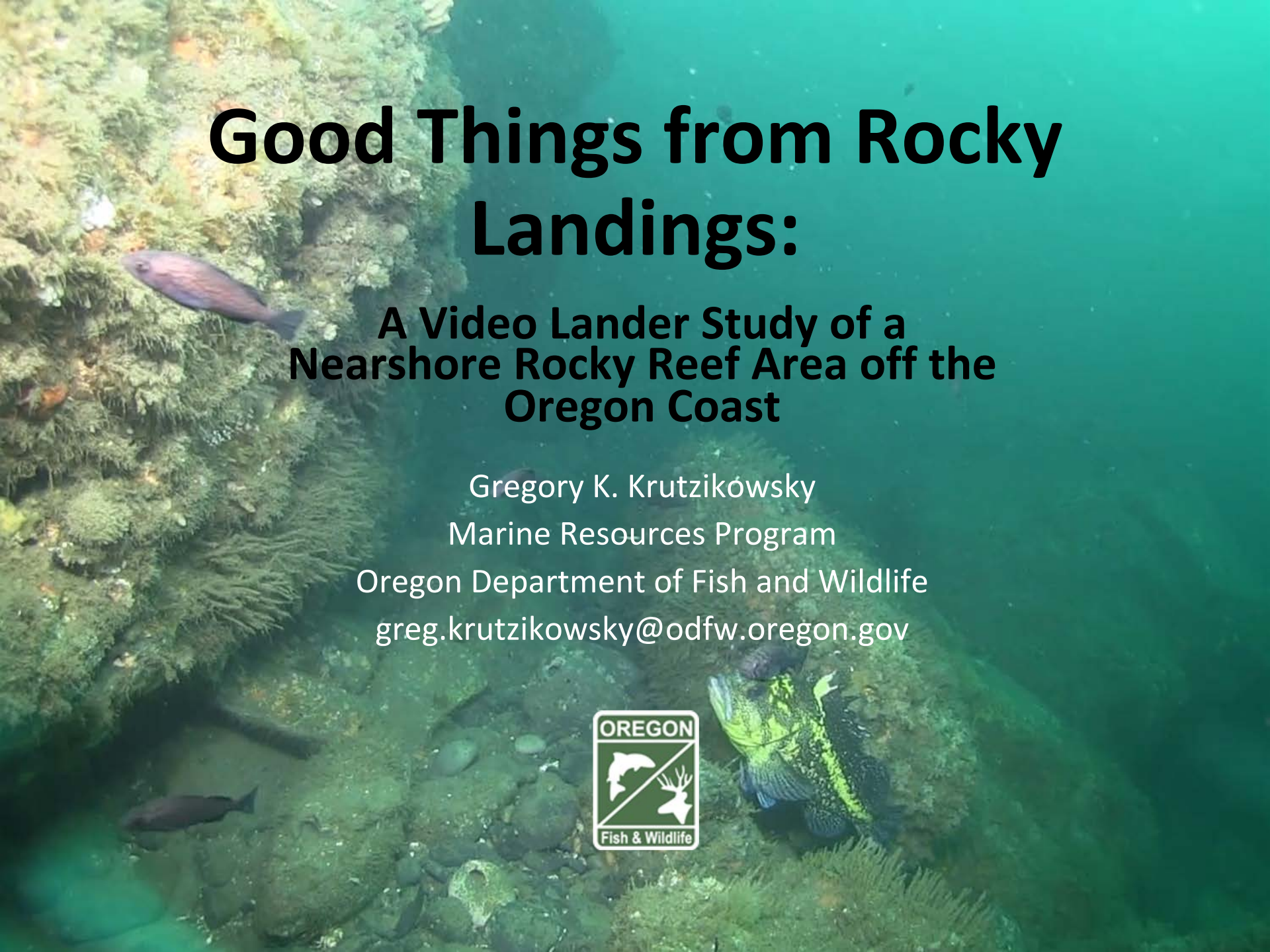
Good Things from Rocky Landings:

A Video Lander Study of a Nearshore Rocky Reef Area off the Oregon Coast

Gregory K. Krutzikowsky
Marine Resources Program
Oregon Department of Fish and Wildlife
greg.krutzikowsky@odfw.oregon.gov



“Counting fish is like counting trees – except they are invisible and keep moving.”

