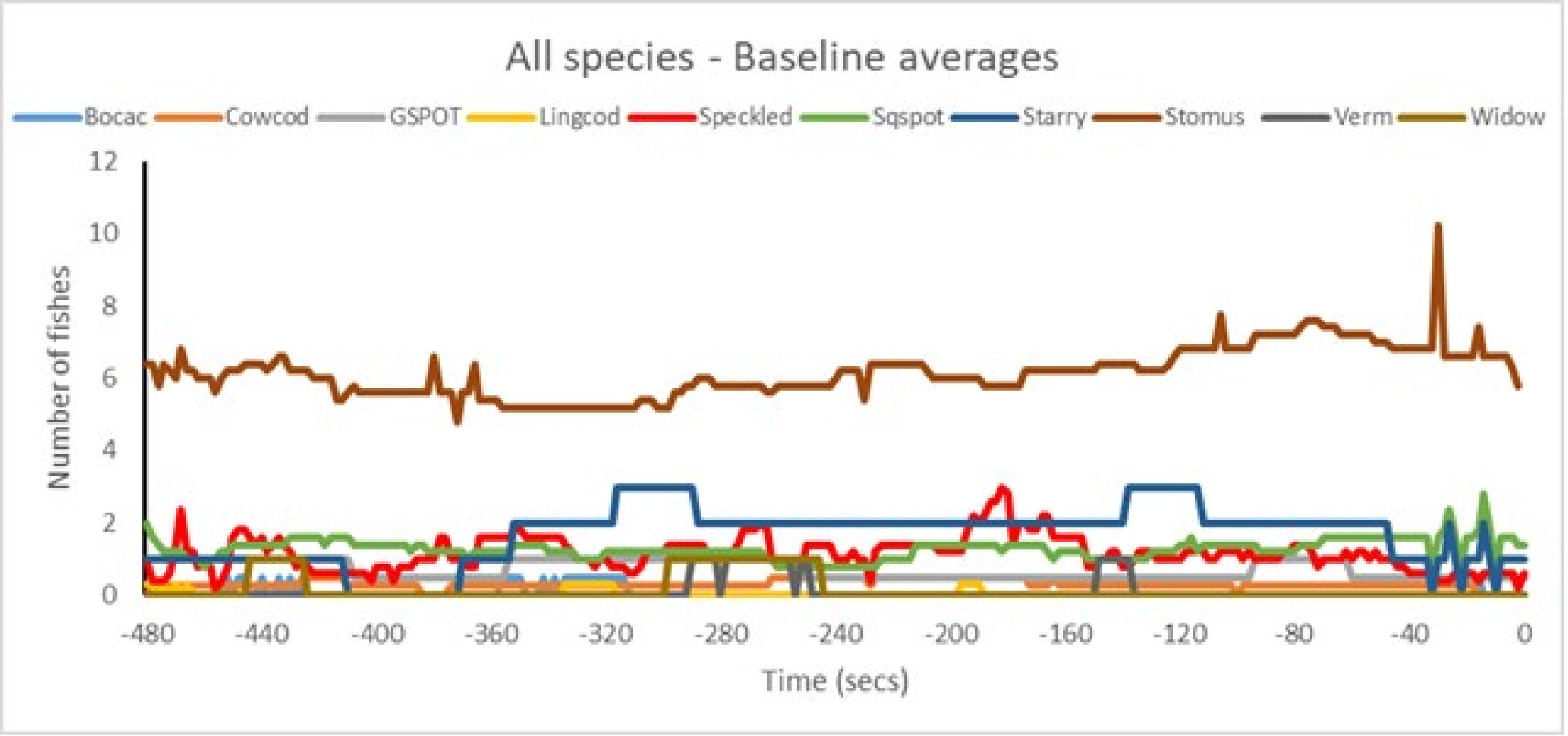


Platform SE, Dive 96



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