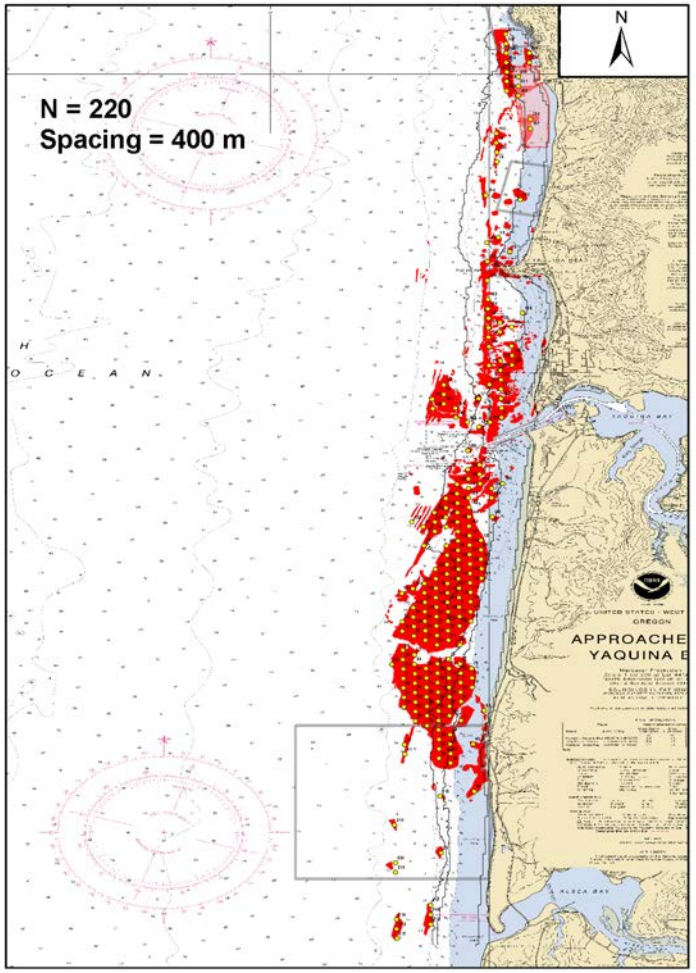
John Shepard, University of South Hampton

The original quote was:

“Managing fisheries is hard: it’s like managing a forest, in which the trees are invisible and keep moving around”

(from an unpublished lecture at Princeton University, ca 1978)