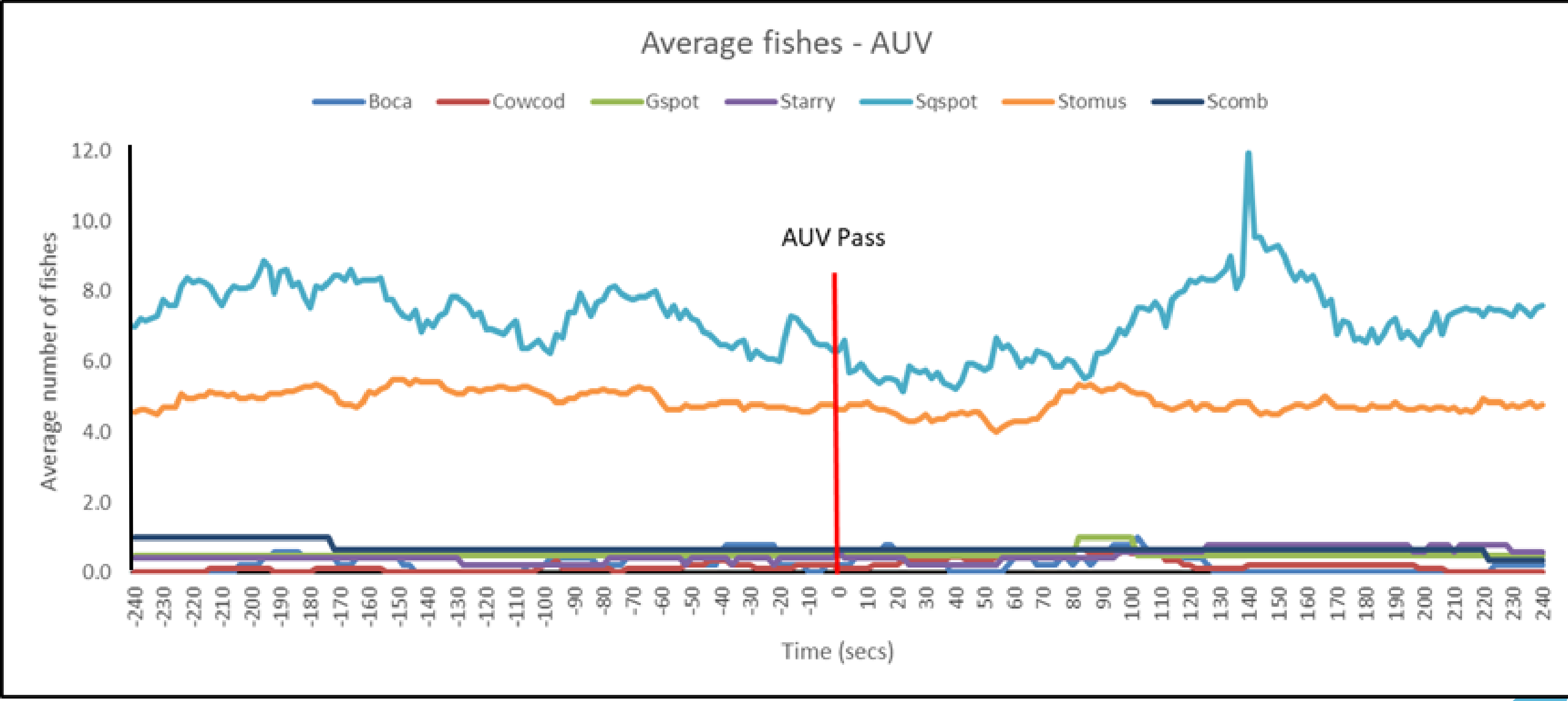
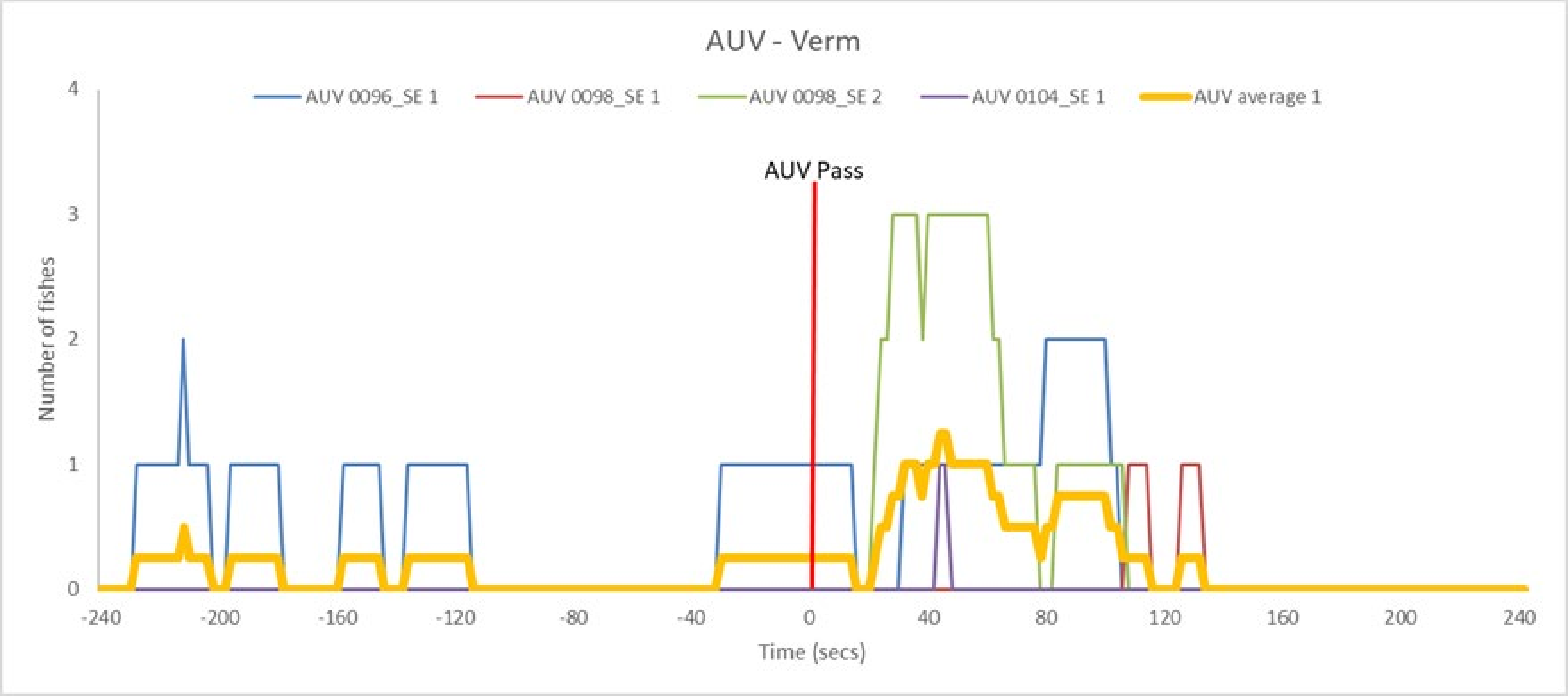