Nearshore Video Lander Survey



Study Goals

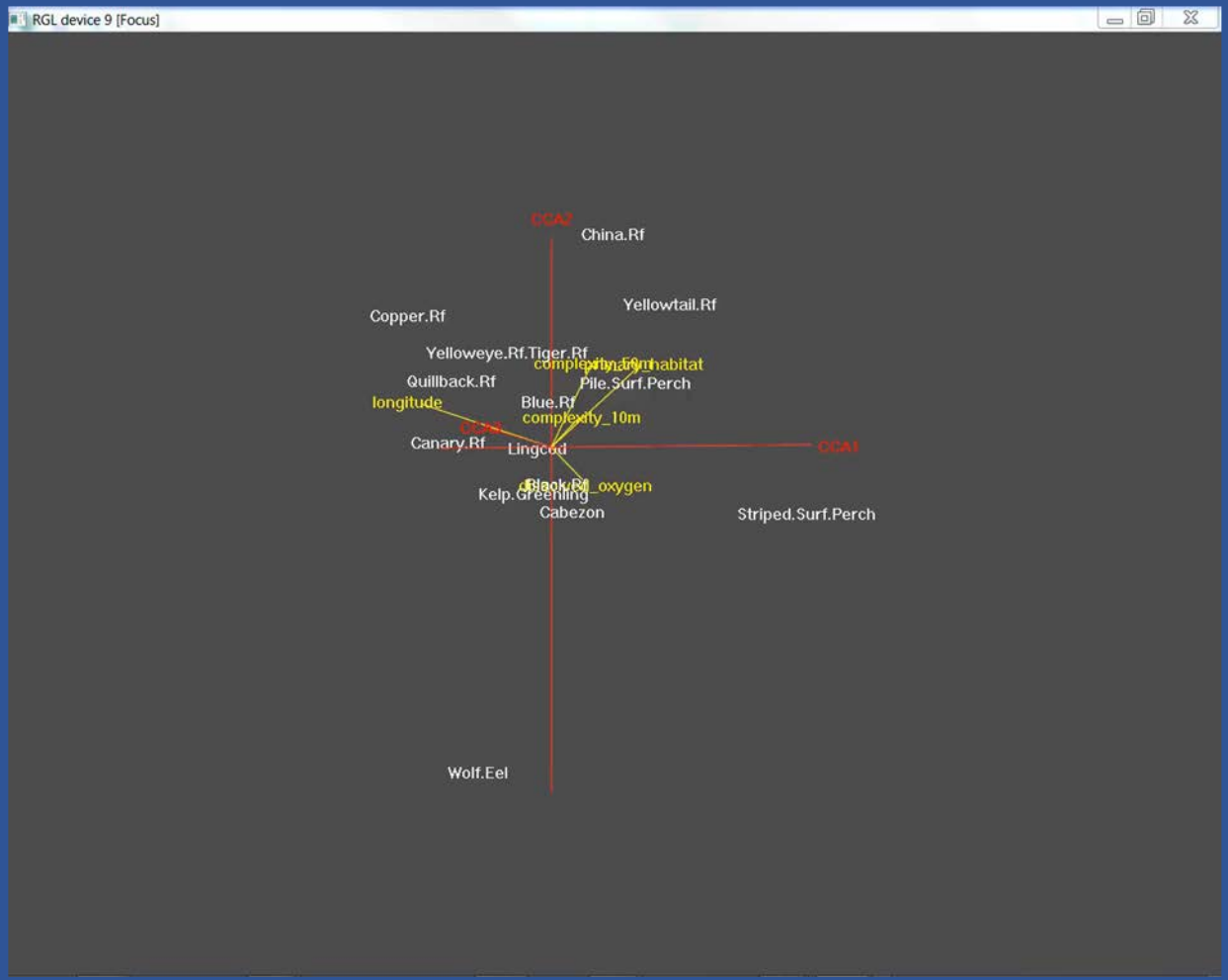
- Examine potential for video lander survey to characterize fish community and habitat characteristics

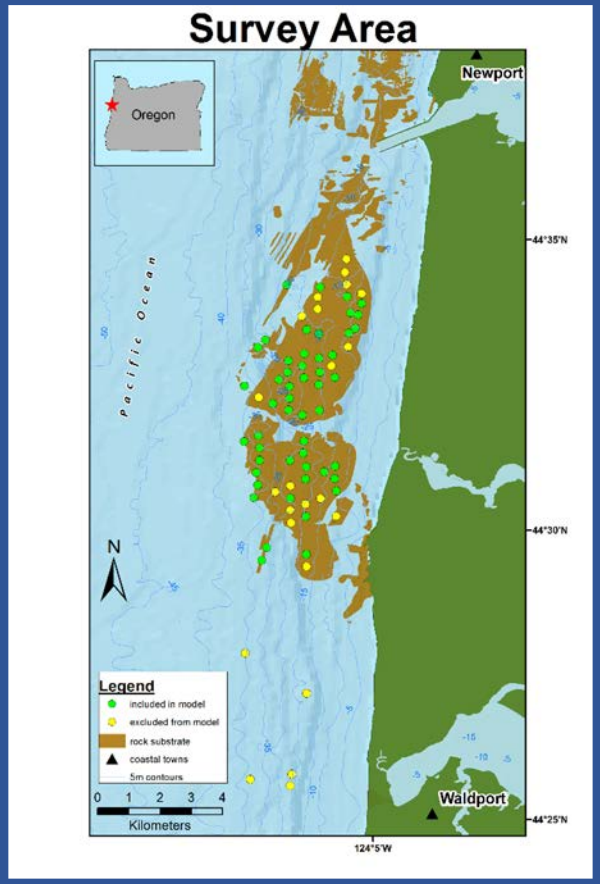
- Examine potential of video lander survey to provide density and abundance information

So What Do the Data Look Like ?

Visible fish that move!

Canonical Correspondence Analysis

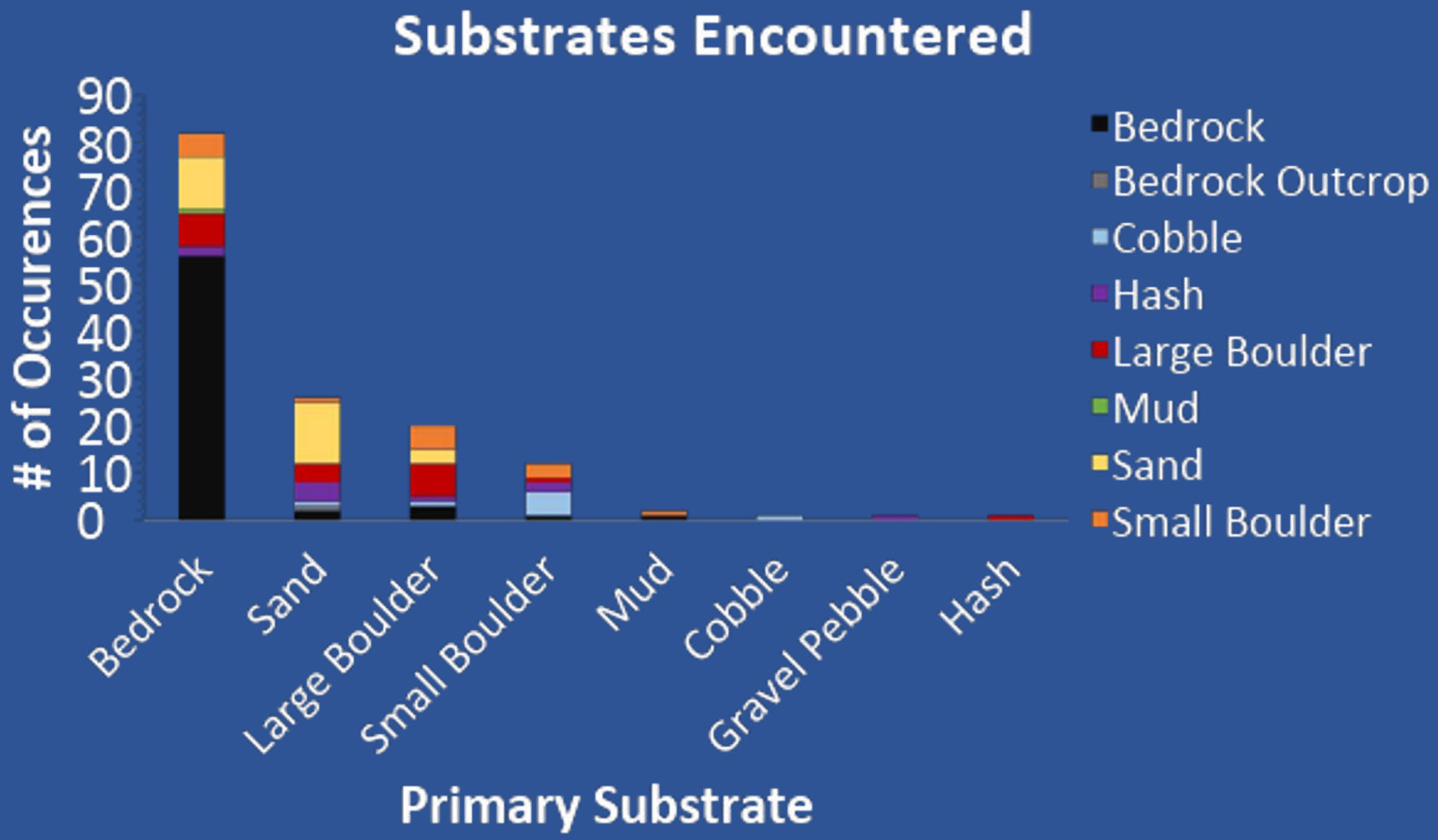




177 Drops Made
145 Video Samples Analyzed

Depth (m)	Drops (%)	Video (%)	Reasons for no video analysis View =13, Vis = 4, Video = 15
<10	18 (10.2 %)	12 (8.3 %)	View - 1; Vis - 1; Video issue - 4
10 to <20	83 (46.9 %)	67 (46.2 %)	View - 8; Vis - 3; Video issue - 5
20 to <30	56 (31.6 %)	47 (32.4 %)	View - 3; Vis - 0; Video issue - 6
30 to <40	18 (10.1 %)	17 (11.7 %)	View - 1; Vis - 0; Video issue - 0
40 to <50	2 (1.1 %)	2 (1.4 %)	N/A