Average fishes - AUV
Boca
Cowcod
Gspot
Starry
Sqspot
Stomus
Scomb
AUV Pass
Average number of fishes
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-240 -230 -220 -210 -200 -190 -180 -170 -160 -150 -140 -130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240
Time (secs)



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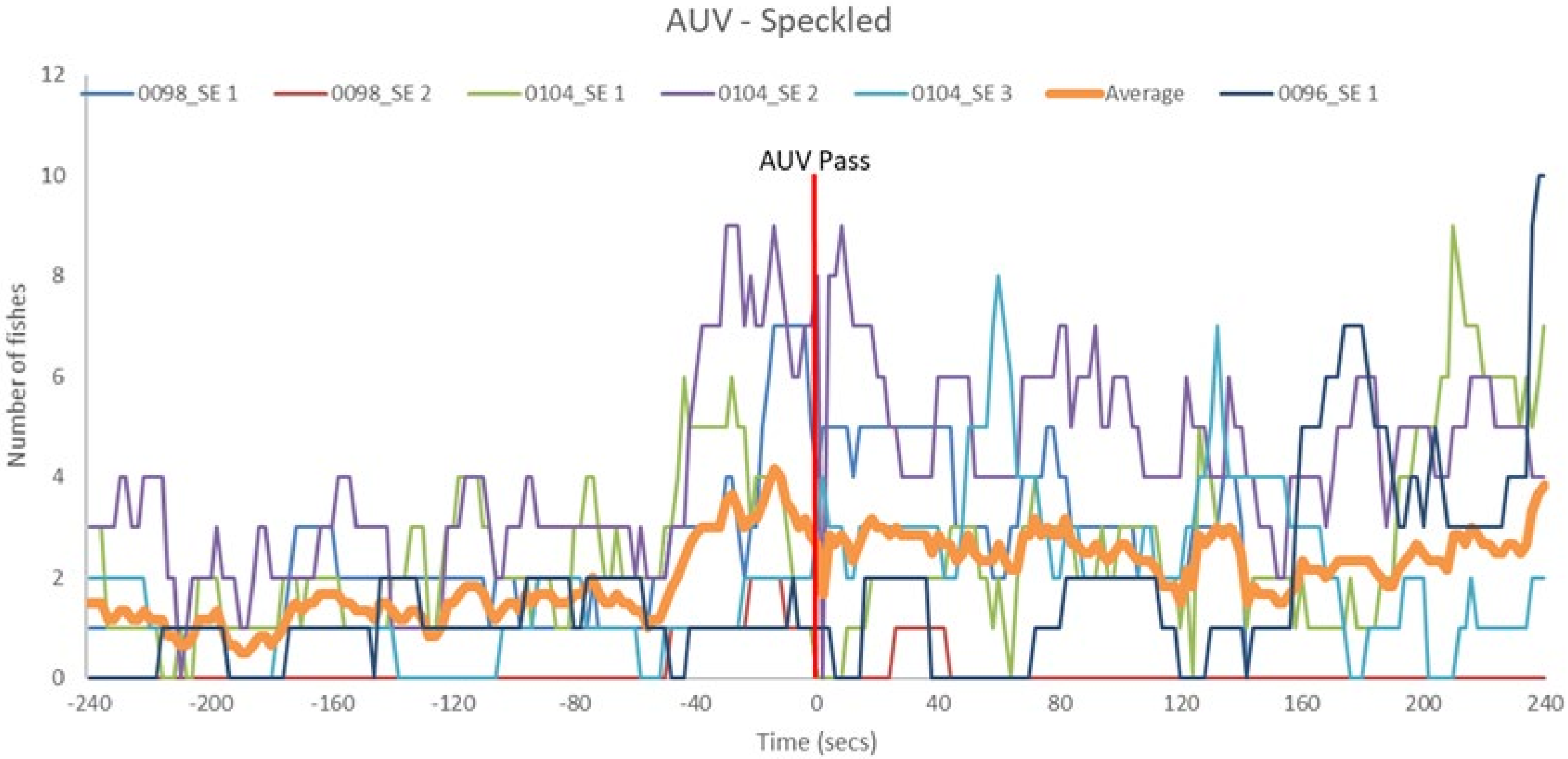
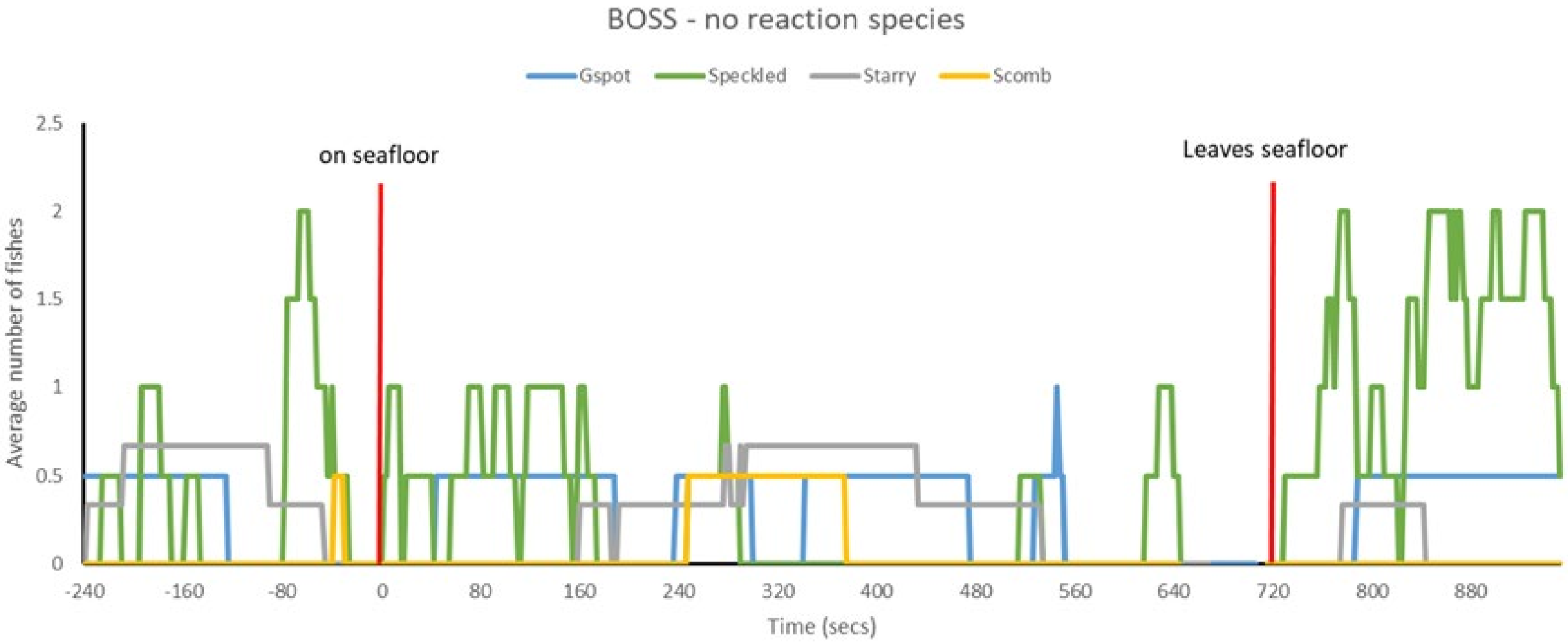

AUV - Speckled
0098_SE 1
0098_SE 2
0104_SE 1
0104_SE 2
0104_SE 3
Average
0096_SE 1
AUV Pass
Number of fishes
Time (secs)
12
10
8
6
4
2
0
-240
-200
-160
-120
-80
-40
0
40
80
120
160
200
240



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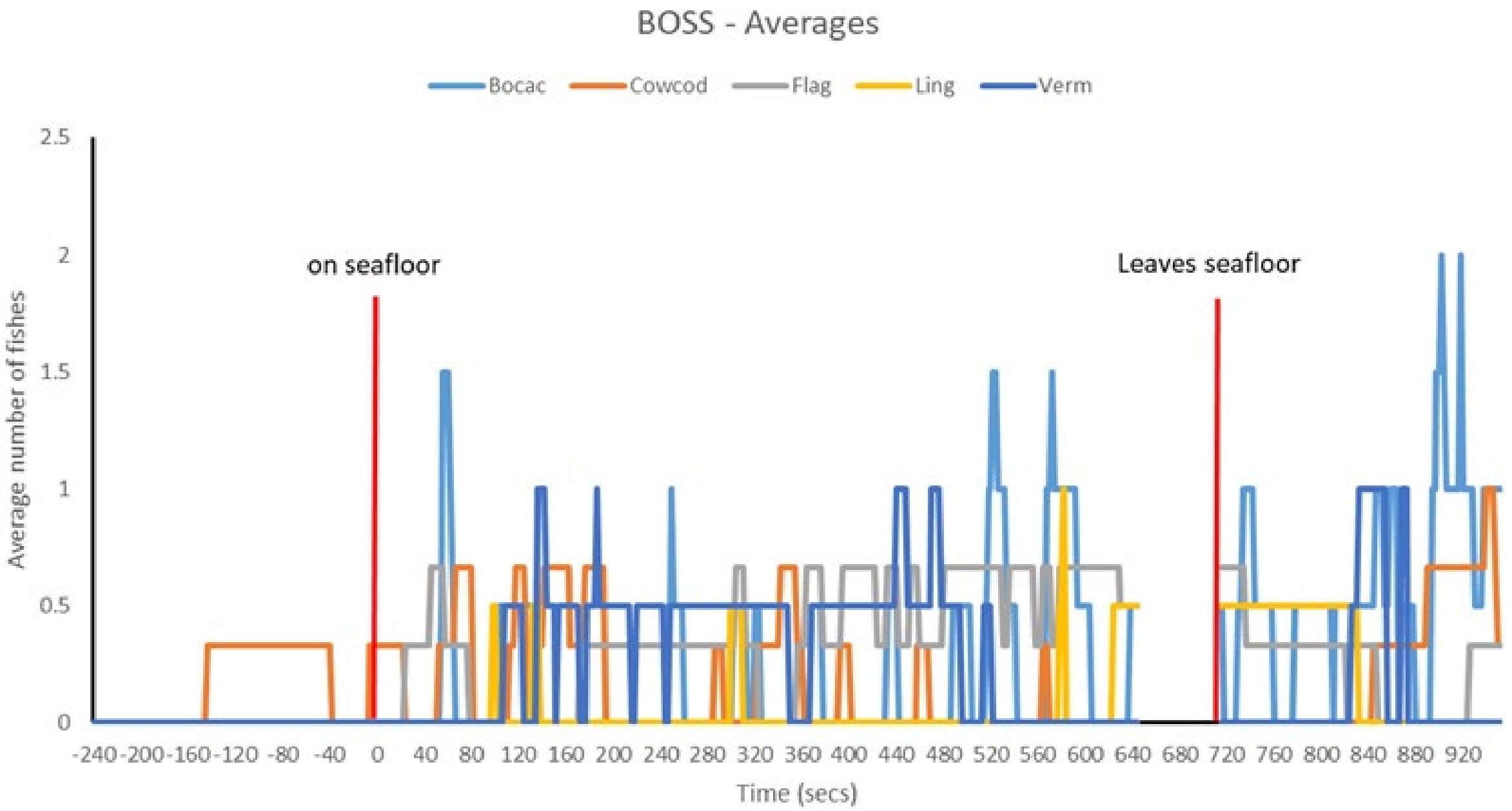