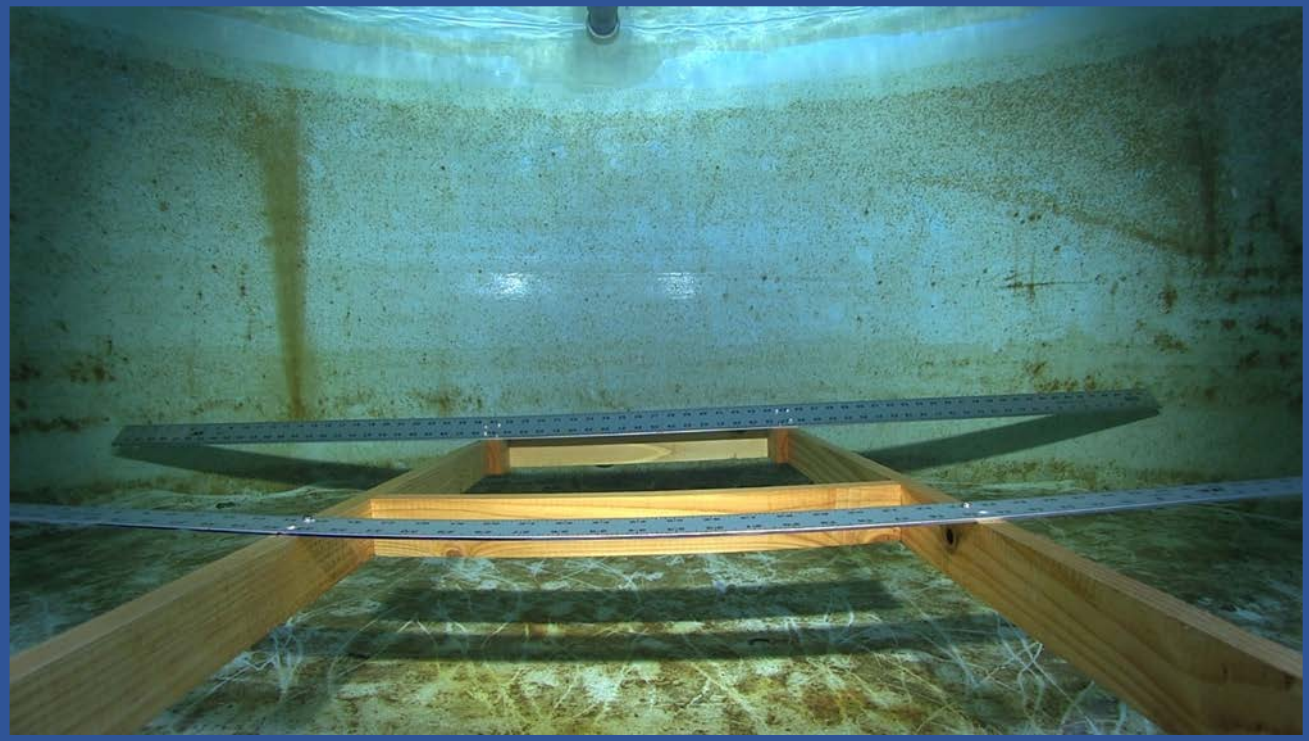
Substrate Info for 145 Drops



From Moving Fish to Numbers

- Fish observed in 123 (85 %) of drops
- 1370 of 1583 (87 %) adult fish identified to species
- MaxN = Maximum # visible in one frame
- Frequency of occurrence – % of drops observed
- Area Viewed: $A = (\frac{\theta}{360})\pi r^2$ for each drop
- Density = Σ(MaxN/*A*)/n for all drops
- Abundance = Density * study area size

Species	# drops	% drops	Sum MaxN	Max. MaxN
Kelp Greenling	77	53.1%	123	12
Black Rockfish	70	48.3%	671	92
Lingcod	58	40.0%	78	4
Blue/Deacon Rockfish	48	33.1%	246	73
Pile Perch	31	21.4%	84	14
Canary Rockfish	25	17.2%	85	16
Striped Surf Perch	14	9.7%	49	15
Yellowtail Rockfish	8	5.5%	10	2
Copper Rockfish	7	4.8%	7	1
Cabezon	6	4.1%	6	1
Quillback Rockfish	5	3.4%	5	1
China Rockfish	2	1.4%	2	1
Tiger Rockfish	1	0.7%	1	1
Wolf Eel	1	0.7%	1	1
Yelloweye Rockfish	1	0.7%	1	1
Shiner Perch	1	0.7%	1	1
YOY UNID Rockfish	36	24.8%	184	32