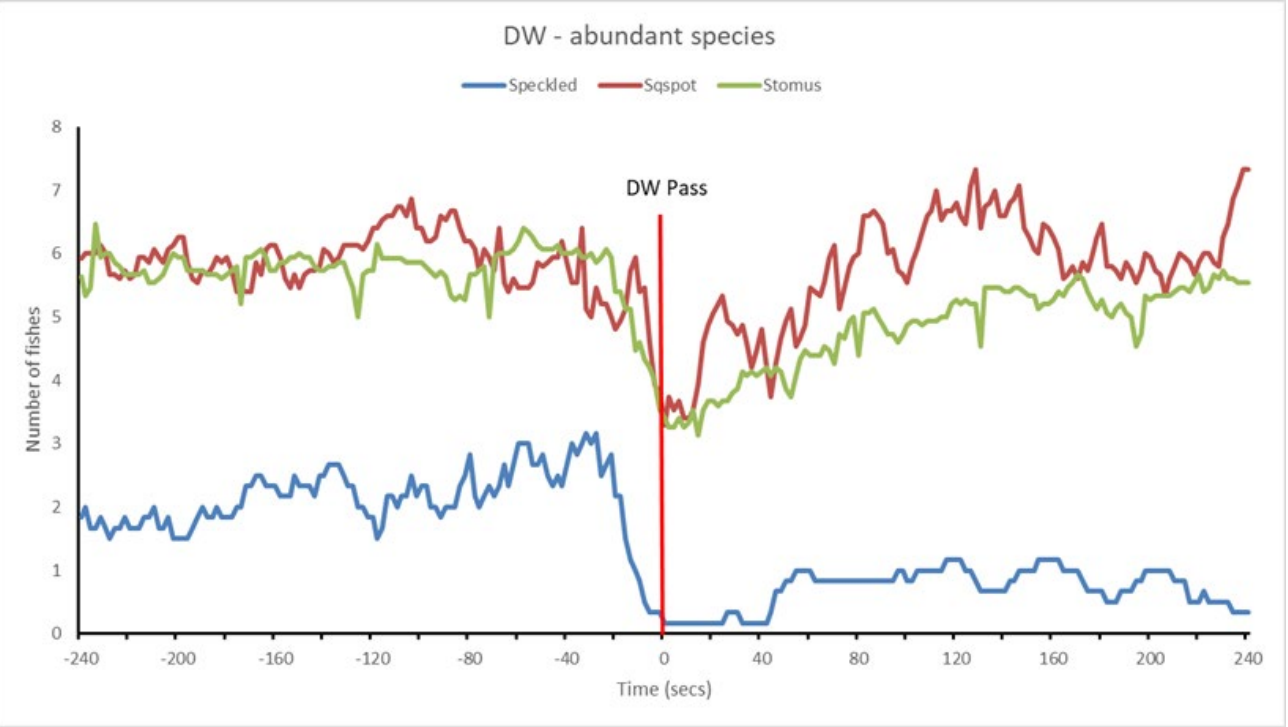
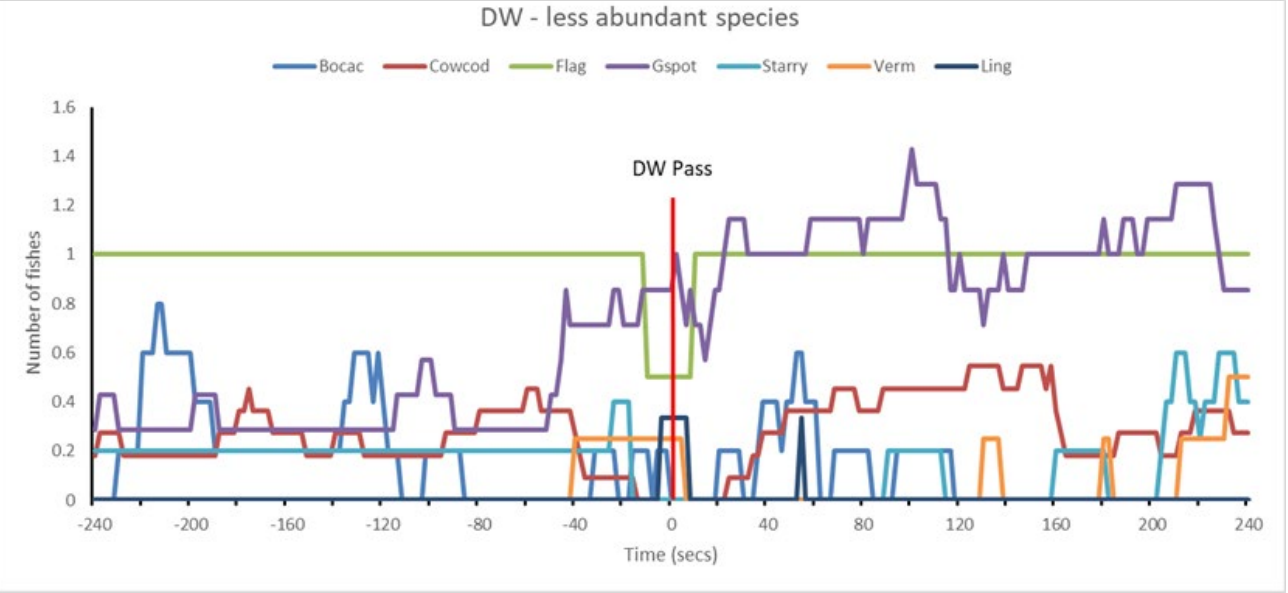
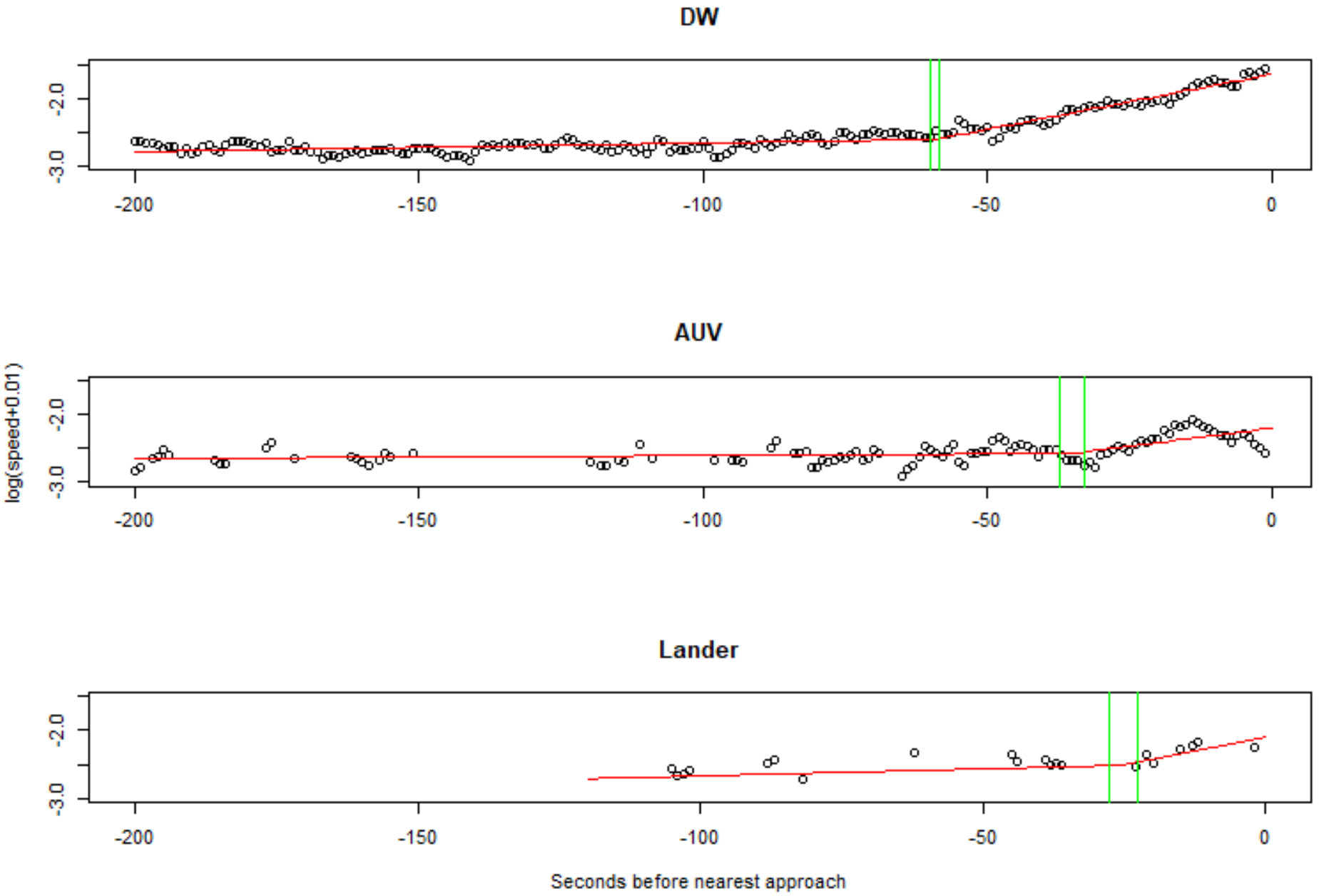

BOSS - Averages
Bocac
Cowcod
Flag
Ling
Verm
on seafloor
Leaves seafloor
Average number of fishes
2.5
2
1.5
1
0.5
0
-240 -200 -160 -120 -80 -40 0 40 80 120 160 200 240 280 320 360 400 440 480 520 560 600 640 680 720 760 800 840 880 920
Time (secs)





Speckled, squarespot, and *Sebastomus* rockfishes avoided the DeepWorker

Greenspotted RF appear to be attracted, and other species avoided the DW. Flag rockfishes did not react. Drop in counts when DW passes is due to sub blocking the camera view.



Swimming speed

Change point detection

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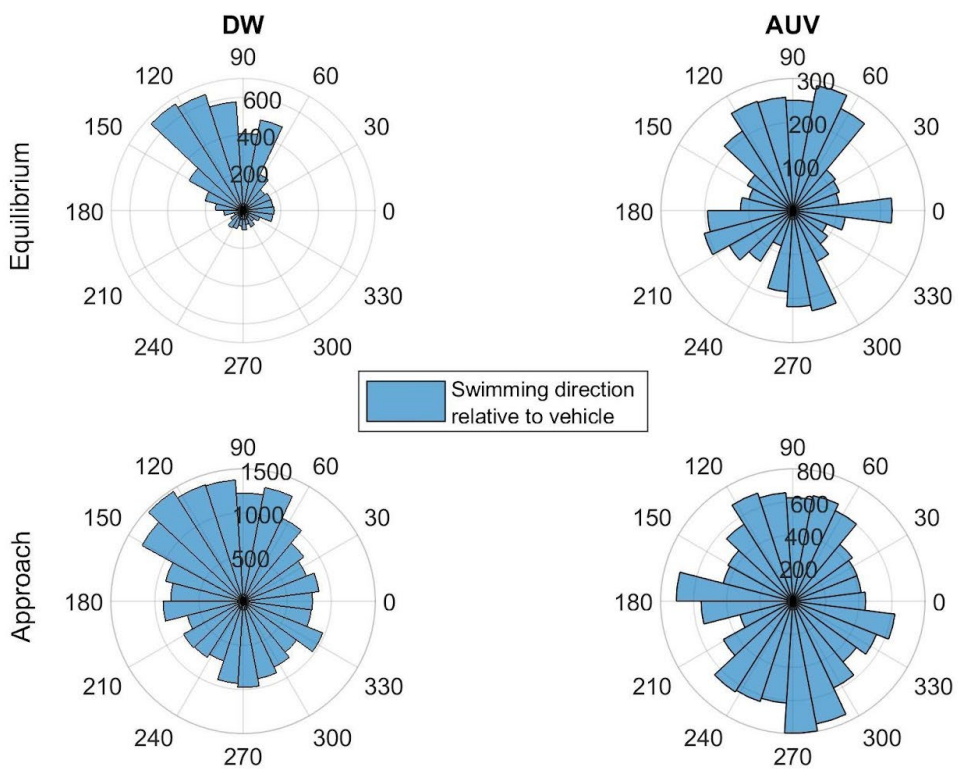