Area Viewed: $A = (\frac{\theta}{360})\pi r^2$

θ = 96.7°

Estimates for r from stereo lander work by Hannah and Blume 2016

Max r = 3.42 m, Mean r = 2.42 m, ~~Min r = 1.57 m~~

Max A = 9.87 m^2, Mean A = 4.94 m^2, ~~Min A = 2.08 m^2~~

How crazy am I?

Several published studies used similar methods to calculate fish densities from video landers.

- Burge et al. 2012 for grouper in the Atlantic
- Mallet et al. 2014 for coral reef fish in New Caledonia
- Pita et al. 2014 rocky reef fish off Spain
- Starr et al. 2016 rocky reef fish off California

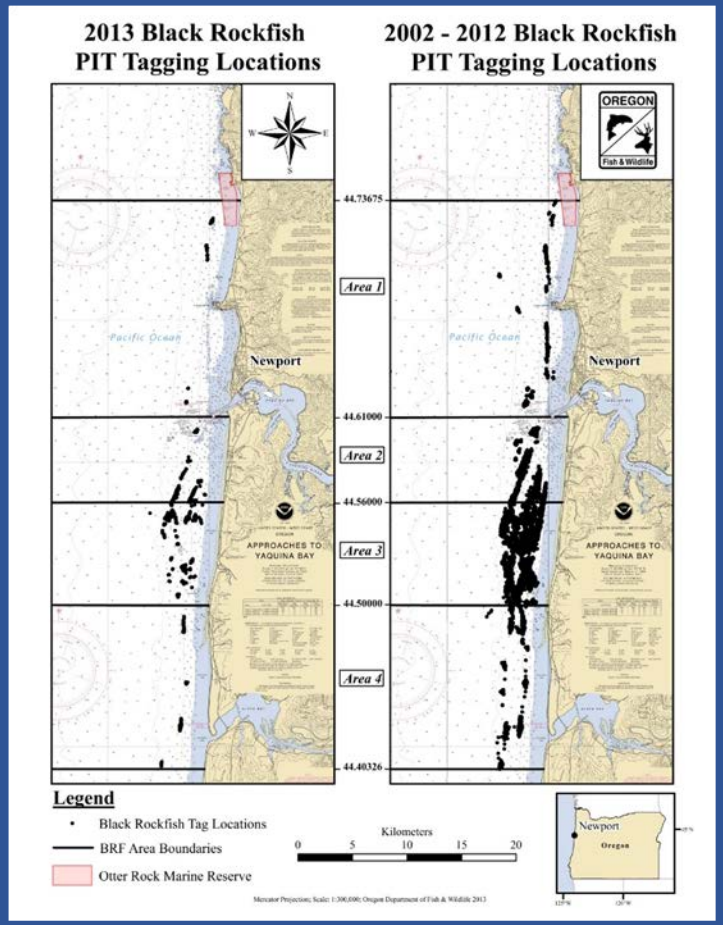
Density and Abundance Estimates

Species	mean density estimate (#/100 m²)	minimum density estimate (#/100 m²)	mean abundance estimate	minimum abundance estimate
Black Rockfish	93.61	46.87	2,825,955	1,414,959
Blue/Deacon Rockfish	34.32	17.18	1,036,043	518,748
Kelp Greenling	17.16	8.59	518,022	259,374
Canary Rockfish	11.86	5.94	357,982	179,242
Pile Perch	11.72	5.87	353,771	177,133
Lingcod	10.88	5.45	328,501	164,481
Striped Surf Perch	6.84	3.42	206,366	103,328
Yellowtail Rockfish	1.40	0.70	42,116	21,087
Copper Rockfish	0.98	0.49	29,481	14,761
Cabezon	0.84	0.42	25,269	12,652
Quillback Rockfish	0.70	0.35	21,058	10,544
China Rockfish	0.28	0.14	8,423	4,217

Any Estimates to Compare?