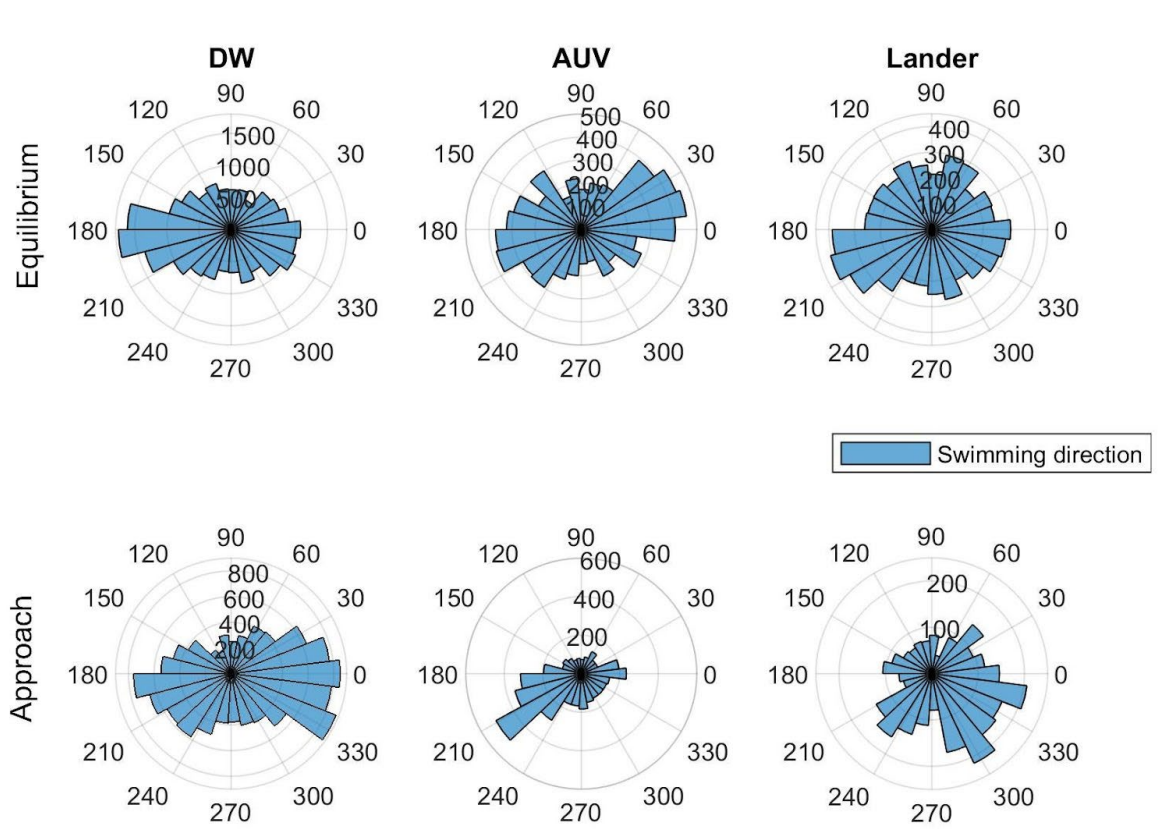

Horizontal DIDSON

Vertical DIDSON

Directional movement

Away

No direction

Down

Down

Down

		AUV			DW			Lander		
Species name	Common name	Attract	No rxn	Avoid	Attract	No rxn	Avoid	Attract	No rxn	Avoid
O. elongatus	Lingcod					X		X		
S. chlorostictus	Greenspotted RF		X		X				X	
S. constellatus	Starry RF		X				X		X	
S. hopkinsi	Squarespot RF		X				X			X
S. levis	Cowcod		X				X	X		
S. miniatus	Vermilion RF	Follow				X		X		
S. ovalis	Speckled RF			X			X			X
S. paucispinis	Bocaccio		X			X		X		
S. rubrivinctus	Flag RF					X		X		
Sebastes spp.	*Sebastomus*		X				X	X?		
Z. frenata	Shortspine Combfish		X						X	

AUV

- Most demersal fishes – vertical image
- Avoid off bottom species

Boss Lander

- Survey when first arrive before species are attracted
- Leave lander on seafloor longer to acclimate
- Avoid off bottom species

DeepWorker

- Many fish reacted, but observed on HOV video
- Avoid off bottom species

UHSI

- Many studies and many manuscripts
  - Acoustics
  - Fish movements
  - Fish density surveys comparing vehicles
  - Spectral sensitivities
  - Lighting effects
  - Mating behavior (cowcod)
- 5 science centers
- Numerous academic and private partners
- Experts from across the US and Canada
- 6 vessels
- Technology development and sharing of expertise

Final report completed later this year

Questions?

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NW
SE