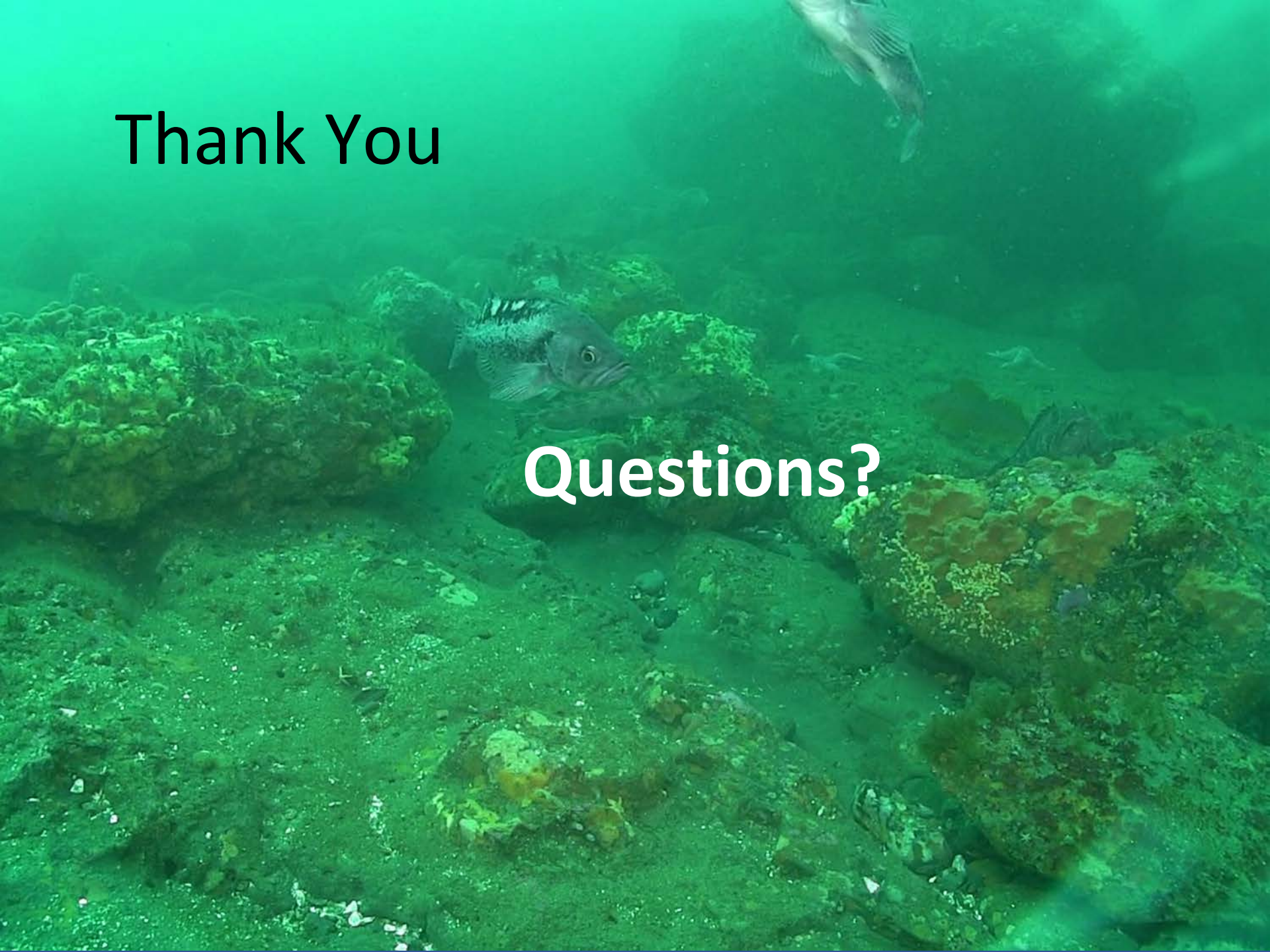
Black Rockfish PIT Tag Work

- Essentially same study area
- Based on Brownie model for mark-recovery
- Abundance estimates informed 2007 and 2016 assessments
- PIT tag estimates 1.2 to 1.9 million
- Lander estimates 1.4 to 2.8 million



Future Work

- Fish Behavior Considerations
- Detectability Issues
- Metrics, Calculation Methods & Processing Point Samples
- Full Incorporation of Stereo Cameras
- Expand spatial and temporal coverage


Thank You
Questions?